Doctoral (PhD) Dissertation

Dr. Erik Diez, Kaposvár, 2024

Hungarian University of Agriculture and Life Sciences (MATE)

Doctoral School of Economic And Regional Sciences

Head of the Doctoral (PhD) School:

Prof. Dr. Zoltán Bujdosó, PhD

Supervisor

Prof. Dr. László ÓZSVÁRI PhD

Exploring the Digitalization and Business Management of German Veterinary Practices

Written by

Dr. ERIK DIEZ

KAPOSVÁR

2024

The PhD School

Name: Doctoral School of Economic and Regional Sciences

Discipline: PhD in Management and Organizational Science

Head: Prof. Dr. Zoltán Bujdosó, PhD

Full professor

Institute of Rural Development and Sustainable Economy

Hungarian University of Agriculture and Life Sciences

Supervisor(s): Prof. Dr. László Ózsvári, PhD

Full professor

Department of Veterinary Forensics and Economics

University of Veterinary Medicine Budapest

....

Approval of the Head of Doctoral School Approval of the Supervisor(s)

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

AFC – AFC Pubic Services by AFC Consulting Group

ATC – Average Transaction Charge

APPA – American Pet Products Association

AVMA – American Veterinary Medical Association

BLE – Bundesanstalt für Landwirtschaft und Ernährung

BMEL – Bundesministerium für Ernährung und Landwirtschaft

bpt – Bundesverband praktizierender Tierärzte e.V.

BTK – Bundestierärztekammer e.V.

EBIT – Earnings Before Interest and TAX

EBITDA – Earnings Before Interest, Tax, Depreciation and Amortization

FEDIAF – European Pet Food Industry Federation

FVE – Federation of Veterinarians of Europe

GOT – Gebührenordnung für Tierärzte

IVH – Industrieverband Heimtierbedarf (IVH) e.V.

KPI – Key Performance Indicator

mATC – medal Average Transaction Charge

IR – Inventory Revenue

ROS – Return of Sales

TASSO – Tierschutzorganisation TASSO – Haustierzentralregister für die bundesrepublik Deutschland

UVMB – University of Veterinary Medicine Budapest

UWG – Act against unfair competition (Gesetz gegen den unlauteren Wettbewerb)

VAT – Value Added Tax

VCPR – Veterinarian-Client-Patient-Relationship

VTC – Video telecommunication

ZZF – Zentralverband Zoologischer Fachbetriebe Deutschlands e.V.

1 INTRODUCTION

The veterinary profession in Germany is currently experiencing significant structural shifts, marked by a decline in small, independent practices and a rise in larger, partnership-based, or corporate-owned practices. These changes are driven by evolving market forces, the increasing humanization of pets, and the adoption of advanced management and marketing strategies. Additionally, pet owners today have greater access to health-related information online, which raises their expectations regarding both service quality and cost. In this environment, veterinarians must navigate not only clinical challenges but also the complexities of running a business. However, many small practices lack the necessary economic and managerial foundations, placing them at a disadvantage compared to larger, well-structured operations.

This dissertation addresses the critical gap in business management skills among veterinary professionals, focusing on the economic and operational challenges that hinder the sustainability of small and mid-sized practices. While veterinary education traditionally emphasizes clinical expertise, it often neglects the management skills essential for running a successful practice. This research aims to provide insights into effective practice management by exploring strategies for improving operational efficiency, client retention, and financial stability within the veterinary sector.

Over the past two decades, the European veterinary market has shifted from a generalist model, where veterinarians offered broad services across multiple species, to one increasingly defined by specialization and niche expertise. This trend has been largely driven by the growing demand for specialized care in response to the rising number of companion animals. As specialized clinics become more prevalent and non-veterinary companies enter the market, competition has intensified not only in clinical expertise but also in business acumen. Additionally, the profession faces demographic challenges such as an aging workforce, the feminization of the profession, and a limited number of young veterinarians willing to establish or invest in new practices. These factors further underscore the need for veterinary professionals to develop robust management skills.

While digitalization and telemedicine are increasingly relevant in veterinary practice, they represent only one aspect of the broader management challenge. Telemedicine has been a part of veterinary services for decades, but recent technological advancements and the COVID-19 pandemic have accelerated its adoption. Nevertheless, the primary focus of this dissertation remains on the management strategies that can help veterinarians thrive in a rapidly changing

market. This includes understanding how to structure practices effectively, implement strategic marketing, and optimize client services—all essential for maintaining a competitive edge.

This research also incorporates an analysis of veterinary telemedicine, not as an isolated technological trend, but as part of a broader strategy to enhance practice management. By surveying German pet owners regarding their perceptions of telemedicine, this study provides insights into how digital tools can complement traditional practice models and improve client engagement. However, the core emphasis remains on identifying actionable management solutions that can be readily applied in everyday veterinary practice.

Overall, as the German veterinary profession continues to evolve, the integration of robust management principles alongside clinical excellence remains indispensable for long-term success. This dissertation addresses a notable gap in economic and managerial competencies within the field, offering practical recommendations for veterinarians seeking to establish sustainable and competitive practices in an increasingly complex market.

2 OBJECTIVES TO ACHIEVE

The aim of this study is to explore the business management and marketing characteristics, market tendencies, and digitalization trends within German small animal and mixed veterinary practices, with a particular focus on the role of telemedicine. In this study small animals include dog and cat breeds and small mammals (e.g. guinea pigs, rabbits). Only small animals treated in mixed animal practices are included in the study, not farm animals such as ruminants.

The following hypothesis were formed and will be addressed:
Hypothesis testing related to digitalization and telemedicine:

1. H1: If an animal owner has small animals, they are likely to make use of telemedical consultations
   H0: Owning small animals has no effect on likelihood of using telemedical consultations
2. H2: Younger animal owners are more likely to make use of telemedical consultations
   H0: Age of animal owners has no effect on likelihood of telemedical consultation usage
3. H3: Rural and small-town populations are more likely to use telemedical consultations
   H0: There are no regional differences in likelihood of telemedical consultation usage

Hypothesis testing related to business management and marketing:

1. H4: There is an effect of practice type on number of employees.
   H0: There is no effect of practice type on number of employees.
2. H5: There is a significant association between practice type and turnover.
   H0: Turnover is independent of the type of practice.
3. H6: The Number of Employees, Equipment and legal form are decisive for high turnover.
   H0: The Number of Employees, Equipment and legal form are not decisive for high turnover
4. H7: There is an effect of number of staff on use of marketing tools.
   H0: There is no effect of number of staff on use of marketing tools.
5. H8: There is an effect of age on views on the future/ marketing instruments.
   H0: There is no effect of age on views on the future/ marketing instruments.
6. H9: There is an effect of age on views on choosing the marketing tools.
   H0: There is no effect of age on views on choosing the marketing tools.

3 LITERATURE REVIEW

3.1 Socio-demographic characteristics of veterinarians in Germany

The veterinary workforce in Germany, as well as across Europe, is undergoing significant transformation. Two decades ago, the profession was primarily male-dominated, characterized by general practitioners who treated a wide range of animals. Presently, however, there has been a notable shift towards a highly specialized field, with a predominance of female veterinarians. This trend mirrors findings from previous studies conducted in North America and other European nations, indicating a broader pattern of gender dynamics and professional specialization within the veterinary sector (Horváth et al., 2021; Kersebohm et al., 2017; Knights & Clarke, 2019; Lofstedt, 2003; Rucker, 2002).

3.1.1 Veterinary students and graduates in Germany (1998-2022)

Between 1998 and 2022, there was an annual average of 1,079 students commencing their veterinary studies in Germany. Among these, there was an average of 936.8 female students per year, representing a mean proportion of 87.0% (SD: 2.0%) of female freshman students over the specified timeframe. (**Figure 1**). The study by Szücs et al. (2023) presents a similar trend, with 73.9% of 548 first-year students enrolled in the Hungarian veterinary medicine course at the University of Veterinary Medicine Budapest during the analysed period from 2016 to 2020 being women.

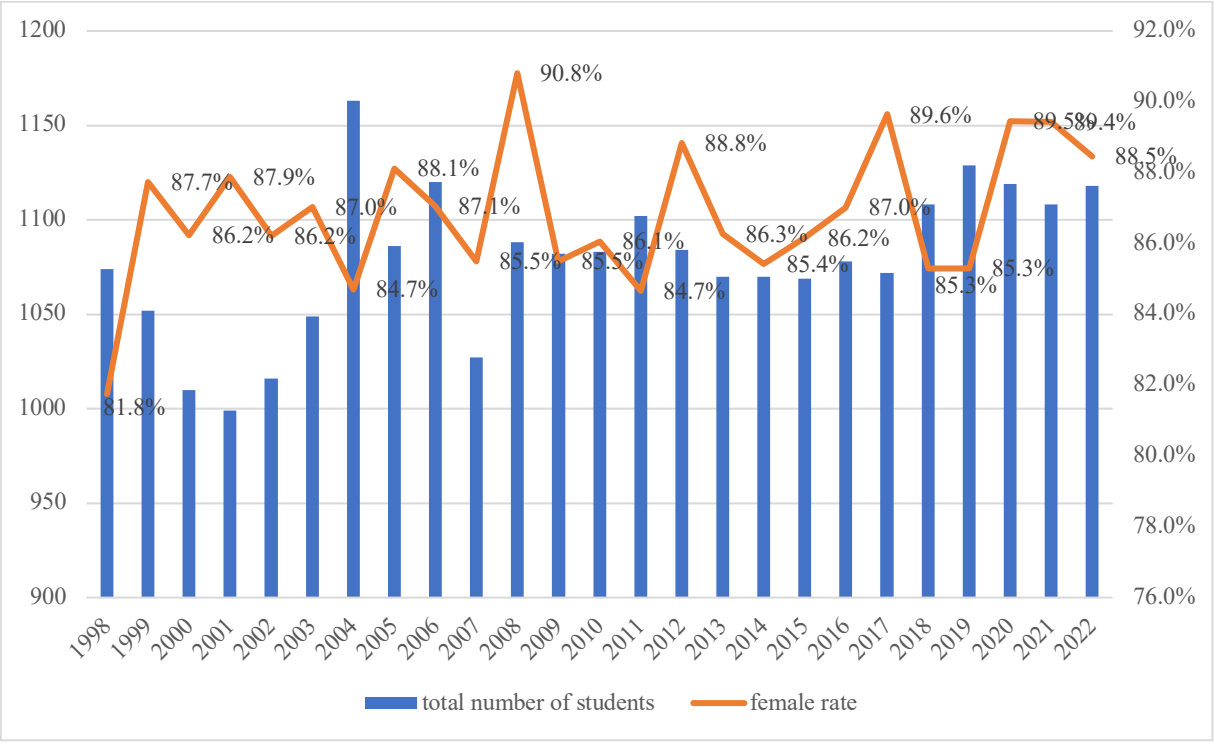

Figure 1. Number of veterinary freshman students in Germany (1998-2022)
Source: Own illustration based on the data supplied by: BTK e.V, 2023.

The overall student population during this period averaged 6,399 (SD: 89) individuals enrolled in veterinary medicine programs during the winter semester of each academic year. However, due to the graduation of veterinarians, the number of students during summer semesters exhibited considerable variability, leading to a high standard deviation in the average student count. Consequently, data for the summer semester are not included. Notably, the average number of female students from 1998 to 2022 was 5,399 (SD: 233), resulting in an average proportion of 84.4% (SD: 3%) of female veterinary students in Germany (**Figure 2).**

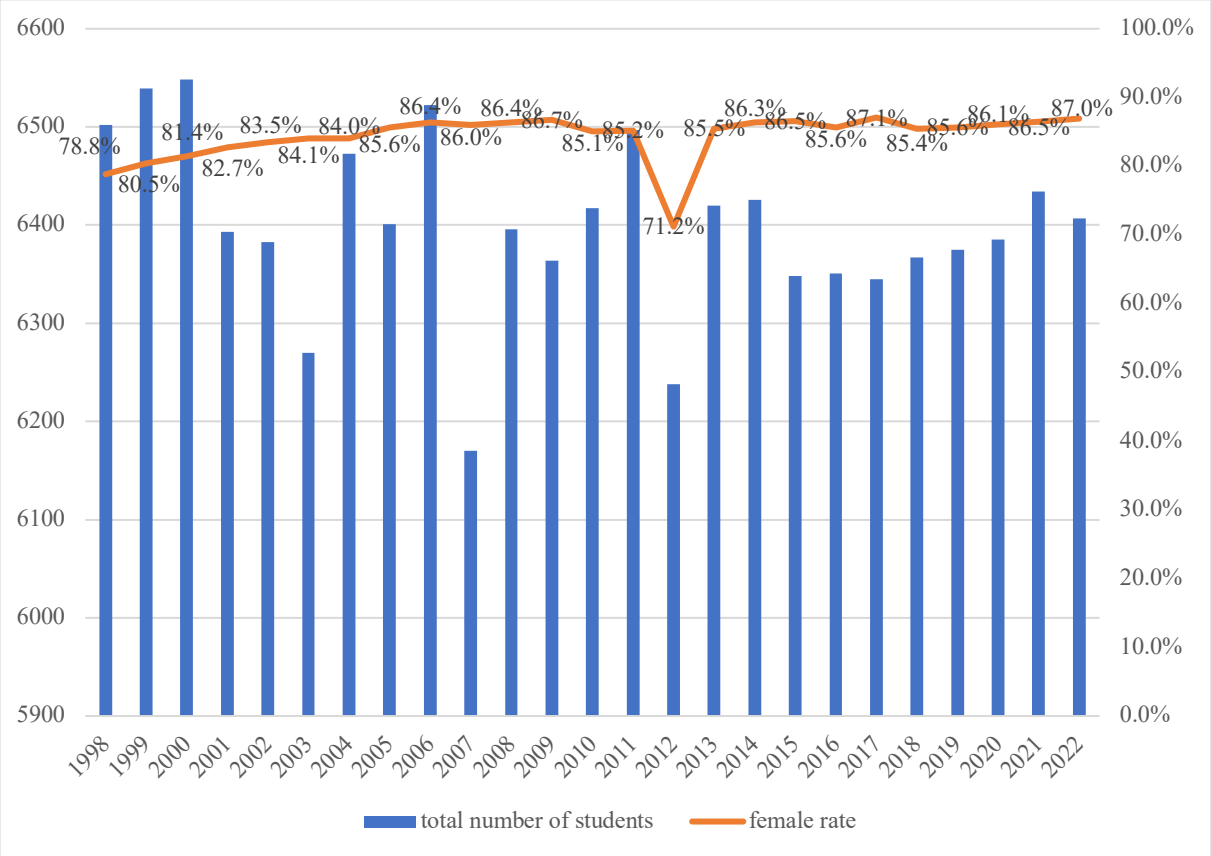

Figure 2. Total number of veterinary students in Germany (1998-2022)
Source: Own Illustration based on the data supplied by BTK e.V., 2023

The data provided by the German federal veterinary chamber - BTK e.V. (2023) illustrates an average of 925 veterinary students in Germany graduating annually from 1990 to 2022 (Figure 3). Throughout this period, the average number of female graduates was 733 (SD: 105), constituting an overall proportion of 79.2% (SD: 10%). Notably, between 1990 and 1998, the percentage of female graduates surged from 59.1% to approximately 79.6%, marking a 20 percentagepoint increase in the female graduation rate. Subsequently, in 2005, there was a further rise to 85.6% of female veterinary graduates in Germany, a proportion that remained relatively stable from 2006 to 2022 (BTK e.V., 2023).

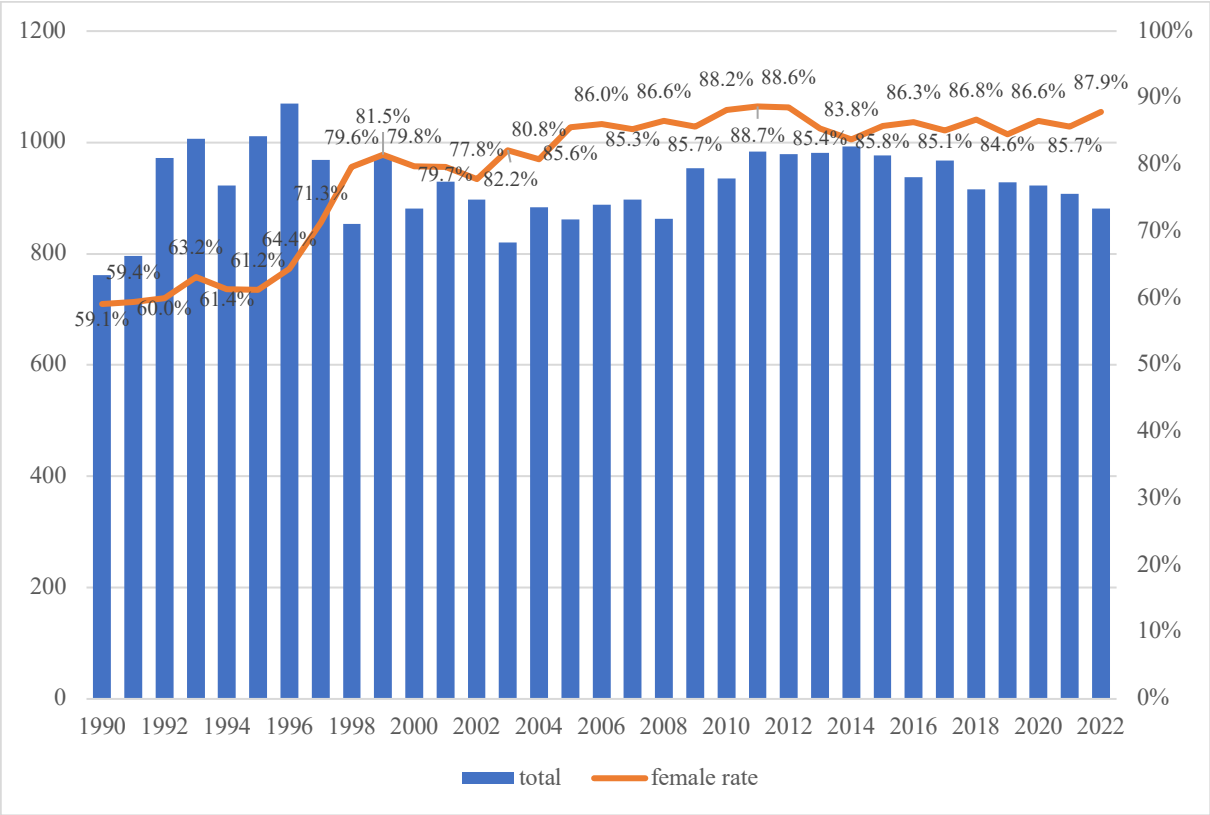

Figure 3. Number and gender rate of veterinary graduates in Germany (1990-2022)
Source: Own Illustration according to the data supplied by BTK e.V., 2023

In 2022, a total of 922 veterinarians successfully completed their state exams, with 82.9% being German females and only 12.6% being German males. Additionally, the statistics revealed that 41 international individuals graduated in 2020, with a female-to-male ratio of 80.5% to 19.5%, respectively. These international veterinarians accounted for 3.5% (female) and 0.9% (male) of the overall graduates in Germany. It's noteworthy that these figures only represent foreign students passing their state exams in Germany, excluding those who graduated abroad, e.g. in Hungary (BTK, 2023).

3.1.2 German and international applicants for German veterinary license

Reliable data regarding German nationals graduating from veterinary universities abroad, such as in Austria, the Czech Republic, or Hungary, is currently unavailable. Mainly, Central and Eastern European veterinary faculties accommodate German students who, due to limited availability of seats in German veterinary universities, are unable to secure enrollment domestically. However, these students often have the opportunity to transfer to a German veterinary university in subsequent semesters or complete their studies abroad. For instance, at the University of Veterinary Medicine Budapest (UVMB), 187 veterinary students with German citizenship graduated between 1989 and 2019 (UVMB, 2021). In Germany, the average annual

number of license applications by international veterinarians was 179 between 1991 and 2018, with the majority of applications originating from Austria, followed by Hungary and Belgium (Schweizer & Schäffer, 2020). The absence of comprehensive data on German nationals studying veterinary medicine abroad underscores the need for further research to better understand this migration pattern and its implications.

3.1.3 The characteristics of the German veterinary practitioners

This section focuses solely on licensed veterinary practitioners, excluding veterinary officers, veterinarians employed in alternative sectors, and postgraduate doctoral students in veterinary studies. While some doctoral students may undertake part-time clinical work or other veterinary-related roles, the available data from the BTK (2021) does not differentiate among these groups. Additionally, there is a lack of research examining potential variations among species in doctoral student populations, necessitating their exclusion from this study. The dataset provides aggregated information on the age distribution of veterinarians over time, without specific delineation for species-specific practitioners. Notably, the data provided by the BTK for the years 2016-2018 lacks sufficient breakdowns by age group for male and female veterinarians within the state veterinary chamber of Bavaria, while the data for 2019 is similarly lacking for the state veterinary chamber of Westfalen-Lippe (*).

3.1.3.1 Age and gender of veterinary practitioners in Germany

Figure 4 illustrates the distribution of female practitioners across defined age groups in Germany from 2007 to 2022. The number of female veterinarians during this period ranged from a minimum of 8,460 in 2007 to a maximum of 14,550 in 2022, indicating a notable increase over time, corresponding to a percentage increase of approximately 72.04%. However, this figure likely underestimates the true count due to missing data from Westfalen Lippe. Despite the absence of data for 2020-2022, female veterinarians consistently outnumbered their male counterparts in all age categories. This suggests a sustained upward trend in the number of female practitioners across all age groups, pointing towards a potential increase in their representation in the future.

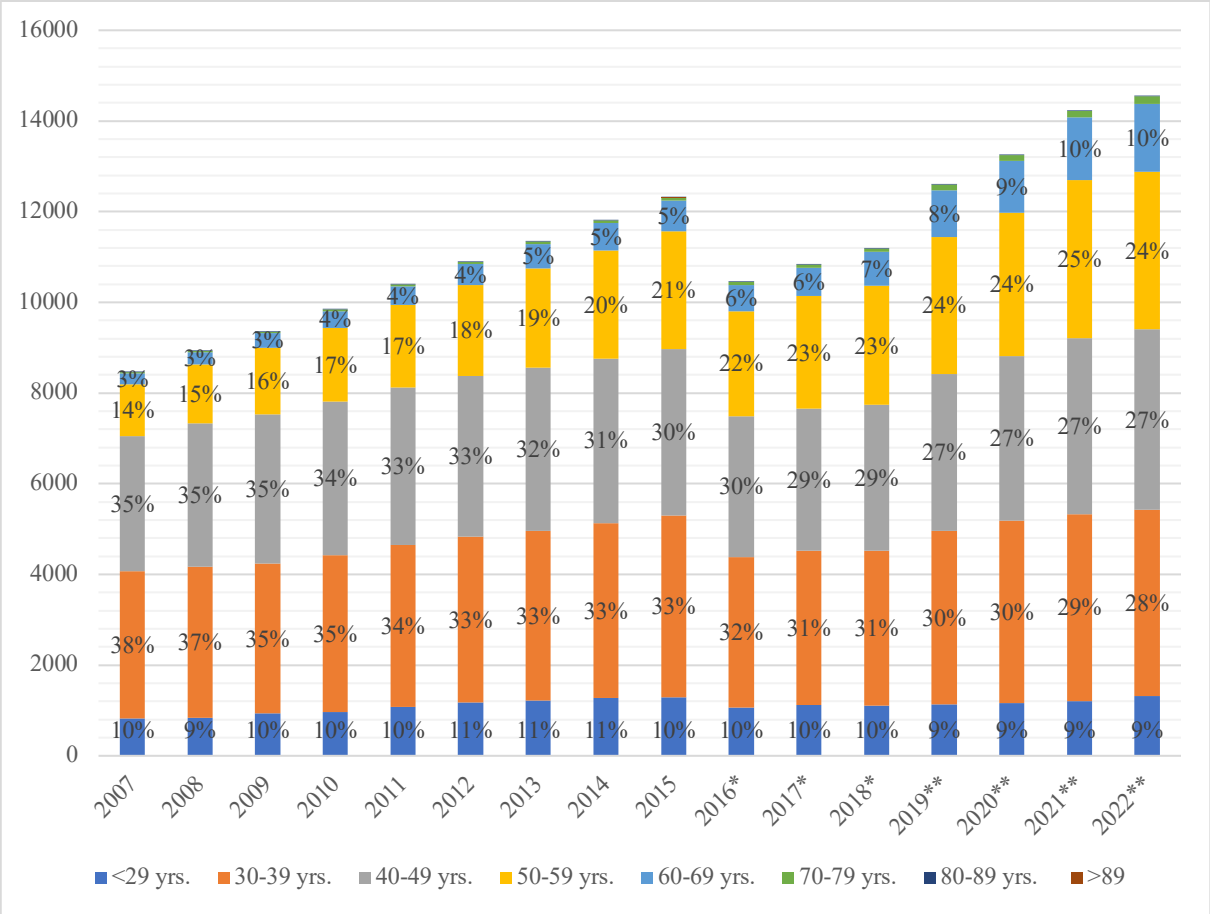

Figure 4. Age structure of female practitioners in Germany from 2007 to 2022
Note: *missing data in 2016/17/18 from Bavaria, **missing data on members of the chamber of Westfallen Lippe in 2019-2022.
Source: Own Illustration according to the data supplied by BTK e.V., 2008-2023

Figure 5 illustrates the distribution of male veterinary practitioners across defined age groups in Germany from 2007 to 2020. The annual number of male veterinarians within this period hit a minimum of 5,933 in 2017, a figure that should be higher due to missing data concerning Bavarian veterinarians. Moreover, values within the missing data timeframe (2016-2022) indicate a significant decrease in the total number of male veterinarians. Analysis of previous years with complete data suggests an average yearly decrease of approximately 54.25 male veterinarians. Consequently, in 2022, the realistic total number of male practitioners reached the lowest point in Germany's recorded data. Conversely, the maximum of 8,036 male veterinarians was recorded in 2007. In summary, the total number of male veterinarians continues to decline, accompanied by a notable shift towards higher age groups. By 2022, the majority of male veterinarians had transitioned from the 40-49 age group to the 50-59 age group. Furthermore, the male age group under 29 years appears stable, with a slight increase observed, while all other age groups experienced a decrease in numbers.

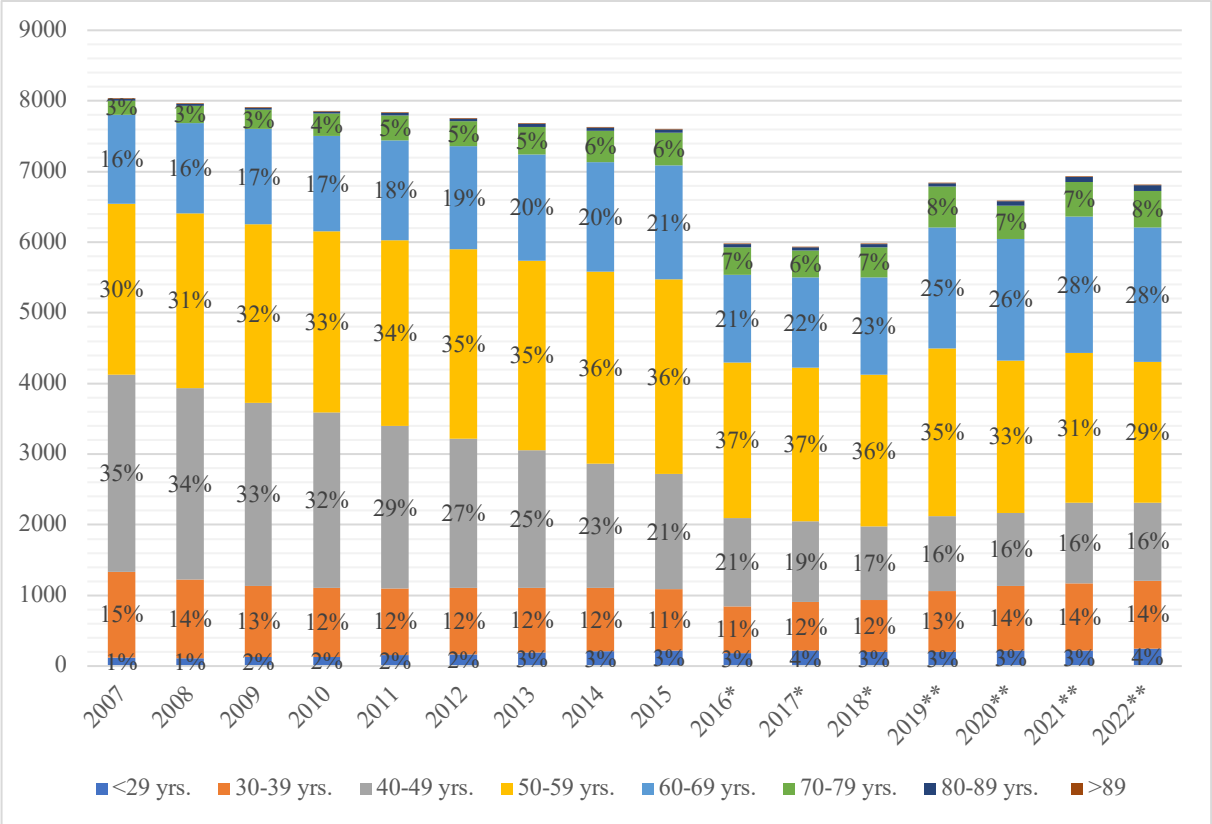

Figure 5. Age structure of male practicioners in Germany from 2007 to 2022
*missing data in 2016/17/18 from Bavaria, **missing data on members of the chamber of Westfallen Lippe in 2019-2022.
Source: Own Illustration according to the data supplied by: BTK e.V., 2008-2023

3.1.4 Characteristics of employed veterinarians in Germany (2007-2021)

In Germany, veterinarians who work in veterinary practices or clinics but do not own them are referred to as "practice assistants". In 2022, a total of 10,652 veterinarians were employed in German veterinary practices and clinics. Of these employed veterinarians, 82% were female, and they either exclusively or partially worked with companion animals (BTK e.V., 2023). **Figure 6** illustrates the number of employed veterinarians in Germany from 2007 to 2022. A continuous, steady increase can be observed in the number of employed veterinarians, with the proportion of female veterinarians growing from 78% to 82-83% over the entire period.

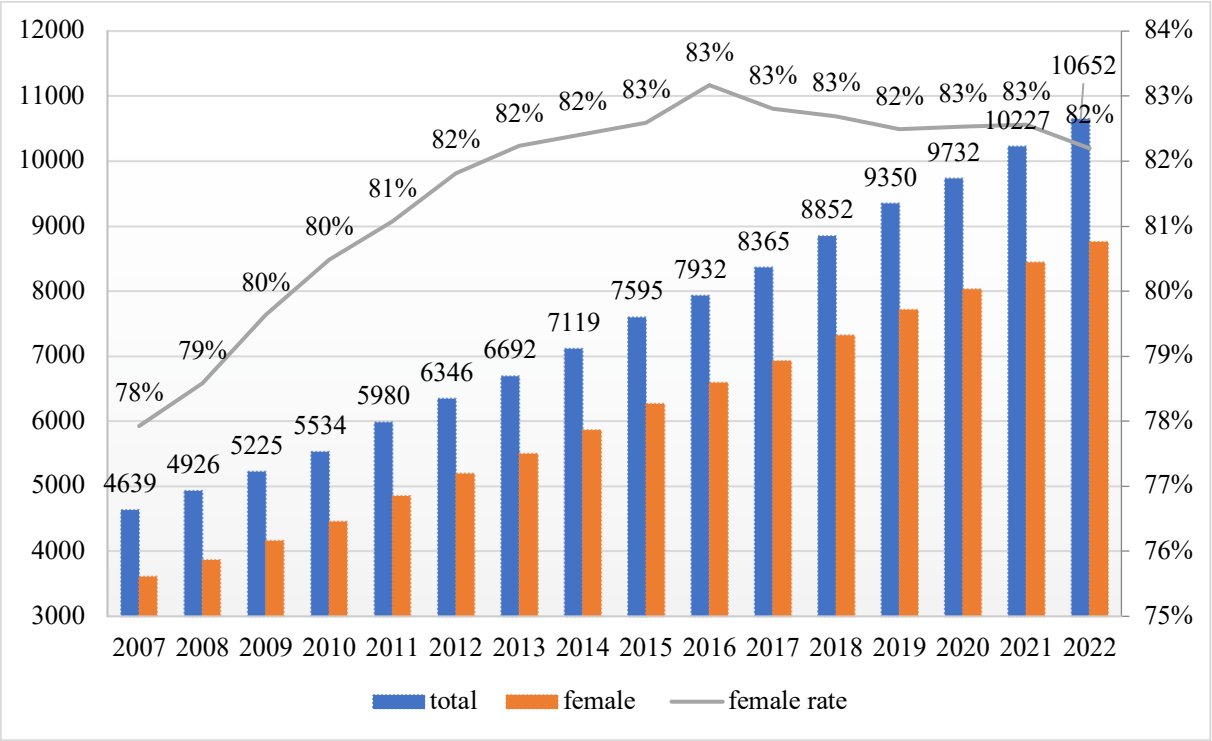

Figure 6. Development of employed veterinarians from 2007-2022 in Germany
Source: Own Illustration according to the data supplied by: BTK e.V., 2008-2023

3.1.5 Characteristics of veterinary practice owners in Germany (2007-2021)

In Germany, the total number of veterinarians, encompassing both practicing and non-practicing individuals, reached 44,618 in 2022, with females constituting approximately 64.7% of the veterinary workforce (BTK e.V., 2023). Among these veterinarians, 11,743 owned their own practice, with 56.9% being female (BTK e.V., 2023).

Significant changes in the gender ratio occurred between 2007 and 2022 with a gradual increase in the number of female veterinary practice owners and a corresponding decrease in the number of male veterinary practice owners (**Figure 7**). The turning point occurred in 2014, when female practice owners comprised 50.1% of all practice owners.

The overrepresentation of male practice owners until 2014 may be attributed to various factors, including historical gender biases in veterinary medicine, disparities in career aspirations and choices between genders, and societal expectations regarding leadership roles in professional settings, as evidenced by various research findings (Horváth et al., 2021; Knights & Clarke, 2019).

It is notable that almost half of practice owners (49.5%) exclusively work with or treat companion animals (without mixed animal practice) as of 2023 (BTK e.V., 2023). This trend could be linked to the increasing demand for pet animals (APPA, 2023).

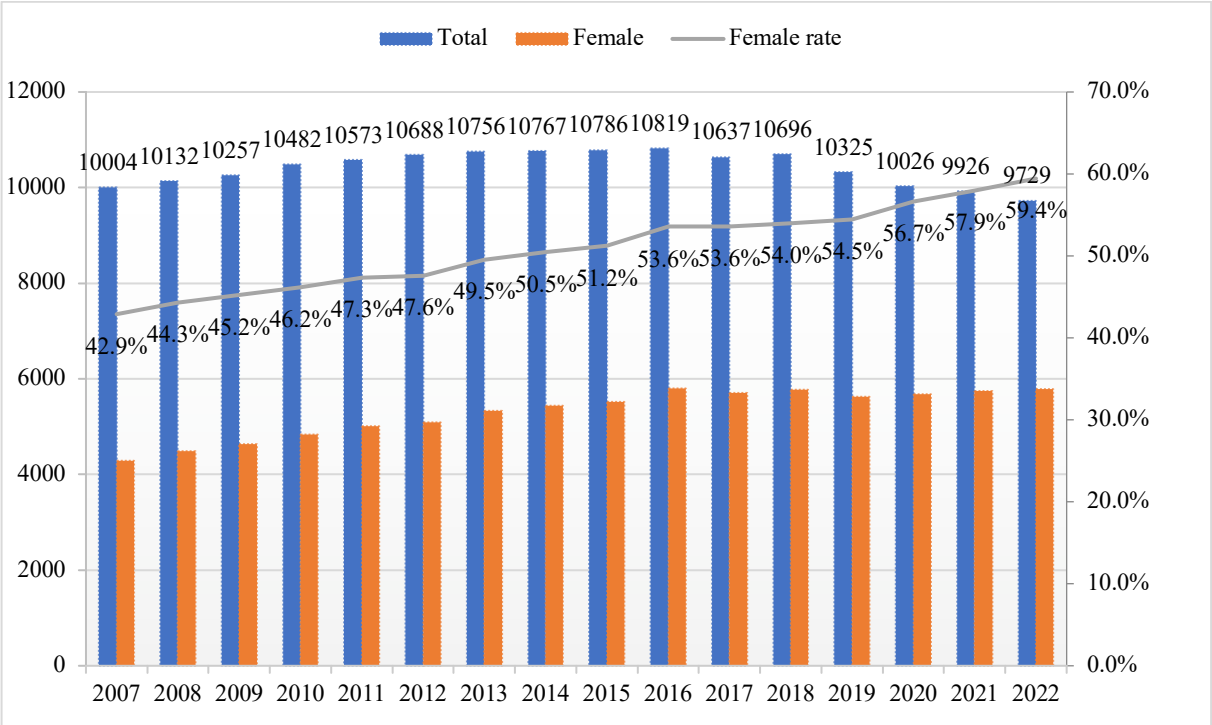

Figure 7. Change in the number and gender ratio of practice owners in Germany (2007-2022)
Source: Own Illustration according to the data supplied by BTK e.V., 2023

3.1.6 The number of veterinary practices and companion animal clinics

The determination of the precise number of veterinary practices in Germany remains challenging, as many state veterinary chambers have only provided estimated figures over the years. Based on available statistics, it is estimated that there will be approximately 10,465 veterinary practices in 2022. However, an exact breakdown of these practices by the species treated is unattainable with the current data.

Analysis of estimated data since 2009 reveals a consistent total number of veterinary practices, with approximately 10,096 practices recorded. Interestingly, there has been a notable decline in veterinary clinics offering emergency care for companion animals outside of regular office hours during this period. For instance, in 2012, Germany had an estimated total of 10,113 veterinary practices, with 294 clinics identified, of which 192 were exclusively dedicated to treating companion animals in emergency situations (24/7) (BTK e.V., 2023).

Furthermore, in 2022, there were a total of 146 clinics in Germany, with 69 solely focused on treating companion animals. This observation underscores a trend towards a decrease in clinics, particularly those providing specialized care for companion animals.

These numbers suggest a complex landscape of veterinary practices in Germany, influenced by various factors such as demographic changes, shifts in pet ownership trends comparable to the data of Sánchez-Vizcaíno et al. (2017), and advancements in veterinary care. While the demand for veterinary services may be influenced by an increasing number of pet owners as shown in

section **3.2.**, the observed decline in veterinary clinics offering specialized care for companion animals highlights potential challenges in access to specialized veterinary care during emergency or after hours. **Figure 8** highlights the decrease in clinics according to their geographical area.

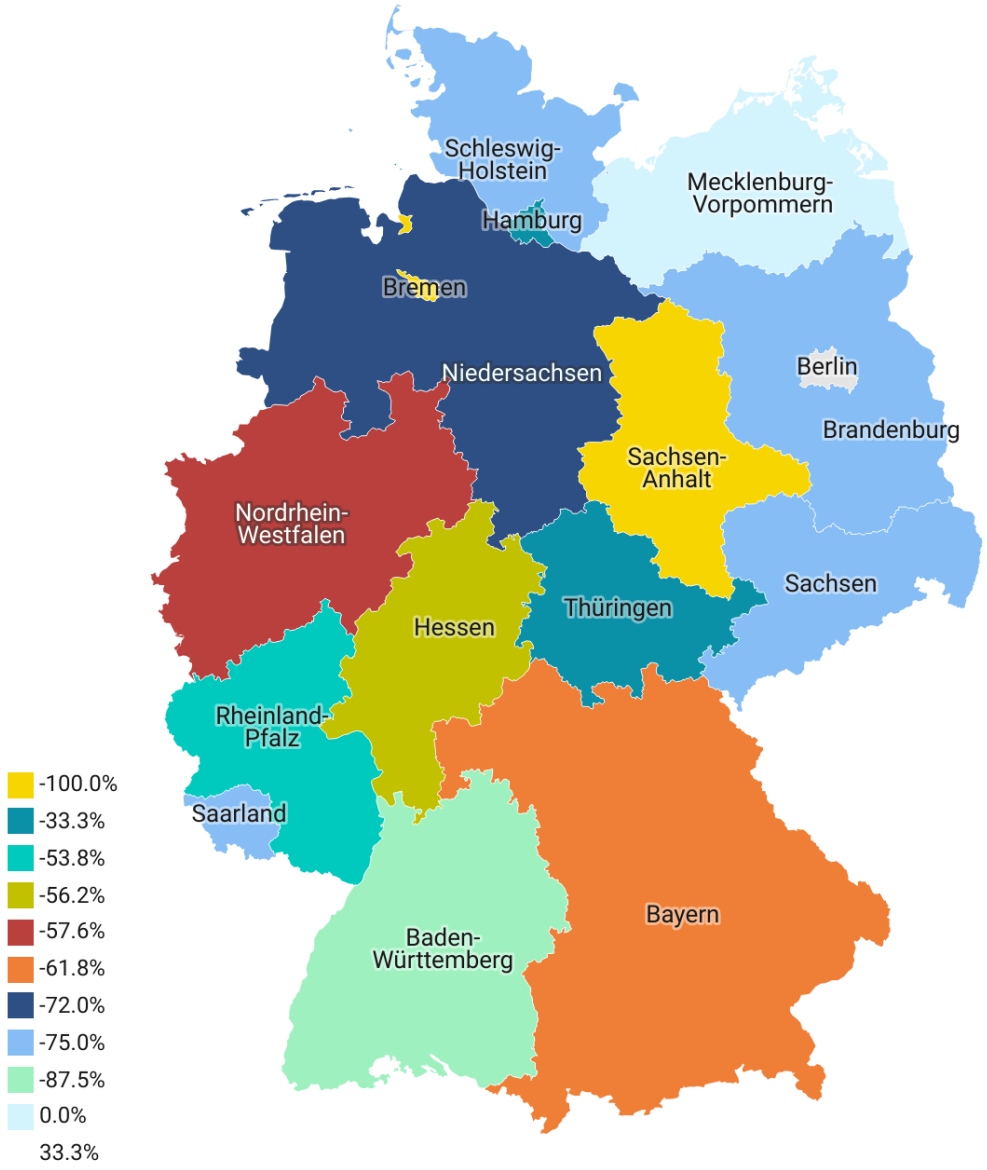

Figure 8. Decrease in the number of small animal clinics between 2012-2022 in German States (in %)
Source: Own Illustration according to the data supplied by Bundestierärztekammer e.V., 2013-2023

3.2 The market for veterinary services

In Europe, there has been a consistent rise in the population of companion animals over the last few decades, particularly in the number of dogs and cats. However, there has been a slight decline in the population of small mammals, as pets. The average number of pets per 1000 individuals in households was recorded at 258 in 2019 (FEDIAF, 2019). By 2023, the pet food industry experienced an annual growth rate in volume of 3.5%, with annual sales of pet food products reaching 10.5 million tons, amounting to a total revenue of 29.1 billion euros (FEDIAF, 2024). Additionally, the annual sales value of associated services and products was estimated at 24.5 billion euros, compared to 2019, with billion euros allocated to pet-related accessories and 10 billion euros to pet-related services, totaling 18 billion euros annually (FEDIAF, 2024).

The past years have witnessed significant developments in the German pet industry, marked by notable increases in sales and the overall pet population. Presently, nearly every second household in Germany owns a pet (Statista, 2023). In 2020, an estimated total of 34.9 million pets resided in private households, with nearly half (47%) of German households owning a pet. In contrast, 20 years prior, in 2000, the ZZF – Zentralverband Zoologischer Fachbetriebe Deutschlands e.V. estimated 21.5 million pets in private households, with one-third of households owning a pet. Cats and dogs constituted the majority of the pet population in 2020, with a total of 15.7 million cats and 10.7 million dogs in German households (ZZF, 2023; ZZF & IVH, 2019, 2021). Conversely, in 2000, there were 6.8 million cats, 5 million dogs, 4.8 million small mammals, birds, and other exotics such as reptiles, and 3 million aquariums in German households. By 2012, the number of pets had increased significantly by almost 10 million within 12 years, from 21.5 to 31 million, residing in 36% of 40.44 German households, indicating a likely increase in pets per household.

Pet shops have also experienced substantial growth in both pet food and product sales, including accessories. Moreover, sales through individual distribution channels such as retailers have witnessed an increase. It is noteworthy that online trade in pet products has gained significance, accounting for approximately 822 million euros in sales volume in 2020 (ZZF & IVH, 2021).

In line with the expanding market for animals and associated expenses, the veterinary services market has become highly lucrative. Besides pet food and pet shop products, the costs of regular veterinary services, including vaccinations, dewormings, annual check-ups, and occasional treatments for ear or eye infections, diarrhea, vomiting, and lameness, should not be overlooked by pet owners. While the costs of routine treatments are typically manageable, expenses can escalate significantly, particularly in cases of injuries, accidents, or older and chronically ill

animals. In Germany, dogs are more frequent visitors to veterinary clinics than cats. Approximately 14% of the entire dog population sees a vet three times a year or more, compared to 6% of cats. Moreover, 26% of dogs and 18% of cats visit the vet twice a year, while 41% of dogs and 61% of cats visit once a year. A small percentage of dogs (16%) and cats (6%) visit the veterinary clinic once every two years, and even fewer dogs (3%) and cats (10%) visit less frequently than every two years (ZZF & IVH, 2019).

Ohr et al. (2019) reported an average annual expenditure of about €227 per dog and €121 per cat on veterinary costs in 2019. In the latter half of the previous decade, approximately 40% of dog owners and 36% of cat owners noted an increase in veterinary treatment costs, spending an average of €1063 and €581 per year on dogs and cats, respectively. These increases were primarily attributed to various surgical interventions, emergency treatments, and serious or multiple diseases in animals (Ohr, 2019). A demographic analysis of dogs, cats, and rabbits attending veterinary practices in Great Britain revealed that dogs constituted approximately 64.8% of patient revenue, followed by cats at around 30%, and rabbits at 2%, with the remaining 2% comprising other species (Sánchez-Vizcaíno et al., 2017). Similar findings were observed in a study by Ózsvári et al. (2006) across 33 small animal and mixed animal practices in Hungary.

Sánchez-Vizcaíno et al. (2017) also observed that dogs residing in more affluent areas of Great-Britain were more likely to be purebred, neutered, insured, and microchipped. These trends were also evident among cats in England. The study underscored the correlation between the population structures of companion animals and various social and environmental factors, such as the predicted socioeconomic status associated with the owner's address, highlighting the need for further investigation into the relationship between social demographics and pet ownership (Sánchez-Vizcaíno et al., 2017).Veterinarians can leverage these insights as a powerful income tool and tailor their services to specific client demographics (Wilke et al., 2005a).

3.3 Financial management in veterinary practices

Veterinary practices are businesses, so in addition to having expertise in the profession, the ability to sell the practice's services is becoming increasingly important to maximize the return on invested labor and capital (ROI – Return of Investment) (Ackerman, 2002). Both domestic and foreign veterinarians are increasingly focusing on the proper financial management of their practices, which includes the planning, organization, and sales potential of veterinary products and services (Neill et al., 2023), as well as their current and future business strategy and marketing activities (Ackerman, 2024). When opening, operating and developing a veterinary practice, it is important to pay attention to finances, pricing, products and services, marketing, and personnel management (Kayser-Passmann & Knäble, 2011). When considering revenue trends in detail, fees for examinations, vaccinations, laboratory diagnostics, radiographs, food sold, medications and other products, surgical and dental procedures, inpatient and outpatient revenue or individual revenue-related parameters should be considered (Feakes & Thomsen, 2021).

3.3.1 Pricing strategy in Veterinary Practices

In contemporary veterinary practice management, pricing strategies and financial management play pivotal roles in ensuring sustainable business operations and optimal patient care. The evolving landscape of veterinary medicine necessitates a nuanced approach to pricing structures and financial decision-making to meet the needs of both clients and practitioners.

Recent studies highlight the complex interplay between client perceptions, pricing dynamics, and veterinary service delivery. Adams and Kurtz (2012) and Verdon (2011) emphasize the significance of understanding client discomfort with high treatment costs and underscore the need for transparent communication regarding pricing. Knippenberg (2014) and Verdon (2011) further emphasize the importance of aligning pricing strategies with client expectations and financial constraints. In cases where veterinarians are faced with the dilemma of charging high amounts for treatments, it is essential for them not to assume whether the pet owner is willing to pay a certain amount (Shaw, 2006). If the owner chooses a different procedure than the one suggested, veterinarians can offer alternatives but should not compromise on price merely to satisfy the client (Ackerman, 2021). Despite limited financial resources, most pet owners consider their pets as family members and are willing to spend more than anticipated on their health (Gray et al., 2018; Gray & Moffett, 2013; Wilke et al., 2005). A survey conducted in the United States found that 47% of pet owners are willing to incur any expenses for their pets' veterinary care (APPA, 2023). Similar sentiments are echoed in other studies (Ackerman, 2013;

Bir et al., 2020; Diez et al., 2023). These findings underscore the imperative for veterinarians to balance financial viability with client satisfaction to maintain trust and loyalty.

The literature underscores the crucial role of financial management in ensuring the viability and profitability of veterinary practices. Authors such as Ackerman (2013) and Ózsvári (2014) emphasize the importance of clear and consistent payment terms, strategic pricing, and prudent financial decision-making. Practices must establish clear payment policies while considering factors such as break-even analysis, investment amortization, and capital budgeting to maintain financial sustainability (Ackerman, 2013; Ózsvári, 2014; Ózsvári et al., 2002).

Research highlights the complexities surrounding investment decisions and equipment acquisition in veterinary practices. Ackerman (2013) and Jones et al. (2017) underscore the importance of assessing the cost-benefit ratio of acquiring new equipment to enhance patient care and practice efficiency. However, practitioners must carefully evaluate the necessity, utilization, and potential return on investment for high-cost equipment to mitigate financial risks (Clarke & Chapman, 2012).

The significance of value-based service provision in fostering client satisfaction and practice success is inevitable. Authors such as Gabay et al. (2014) and Milani (2013, 2016) emphasize the importance of delivering personalized, empathetic care to pet owners to enhance perceived value. Simple gestures, such as follow-up calls and personalized interactions, contribute significantly to client satisfaction and practice reputation (American Animal Hospital Association, 2016; Shilcock & Stutchfield, 2008b; Wessels et al., 2014).

Strategic pricing and revenue optimization emerge as critical considerations for veterinary practices seeking to maximize profitability while maintaining competitive pricing. Clarke & Chapman (2012) caution against the indiscriminate use of promotions and discounts, which may erode profitability and set unsustainable precedents. Thiele (2009) advocates for diversifying revenue streams and offering unique services to mitigate dependency on commoditized services and price competition. Summarily, by aligning pricing structures with client expectations, adopting prudent financial management practices, investing judiciously in equipment, delivering value-based services, and implementing strategic pricing strategies, veterinary practices can navigate the complex economic landscape while ensuring optimal patient care and business sustainability.

3.3.2 Key Performance Indicators

Key Performance Indicators (KPIs) represent standardized metrics employed to quantify data for managerial purposes, delineating the performance and trends within a business that influence the attainment of its goals and objectives. These indicators are applicable at various organizational levels, encompassing the entity level, business unit level, work group level, and individual level (American Animal Hospital Association., 2010; Shilcock & Stutchfield, 2008e, 2008d). Despite their significance in offering insights, it is imperative to interpret KPIs cautiously, recognizing them as indicators rather than definitive measures of success (Feakes & Thomsen, 2021).

KPIs span diverse business domains such as business performance, human resources, and marketing, furnishing valuable insights into business operations. For a veterinary business to thrive, vigilant monitoring of various KPIs is imperative to enhance service provision and profitability (Felsted, 2024). The initial step in leveraging KPIs involves delineating the strategic objectives of the business, which may entail achieving excellence in client service, reducing debt, or augmenting income across different sectors. Subsequently, relevant KPIs can be selected, and data collection initiated to monitor progress (Ackerman, 2020). Continuous monitoring of KPIs, coupled with periodic reviews, facilitates informed decision-making and underpins the success of the business model. Veterinary companies categorize KPIs into three domains: financial ratio KPIs, sales KPIs, and cost control KPIs (Feakes & Thomsen, 2021; Sanford & DeBowes, 2024).

Financial ratio KPIs gauge overall financial performance, encompassing aspects such as profitability and solvency, while sales KPIs assess sales performance and its impact on profitability. Cost control KPIs aid in monitoring and managing expenses to bolster profitability. Financial ratio KPIs comprise rates of return, solvency metrics, debt ratio, inventory revenue, and debtor control. These ratios are computed utilizing data from the Statement of Financial Position (Balance Sheet) and the Income (Profit and Loss) Statement (Ackerman, 2020). Rates of return, including return on sales, return on assets, and return on owner equity, furnish insights into profitability. Return on sales (ROS) gauges profit generated from total income and can be computed in various iterations, encompassing ROS, Earnings Before Interest and Taxes (EBIT), and Earnings Before Interest, Tax, Depreciation, and Amortization (EBITDA) (Mamalis, 2024; Shilcock & Stutchfield, 2008c).

3.3.2.1 Inventory Revenue

Inventory revenue (IT) serves as a pivotal indicator of inventory management efficiency within veterinary enterprises. Calculated by dividing the cost of saleable items by the average inventory value, a higher IT signifies more frequent revenue of inventory, mitigating risks associated with obsolescence, damage, and excess inventory (Clarke & Chapman, 2012). Typical revenue rates for veterinary practices range from 5 to 8 times per year, with optimal rates approximating 8 to 12 times annually. A higher revenue rate, such as 12 times per year, denotes rapid sales revenue, whereas a lower rate, like 6 times per year, suggests prolonged inventory retention (Feakes & Thomsen, 2021).

3.3.2.2 Debt

Debtor control metrics are indispensable for evaluating the efficacy of debt collection and managing outstanding balances adeptly (Ackerman, 2002, 2020). One pivotal measure employed for assessing debtor control is the receivables revenue ratio, indicating the promptness with which outstanding balances are collected from clients within a specific accounting period (Feakes & Thomsen, 2021). Another crucial metric derived from the receivables revenue ratio is debtor days, denoting the average time taken to collect debts. Debtor control ratios, including receivables revenue and debtor days, are computed utilizing data from the Income Statement, Statements of Financial Position, or a twelve-month Transaction Analysis Report (American Animal Hospital Association., 2010).

3.3.2.3 Sales

Sales Key Performance Indicators (KPIs) constitute essential metrics for evaluating the sales performance of veterinary enterprises and guiding their growth trajectory (Feakes & Thomsen, 2021). These KPIs focus on scrutinizing sales data to discern the business's growth direction, prioritizing factors such as enhancing profitability over mere service expansion. Calculating sales KPIs typically entails utilizing sales reports from the veterinary business's debtor program, which generates standardized reports. Sales KPIs encompass three primary areas: Income Area Sales KPIs, Veterinarian Productivity KPIs, and Transaction Sales KPIs (Clarke & Chapman, 2012; Feakes & Thomsen, 2021; Shilcock & Stutchfield, 2008c).

3.3.2.4 Productivity

Veterinarian productivity KPIs serve as pivotal metrics for assessing the efficiency and effectiveness of veterinary practices. These KPIs are typically standardized to a core key driver, such as full-time equivalent veterinary labor units, facilitating meaningful comparisons across different practices or over time (Ackerman, 2020; American Animal Hospital Association., 2010). Internal benchmarking and trend analysis are common applications of these KPIs in veterinary practice management. Regular monitoring and review of veterinarian productivity KPIs enable practices to identify areas for improvement and enhance operational efficiency.

Sales income per vet is a vital KPI that measures the total practice income divided by the number of FTE veterinarians. This metric can vary based on the type of practice and business model employed. Similarly, annual transactions per vet, active clients per vet, new clients per vet, and lapsed clients per vet provide insights into client engagement, practice growth, and marketing effectiveness (Ózsvári, 2014).

Transaction-based KPIs, such as Average Transaction Charge (ATC), Medical ATC (mATC), and annual transactions per active client, offer additional perspectives on practice performance. ATC and mATC assess the relationship between total income and the number of transactions, with mATC specifically focusing on medical-based income (Feakes & Thomsen, 2021). Annual transactions per active client measure the average number of visits per client in a year, reflecting client engagement and relationship quality (Shilcock & Stutchfield, 2008c).

3.3.2.5 Costs

Cost control involves adept management of business expenses. Cost control KPIs aid in pinpointing areas where a practice can curtail costs to bolster profitability (Feakes & Thomsen, 2021). These KPIs are vital for both internal and external benchmarking. However, it is crucial to tailor cost control KPIs to the specific strategic goals of the veterinary business to ensure focused monitoring and effective cost control practices. One primary cost control KPI is the Total Costs to Total Income Percentage, which measures the relationship between total costs and total income (Ackerman, 2020). Another essential KPI is the Drugs and Medical Supply Percentage, which evaluates the proportion of medication and surgical inventory costs relative to total income (Ackerman, 2020; Clarke & Chapman, 2012). Similarly, Support Staff Costs Percentage assesses the proportion of support staff wages and associated costs to total income. Veterinary Staff Costs Percentage examines the expenses related to veterinary staff compensation in relation to total income. Pathology Variable Costs Percentage measures the

variable costs associated with pathology tests relative to total practice income (Ackerman, 2020; Clarke & Chapman, 2012).

3.3.2.6 Benchmarking

Benchmarking encompasses the comparison of KPIs among businesses operating within the same sector or across different branches or years within a single business entity. Within the veterinary industry, engaging in best practice benchmarking involves the identification of exemplary practices and a thorough analysis of their operational processes to discern the factors contributing to their success. To facilitate continuous improvement in operational processes, it is advisable to conduct benchmarking exercises regularly, taking into account the inherent differences between practices to ensure that comparisons are meaningful. In the context of the German market, benchmarking pertaining to revenue and costs is constrained, with only a limited number of studies available, as elaborated in the subsequent section (Blättner & Berger, 2020; Ripper, 2020a; Strecker et al., 2021).

3.3.3 Revenues and Costs in German small animal practices

Several datasets exist regarding the annual revenues of veterinary practices in Germany. Firstly, one can utilize the value-added tax (VAT) statistics provided by the Federal Statistical Office in Germany. These statistics document all entrepreneurs' annual sales surpassing €17,500, as entrepreneurs exceeding this threshold are mandated to pay VAT. The Federal Union of Practicing Veterinarians (BPT) has published the trends based on VAT statistics annually for the years 2000 and 2018. The data reveal an increase in the number of practices subject to VAT from 8,284 to 9,637, consequently leading to a rise in practice revenues subject to VAT from €1.47 billion to €3.36 billion. This signifies a notable surge of 128.6% in practice sales subject to VAT between 2000 and 2018, while the number of practices witnessed a comparatively modest increase of 16.3% over the same period (Ripper, 2022).

Figure 9 illustrates the income of self-employed veterinarians in 2018. However, it is imperative to interpret these figures with caution, as the participating veterinarians possess a more business-oriented mindset and, thus, may not fully represent the veterinary profession as a whole. The data highlight that self-employed veterinarians, particularly those in the revenue range of €250,000 to €500,000, exhibit the highest return on investment (Ripper, 2020b, 2020a).

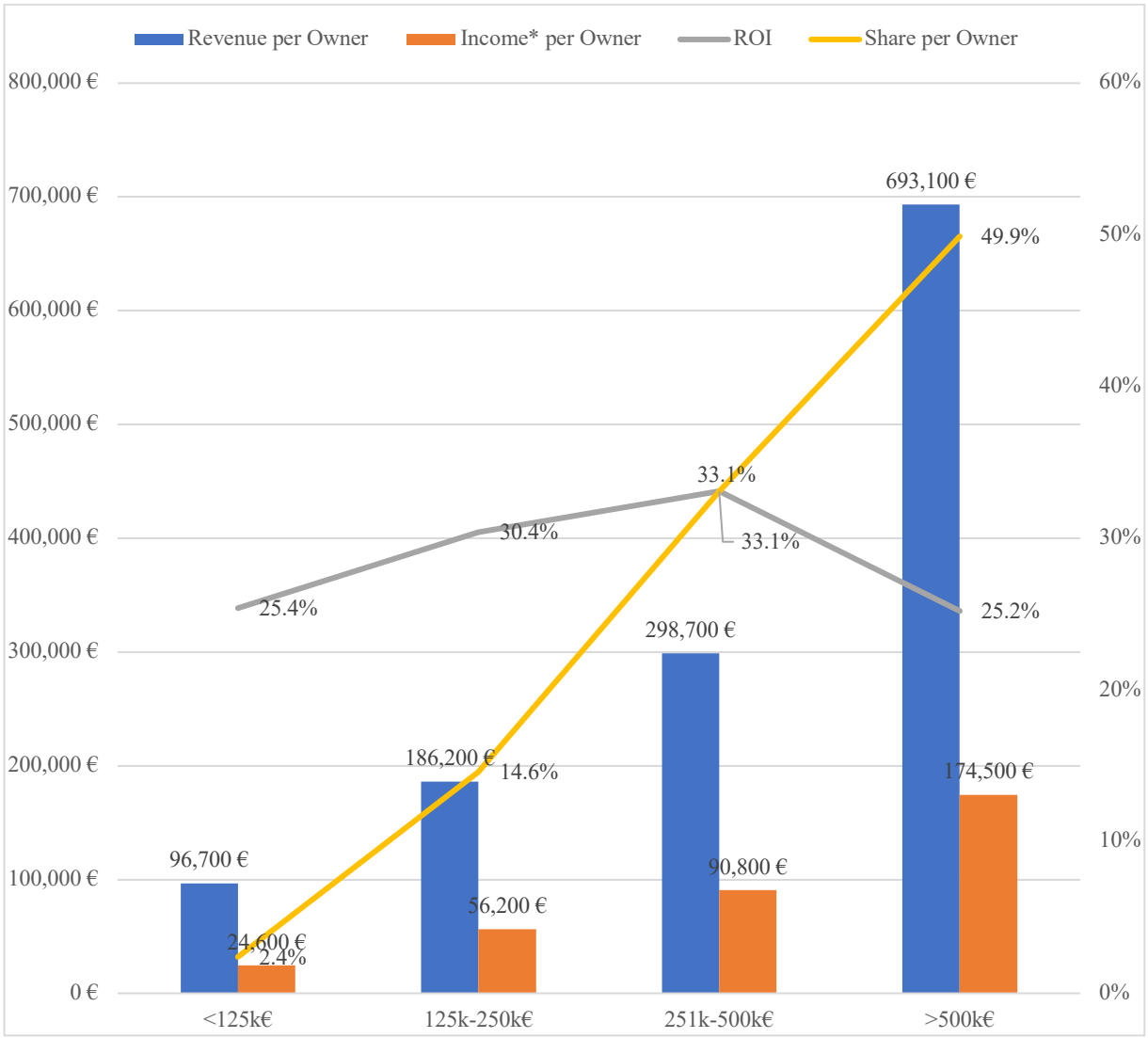

Figure 9. Income situation of self-employed veterinarians in 2018
Note: *Income before tax and social service contributions
Source: Own illustration based on the data supplied by (Ripper, 2022)

The profit margins of the various services tend to vary and, thus, affect the profitability of practices to different degrees. Increasing the revenue of a veterinary practice can usually be achieved by taking smaller steps, such as effectively educating and informing owners or introducing new services. Cost reduction is usually more successful when the focus is on keeping large expenses under control. Therefore, it is recommended, that the cost of professional services such as medications, medical equipment, laboratory tests, and surgeries, as well as salaries and maintenance costs, be reviewed on a regular basis. For example, approximately 15% of small animal practices' gross revenue in the United States is spent on medications and medical supplies (Madden, 2013). If the percentage is much higher, it is worth investigating the source of the problem (overstocking, higher than the average purchase price, etc.) (Ackerman, 2003).

In Contrast, in Germany, small animal practices spend around 23-30% of their revenue on medication and medical supplies. **Tables 1-2** show the cost items of sole proprietors (Table 1) and partnership practices (Table 2) in the German small animal veterinary sector according to different revenue categories. The highest cost items in the veterinary practices are the labour and material (including vet drug) costs. According to the research, the cost center of material and drug costs appears to decrease in percentage with increasing revenue, and the cost center of personnel costs appears to increase and vice versa (Table 1).

Table 1. Cost structure of small animal veterinary practices - Sole proprietors in 2018 (Ripper, 2020a)

Revenue Category (net annual revenue in k€)	**I. <125**	**II. 125-250**	**III. 251-500**	**IV. >500**
Number of practices	6	49	62	41
Average net practice revenue (k€)	104.2	188.9	357.5	795.1
Costs	**Percentage share of net practice revenue (%)**			
Materials/medical supplies/external laboratory costs	29.4	27.9	28.1	24.4
Labour costs	19.3	19.4	25.3	35.2
Rent	5.4	5.9	4.7	3.1
Utility costs (water/ sewage/ electricity, etc.)	1.8	1.3	1.5	1.2
Insurances, contributions	1.5	1.2	0.8	0.6
Vehicle costs incl. leasing	1.9	1.7	1.3	1.0
Marketing/travel costs	1.9	1.4	1.1	0.7
Maintenance costs	0.7	1	0.8	0.7
Leasing without vehicles	0.3	0.1	0.2	0.2
Miscellaneous costs	6.8	5.8	4.5	4.1
Earnings before interest and depreciation	***31.0***	***34.3***	***31.7***	***28.8***
Interest	0.8	0.5	0.5	0.6
Depreciation	2.8	4.4	2.8	3.5
Profit before tax	***27.8***	***29.4***	***28.4***	***24.7***
Profit before tax and social contributions (k€)	***28.97***	***55.54***	***101.53***	***196.39***

Table 1 shows that the profit share before tax varied between 24.7% and 29.4% which amounted to 28.97 to 196.39 k€ in the different revenue categories. The smallest profit margin (24.7%) could be observed in the revenue category over 500 k€, this is mainly because of the rising labour cost, albeit the fixed costs proportionally reduced (fixed cost degression).

According to Ripper (2020) the economic stability of partnership veterinary practice can only be achieved above 200,000€ annual net sales per practice owner. The cost items do not show a significant difference compared to the sole proprietor, but partners with a revenue of 250,000-500,000€ appear to achieve the highest return on sales of all self-employed small animal practitioners regardless of practice form and number of practice owners (32.1%; Table 2).

Table 2. Cost structure of small animal veterinary practices - Partnership practices in 2018 (Ripper, 2020a)

Revenue Category (net annual revenue in k€)	**III. 250-500**	**IV. >500**
Number of practices	18	29
Average number of partners per practice	2.11	2.21
Average net practice revenue (k€)	372.7	1326.0
Revenue per partner (k€)	176.5	600.0
Costs	**Percentage share of net practice revenue (%)**	
Materials/medical supplies/external laboratory costs	27.2	23
Labour costs	23.1	35.1
Rent	4.2	3.7
Utility costs (water/ sewage/ electricity, etc.)	1.2	1.2
Insurances, contributions	0.9	0.5
Vehicles incl. leasing	0.7	0.4
Marketing/travel costs	0.7	0.8
Maintenance costs	0.9	1.3
Leasing without vehicles	0.2	0.1
Miscellaneous costs	5.8	4.8
Earnings before interest and depreciation	***35.1***	***29.1***
Interest	0.3	0.2
Depreciation	2.7	2.9
Profit before tax	**32.1**	**26.0**
Profit before tax and social contributions (k€)	**56.7**	**156.0**

3.3.4 Appointment management

Patient visitation rates in veterinary practices are influenced by various factors, as highlighted in studies within the past decade. Volk et al. (2011) emphasized the significance of consistency in patient visits, indicating that clients who consistently see the same veterinarian tend to schedule more appointments. The establishment of strong relationships between veterinarians and clients, coupled with the perceived value of wellness examinations, emerged as key determinants of increased visitation rates. Moreover, the adoption of effective marketing strategies, including the utilization of social media platforms, was deemed crucial for enhancing the success of veterinary practices. The results are in line with various different research from different parts around the world (Ackerman, 2021; DeWilde, 2024; Diez et al., 2023; Shaw et al., 2008).

Conversely, characteristics associated with fewer scheduled appointments were identified, shedding light on areas for improvement within veterinary practices. These attributes often revolved around the practice owners' perspectives on marketing importance and referral programs. To address this, there is a growing recognition of the need to refine marketing concepts and offer additional services to incentivize client engagement and boost appointment rates (Volk et al., 2011). Recommendations for increasing appointment rates in veterinary practices have been proposed based on empirical research. One such suggestion involves identifying other pets during appointments by routinely inquiring about additional pets owned by the client (Diez, 2021; Shaw et al., 2008). This approach not only encourages comprehensive care but also fosters a sense of inclusivity and attentiveness toward clients' needs (Shaw et al., 2008). Additionally, reinforcing the importance of routine examinations has been advocated as a means to encourage regular visitation and proactive pet care practices.

Studies have also underscored the importance of streamlining appointment scheduling processes to facilitate client convenience and adherence. Implementing strategies such as scheduling subsequent appointments before clients leave the clinic and adopting electronic scheduling software have been recommended (Blättner & Berger, 2020; DeWilde, 2024; Diez, 2021; Diez et al., 2023; Diez & Ózsvári, 2019). Furthermore, leveraging reminder notifications via email and text messages has shown promise in improving appointment adherence and reducing no-show rates, thereby optimizing practice efficiency and revenue generation.

3.4 Marketing and Communication in Veterinary Practice

In marketing, a fundamental objective is the conversion of pet owners into enduring clientele, a process achieved not only through attracting new clients but also by nurturing satisfaction among existing ones. Central to this endeavor is ensuring that pet owners perceive their experience with the veterinary practice as surpassing their expectations and that any inquiries or concerns they may have are promptly addressed (Arkow, 2020; Brown, 2018; Küeper & Merle, 2021). While word-of-mouth remains the predominant mode of advertising for veterinary practices, a myriad of deliberate marketing strategies can be employed, ranging from enhancing practice aesthetics to utilizing multimedia presentations in waiting areas (Ózsvári, 2008; Puddle, 2015). It is noteworthy that clients often base their selection of veterinary practices on readily observable external attributes rather than solely on the quality of veterinary care provided, a phenomenon exacerbated by the subjective nature of assessing veterinary expertise (Desmond, 2022; Holbrook, 1994). For instance, subpar staff presentation can significantly impact clients' overall perception of the practice, potentially leading to client attrition, irrespective of the quality of veterinary services rendered (Bard et al., 2019; Brown, 2018).

3.4.1 Definition of marketing and customer value in the veterinary sector

In the realm of veterinary businesses, the concepts of marketing, customer value, and corporate identity collectively form the cornerstone of organizational success. Marketing, defined as the strategic process of identifying, anticipating, and satisfying the needs and wants of pet owners while achieving practice objectives, serves as the vehicle through which customer value is communicated and delivered (Blättner & Matzner, 2010). Customer value, in the context of veterinary services, encompasses the perceived benefits and satisfaction that pet owners derive from their interactions with a practice relative to the costs incurred. This subjective evaluation is influenced by factors such as the quality of care, professionalism, and emotional support provided by the practice, as well as the convenience and accessibility of veterinary services (Catanzaro, 2000; Donahue, 2022; Pizzolon et al., 2019).

Corporate identity, another integral component, encompasses the visual and behavioral aspects that define a veterinary practice's brand image and culture. It includes elements such as the practice's logo, color scheme, writing style, and overall appearance, as well as the behavior and communication of staff both within and outside the practice (Cooper, 2000).

Strategically aligning marketing initiatives with the creation and delivery of customer value requires a clear understanding of the practice's corporate identity. A well-defined corporate

identity fosters a sense of unity among staff, leading to increased work ethics, motivation, and performance. Moreover, it serves as a visual and behavioral representation of the practice's values, mission, and commitment to excellence (Blättner & Matzner, 2010).

Effective corporate communication strategies play a pivotal role in articulating the value proposition of the practice and fostering meaningful connections with clients. By conveying a consistent message that aligns with the practice's corporate identity, veterinary businesses can engender trust, loyalty, and engagement among their clientele (Ózsvári, 2014). In essence, the strategic integration of marketing, customer value, and corporate identity enables veterinary businesses to differentiate themselves in the marketplace, cultivate lasting relationships with clients, and achieve sustainable growth and success. By aligning practice objectives with client needs and preferences, and by fostering a cohesive brand image and culture, veterinary practices can position themselves as trusted partners in pet care and enhance their competitive positioning in the industry (Ackerman, 2024).

3.4.2 Marketing plan

Marketing plans are integral components of veterinary businesses, designed to outline strategies for market positioning and customer engagement. Volk et al. (2011) identified four key factors influencing pet owners' propensity to increase appointments at small animal veterinary practices. These factors include the continuity of seeing the same veterinarian during each visit, the perceived value of regular examinations, the significance of marketing efforts, and the active utilization of social media platforms (Volk et al., 2011, 2014). A comprehensive marketing plan should delineate the approach to target customer segments, manage marketing activities, and allocate resources effectively (Clarke & Chapman, 2012).

Positioning a veterinary practice within the market requires a meticulous analysis of both internal and external factors. According to Ackerman (2003), successful positioning entails understanding the market, patient base, and staff dynamics. This involves conducting a thorough market analysis encompassing five crucial steps: market analysis, defining practice strategy objectives, formulating marketing strategies, selecting marketing instruments, and performance evaluation (Ackerman, 2003; Blättner & Matzner, 2010). Market analysis is foundational, involving an examination of the practice's current situation, strengths, weaknesses, opportunities, and threats through internal and external assessments.

Internally, practices must evaluate various aspects including their mission, team dynamics, organizational structure, practice environment, equipment quality, customer demographics, financial status, and cost structure (Ackerman, 2003; Clarke & Chapman, 2012). This internal

analysis should delve into questions such as: What are the practice's core strengths and weaknesses? How effectively is the staff organized and managed? Is the practice environment conducive to providing quality care? Are the equipment and facilities up to industry standards? What is the demographic composition of the customer base, and how has it evolved over time (Ackerman, 2003; Clarke & Chapman, 2012)?

Externally, considerations extend to market dynamics, collaboration opportunities with other establishments, industry trends, and competition analysis (Brogdon, 2024; Diez, 2021; MacKay, 2009; Vredenburg, 2009). This external analysis should address questions such as: What is the socioeconomic composition of the clientele in the practice's area of interest? How do competitors' offerings and marketing strategies compare? Are there emerging trends in veterinary care or customer preferences that could impact the practice? What opportunities exist for collaboration with other entities such as general practitioners, specialists, or animal shelters? Furthermore, staying attuned to developments and trends in animal care, technological advancements, and evolving customer preferences is imperative for strategic planning. This entails not only monitoring medical and technical advancements but also understanding shifts in customer desires, which can be gleaned from surveys conducted by various industry stakeholders (APPA, 2023; Brogdon, 2024; Christman, 2024; DeWilde, 2024). Additionally, a thorough analysis of competitors, including their offerings, marketing strategies, and emerging competition from non-veterinary entities, is vital for maintaining a competitive edge (Ackerman, 2024)

3.4.3 Aim of the practice strategy

To give information about the marketing essentials of veterinary practices, Puddle (2015) pointed out that a successful veterinary practice must establish a marketing and client service culture that starts with the planning of owners and managers with the marketing strategy. Once the management has established the course, it is then a case of delivering the practice services to clients with a continuous developmental mindset which will constantly find opportunities to create more value for pet owners and the practice team as a whole.

The aims of the practice/marketing management can be defined according to the **SMART** principle: **S**pecific, **M**easurable, **A**chievable/accountable, **R**elevant/realistic, **T**ime based/timely (Ackerman, 2013; Catanzaro and Seibert, 2000). When defining the goals, one should focus on the target groups to be attracted or bound to the practice because only those businesses who know their customers well can adjust to their wishes and expectations (Ackerman, 2003; Blättner and Matzner, 2010; Thiele, 2009). According to Clarke and Chapman (2012) all staff should be involved in the whole process of strategy planning, considering that they are the first and the last to be in contact with the customer. In the customer's mindset, everyone working in the practice contributes to the practice's image (Ackerman, 2003; Blättner and Matzner, 2010) (**Table 3**).

Table 3. The structure of practice goals according to Schüller and Dumont, modified by Frodl (Blättner and Matzner, 2010)

Practice goals	**Marketing**	Market domination Name recognition Customer satisfaction
	Organisation	Staff Management Good veterinary practice (GVP)
	Service profile	Product choice/offer services
	Profitability	Increase in revenue Decrease in costs Profit maximisation

3.4.4 Marketing strategy

Selecting a practice and marketing strategy holds paramount importance in any business endeavor. Once the objectives of marketing and the practice have been delineated, a strategic plan encompassing both practice and marketing aspects should be devised (Blättner & Matzner, 2010). This practice strategy serves as the conduit between the current situation and the goals of marketing initiatives (Diez & Ózsvári, 2019). In an era marked by escalating competition and heightened scrutiny of public perception and services, the adaptability of strategies becomes crucial (D. E. Lee, 2006; Littlewood et al., 2021). Hence, the indispensability of cultivating a distinctive corporate identity cannot be overstated. A robust corporate identity fosters cohesion within the practice, thereby augmenting work ethic, motivation, and staff performance (Pizzolon et al., 2019). Corporate identity encompasses various facets, including the physical appearance of the practice, corporate design, and communication channels between the staff and clients (Blättner & Matzner, 2010). Furthermore, it encompasses staff behavior and corporate conduct, both within and beyond the confines of the practice environment (Cooper, 2000). In Germany, veterinarians are permitted to advertise their services, albeit under stringent legal regulations aimed at preventing unfair competition. Several regulations govern veterinary advertisements, ensuring adherence to professional standards and ethical conduct. These regulations include provisions under professional regulation (Berufsrecht), competition law (UWG – Wettbewerbsrecht), and laws pertaining to the advertising of medical services (Heilmittelwerbegesetz). Such legal frameworks are designed to maintain integrity within the veterinary profession while safeguarding the interests of consumers and promoting fair business practices. (Althaus, 2006; Kayser-Passmann & Knäble, 2011)

3.4.5 Marketing mix

The key importance of the **place** is the emphasis on the client's perception and first impression. The practice team should question themselves on how the services are delivered to the clients and where the services can be offered. Providing sufficient parking, easy access to the building, and a clean, odor-free facility will indirectly communicate a high-quality practice (Ackerman, 2013; Thiele, 2009).

Prices for services are an indicator of the practice's image. Prices of competing practices should not be undermined to attract new customers considering that the regular clients did not choose the practice because of the low prices but purely for the image, staff, and quality of the services provided (Cron et al., 2000). There are four basic pricing strategies.

- **Competitive pricing**, this first pricing strategy is used for goods and services that is shoppable, e.g. spays, neuters, and vaccinations. Here the practice owner needs to determine the prices offered by the competition to avoid losing clients to neighbouring practices. However, the importance of not undercutting these services to gain new clients, mainly the bargaining cost fixed type, needs to be taken into consideration (Coe et al., 2009; Corah et al., 2019). Price cutting as a means of promotion, e.g. for spays and neuters, will destroy the perceived value of the services provided and will consequently lead to a higher volume of customers and their pets being seen to maintain the same level of profitability (Brown, 2018).
- **Value-based pricing** describes the pricing of the services and products which need the exclusive expertise of a specialised veterinarian to perform the service or advise the usage of the product. Therefore, these prices should reflect the veterinarian's inherent value of specialised training and expertise. For example, introducing new diagnostic tools and medical services like cranial cruciate ligament rupture surgery or introducing an endoscope requires fundamental training and specialization of the veterinarian performing these services (Jones et al., 2017; Wilke et al., 2005).
- **Cost-based pricing** is the cost of the product to the clinic multiplied by a factor to get the retail price the client will have to pay (Ackerman, 2003). This strategy has been effective in the past but is nowadays ineffective because clients can research prices for pet products and food, or services provided by other veterinary establishments on the internet, in catalogues or in retail outlets (Corah et al., 2019).
- **Variable-cost pricing** is a strategy that is effective in catching all the costs associated with offering a product, such as factors like the inventory revenue rate and profit per square meter. It means that the method is working well when the veterinary practice can

increase the product volume without increasing the available labour and facility space (Dicks, 2014).

Furhremore, Volk et al. (2011) suggested practices consider alternative pricing strategies and offer financing options for pet owners, as well as develop an individualized full-year service program.

The **product** in the marketing mix should be regarded as the achievement of the customers' wishes and needs (Ackerman, 2013; Ackerman, 2003). It will include the quality of the product, the specific offers, and how the product is delivered to the customer (Milani, 2013). The product in the veterinary setting refers to the immaterial services that should be seen as the total value delivered to the client and the pet rather than a physical entity, as well as the consumable items such as medications or prescribed pet food (Brown, 2018). This is the base for how value will be delivered to customers and therefore becomes incorporated into the practice's vision or philosophy (Cron et al., 2000). In return, this means that a practice owner should know what the goals of the practice are and which customers he wants to serve with his services (Gabay et al., 2014). Volk et al. (2011) distinguished four service concepts that would likely increase the number of visits to the veterinarian. Owners in the United States stated that they were most likely to visit the veterinarian more often if the practice would offer routine services with monthly instalments as well as full-year health plans that would focus on client education. Concerning extended business hours, Volk et al. (2011) could not distinguish a clear advantage or disadvantage for extended office hours.

Promotion (marketing communication) is used to communicate the value, benefits and features of the services offered by the practice to the client. If a practice cannot communicate these values to the target customers, the practice will not be able to make these target customers into actual customers of the practice (Abood, 2008). Promotion can be classified into either personal or non-personal efforts, but since veterinarians are not allowed to actively participate in advertisements or sales promotions due to legal regulations, non-personal efforts like public relations need to be used (C. A. Carson, 2007).

The role of **People** in veterinary practice extends beyond the mere provision of services; it encompasses the critical interactions that shape client perceptions and loyalty. The practice team, which includes veterinarians, technicians, receptionists, and support staff, must cultivate a culture of empathy, professionalism, and communication (Diez & Ózsvári, 2019). Engaging with clients in an informed and compassionate manner not only enhances the overall client experience but also fosters trust in the quality of care provided. Each interaction, from the first phone call to the post-service follow-up, offers an opportunity to establish rapport and build

long-term relationships with pet owners, thereby influencing their choices regarding future veterinary visits (Diez, 2020).

Process within the veterinary setting refers to the structured procedures and protocols implemented to ensure a seamless service delivery experience. Effective processes are essential in managing appointments, handling patient care, and ensuring that all aspects of the service are delivered in a timely and organized manner (Cron et al., 2000). This includes clear workflows for client intake, diagnostic testing, treatment plans, and follow-up care. By standardizing these processes, practices can enhance operational efficiency, reduce wait times, and ultimately improve customer satisfaction. Additionally, staff should be trained regularly to adapt to evolving practices and technologies, ensuring that they can efficiently meet the needs of both clients and their pets (Volk et al., 2011).

Physical Evidence serves as a tangible manifestation of the services provided in a veterinary practice, influencing client perceptions of quality and professionalism. The physical environment – including the waiting area, examination rooms, and overall facility cleanliness – plays a significant role in shaping first impressions. A well-maintained, welcoming, and odor-free environment not only reinforces the practice's commitment to high standards but also comforts clients during often stressful visits (Ackerman, 2020). Furthermore, physical evidence extends to marketing materials, such as brochures, signage, and educational resources that convey information about services offered and promote the practice’s brand image. These elements should consistently reflect the values and philosophy of the practice, serving to reassure clients of the quality and reliability of the care their pets will receive (Blättner & Matzner, 2010).

3.4.6 Appearance of Veterinary Practice and Staff

Corporate design encompasses various elements, with the logo being a fundamental component that holds significant importance. The logo serves as a symbol that clients should readily identify with the company, conveying information while evoking aesthetic and emotional appeal (Clarke & Chapman, 2012). It is imperative for staff members to resonate with the logo, as it fosters a sense of belonging and unity within the organization (Blättner & Matzner, 2010). Additionally, the logo should possess attributes such as memorability and integrity, while also being attention-grabbing and indicative of the company's identity (Ackerman, 2020).

In addition to the logo, several other components contribute to the overall corporate design framework. These include the selection of colors, consistent writing style across various commercial assets such as logos, stickers, and advertisements, as well as the design of promotional materials like flyers, newsletters, and documents (Ózsvári, 2014). Furthermore, the professional attire of staff members and the interior design of the practice building play crucial roles in shaping the corporate identity and conveying a cohesive brand image to clients.

Corporate communication plays a vital role in promoting the company and its services to target audiences. This encompasses various communication tools such as announcements, advertising materials, customer newsletters, brochures, and posters (Blättner & Matzner, 2010). Effective corporate communication requires alignment with the company's mission statement and strategic objectives, ensuring consistency and clarity in messaging across all channels (Reuter & Thiele, 2011).

Central to corporate behavior is the concept of uniformity in appearance and conduct among all staff members within the organization. Maintaining consistency in corporate behavior poses a significant challenge but is crucial for upholding the company's corporate identity (Blättner & Matzner, 2010). The leadership style adopted by the owner or supervising veterinarian plays a pivotal role in shaping the behavior and demeanor of the staff members (Crowley et al., 2019). Effective leadership fosters a culture of professionalism, accountability, and alignment with the company's values and objectives.

In summary, corporate design encompasses various elements that collectively contribute to shaping the identity and image of a veterinary practice. From the logo to the interior design of the practice building, each component plays a crucial role in conveying the company's values and establishing a cohesive brand identity. Moreover, effective corporate communication and uniformity in corporate behavior among staff members are essential for reinforcing the company's identity and fostering trust and loyalty among clients.

3.4.7 Marketing communication tools

Most of the services that are provided by the veterinary practice are immaterial and cannot be measured correctly by the customer before and after the visit. The quality of the service is not a directly measurable factor and can only be evaluated after the interaction with the customer and by customer satisfaction analysis (Brown, 2018; Gemmill, 2001). To focus on clients' needs, wishes or concerns with the services, a veterinary practice must invest in instruments that can follow up on those (Thiele, 2009). Some of these tools are used for promotion.

Volk et al. (2011) also determined several underused tools that would potentially help practices increase the number of patient visits, using business metrics more effectively to observe the use of services by clients and patients:

- Cat-friendly practices – client education on training procedures to bring pets in less stressfully.
- Routine measurement of client satisfaction through after-service surveys (e.g. exit interviews).
- Increase the use of social media and other communication tools.
- Price discussions - more effectively addressing monetary aspects of the treatment.
- Marketing the practice through referral programs with other pet service providers, providing referral incentives for existing clients.

The range of marketing tools is wide, and currently, cross-marketing is becoming more important. It fits in with digitalization and the growing pet product market and ensures more visibility (Diez, 2021; Nihad Fejzić et al., 2023). One of the main goals of marketing is to turn pet owners into long-term customers. To achieve this, many veterinary practices use various active advertising measures and work on the "feel-good factor" of the practice to bind new customers to the practice (Puddle, 2015b). In parallel, veterinary practices must also make a conscious effort to maintain the satisfaction of their existing customer base. Turning new customers into regular customers is more economically challenging than maintaining the existing customer base and increasing revenue through other more cost-effective measures, such as cross-selling (Blättner and Matzner, 2010).

Therefore, a veterinarian should always strive to ensure that the pet owner feels that they have received "more" from the practice than they expected. And in this context, a comprehensive consultation, in which all the pet owner's questions are to be answered, scores particularly well. Also, the advisory activity should also be invoiced correctly from a business point of view (Ackerman, 2013).

The most important form of advertising for veterinary practices has always been word-of-mouth. Nowadays, digital word-of-mouth advertising is becoming more and more important due to the advancing digitalization, the market dynamics and due to evaluation portals. Nevertheless, the range of conscious marketing instruments that can also be used - from the image of the practice to short films in the waiting room.

Marketing communication might also include the following elements:

- The internet, with the emphasis on a professional homepage as well as social media like Facebook, Twitter, Instagram, Youtube, etc. (Diez & Ózsvári, 2019),
- Yellow Pages (Ózsvári, 2014; Volk et al., 2011),
- Practice brochures and flyers containing the most important information such as the address, phone and fax number, email and homepage address, and an introduction to the practice with the provided services and qualifications or specialisations of the staff (Blättner and Matzner, 2010),
- Giving speeches or workshops in the local community like on schools or in the own practice, concerning awareness of pet health, animal welfare, general animal husbandry, etc. (Ackerman, 2013),
- Newsletters or practice journals can convey the individual diagnostic and therapeutic emphasis of the practice and educate the client, i.e. about characteristic time of the year related diseases on animal health (Ózsvári, 2007),
- Recall-systems, for yearly or geriatric checkups or vaccinations, weight control, etc. (Cron et al., 2000),
- Appointment cards, with all services provided by the clinic as promotion with enough space to indicate the date and the service provided on the appointment (Ózsvári, 2007).

3.5 Digitalization in veterinary medicine

Long-distance telecommunication devices such as telephone or telefax are examples of veterinary telemedicine devices that have been part of veterinary sciences for decades (Mars & Auer, 2006). More recently, the coronavirus disease 2019 (COVID-19) pandemic has made online communication with medical professionals a necessity (Magalhães-Sant'Ana et al., 2020). However, it is important to note that even before the COVID-19 pandemic, the field experienced rapid growth since it is bound to modern technological progress (Littlehales et al., 2020).

While telemedicine has been well established as a useful tool in human medicine, veterinarians are comparatively conservative when it comes to modern video telecommunication (VTC) being used for healthcare purposes. This topic is more relevant than ever due to the global pandemic and concurrent restrictions to personal contact, which should permit a more open discussion regarding the upsides and limitations of veterinary telemedicine. Nevertheless, the current surge in interest should not outshine the already established advantages of the field. Economizing workflow, improving standard of healthcare, reducing customers', patients', and ultimately veterinarians' stress, and reducing the carbon footprint are only some of the scientifically researched upsides in connection with digitalizing medicine (Holmner et al., 2014).

Telecommunication devices are not only useful for the veterinary profession during lockdowns, but they can help aspiring medical professionals increase their level of education, too. However, one of the most significant differences of veterinary medicine in comparison to its human counterpart – veterinarians' patients cannot make use of telemedicine – appears to be commonly disregarded. To establish telemedical services in the veterinary field, the animal owner or customer must make use of them, even when not forced to do so by a global health crisis (Diez et al., 2023).

3.5.1 The Construct of a Digital Veterinary Branch – Telehealth and Telemedicine

The American Veterinary Medical Association (AVMA) describes telehealth as an umbrella term including all forms of technologically provided information, education, and remote care, dividable into different subspecialities (AVMA, 2021). The bpt specifically described veterinary telemedicine as the use of information and telecommunication technologies in order to aid in medical care, if veterinarians and owners with their pets are physically separated (bpt, 2021) Telemedicine has also simply been classified as the use of telecommunication to discuss patient clinical data and management (Gyles, 2019; Voyer & Jordan, 2018; Watson et al., 2019). Telepathology consists of employing online communication to transfer pathologically relevant data, including images and videos. Its main areas of use are to consult, educate, research, deliver, or confirm diagnoses as well as give pathological insight remotely (Farahani & Pantanowitz, 2015). Computerized complete or whole slides are often used by veterinary pathologists to save information for a long time. Setting up a laboratory that fulfills requirements to practice telepathology is mostly a question of network connectivity (based on broadband access) and wireless telecommunications. Common telecommunication and online data sharing and storing platforms, e.g., Skype, Lync, Team Viewer, DropBox, etc., have been used successfully to establish professional exchange. More specifically SecondSlide and PathXchange are used as online file storage providers for telepathology (Farahani & Pantanowitz, 2015).

Teleradiology specializes in sharing diagnostic imaging from modalities like x-ray radiography, computed tomography, magnetic resonance imaging, as well as ultrasound or others (EKG, etc.). It has been around ever since telecommunication is usable in practice, but after major technological advances, it has become more frequently used as a telemedical device to acquire diagnoses remotely (Essman, 2011). With technological advancement, teleradiology has quickly found its place in everyday veterinary practice through supplying immediate input by radiologists. This allows more medical institutions, that would otherwise lack radiology expertise to consult specialized veterinary professionals (Essman, 2011). Especially “cross-sectional imaging,” as used in computed tomography or magnetic resonance imaging, benefits from modern technology.

Veterinary teledermatology, as a subcategory of dermatology, deals with the remote assessment of skin lesions based on visual medical data provided via telecommunication services. Teledermatology is a field in which the advances of modern-day technology can be used specifically for quick and reliable image-sharing mechanisms made possible by smart devices and computers nowadays. Thus, the nature of the diagnostic approach, the inspection of the

lesions with the naked eye, is compatible with telemedical processes like video consultation and picture sharing. Human medicine provides data that is likely transferable to veterinary medicine. Studies have shown that the overall precision of remote diagnoses in human dermatology settles in at around 70% (Eedy & Wootton, 2001; Lee & English, 2018), which is comparable to precision in face-to-face examinations.

Due to the similarities in the procedure of establishing a diagnosis in both veterinary and human medicine, the modus operandi for remote dermatology consultations could be adopted by veterinarians. This can be showcased when examining diseases like Atopic Dermatitis, a condition known to affect humans as well as pet and production animals. Immunological similarities have been noted in Atopic Dermatitis of humans and dogs (Arcique & Bajwa, 2020; Lee & English, 2018).

In professional circles, the term teleconsultation usually represents an exchange of two veterinarians, using some form of telecommunication to consult on a case, that one of them encounters. Usually, one of the veterinarians has a previously established business relationship with the customer and patient (or, a veterinarian-client-patient-relationship, a VCPR) (Pang et al., 2020; Roca & McCarthy, 2019). However, it is routinely used to describe the online consulting between customers and veterinarians too. Also, within a pre-existing VCPR (Cushing, 2022). Through teleconsultations between veterinarians, expert knowledge can be made accessible in everyday practice, without the specialist having to be physically present (Mitek, 2022; Smiley, 2022). This makes treatment of a formerly non-treatable patient possible, showing the way teleconsultations can improve veterinary care. It also shows that videoconferences using commonly available technological devices can be a viable option to improve patient care. Most veterinary institutions are probably already in possession of the required technical equipment (Bishop et al., 2018). Teleconsultations are the combining factor between fields of telepathology, teleradiology, and tele dermatology. By increasing the accessibility of expert evaluation through teleconsultations, the overall standard and efficacy of care are improved.

Client-veterinarian teleconsultation is a telemedical service using telecommunication tools allowing the veterinarian to get in contact with the client and assess the overall medical status of the patient without relying on a physical examination (Mitek, 2022; Mitek et al., 2022). However, teleconsultation is indeed a branch of telemedicine and should be treated as such, instead of using the terms telemedicine and teleconsultation synonymously, which creates a confusing space for argumentation and has occurred in scientific literature and discussion (Hess, 2017).

Client-veterinarian teleconsultation is a controversial topic among veterinarians. Some practitioners see its benefits, like the chance to view patients via video chat under everyday circumstances, rather than a stressed or fearful animal at their workplace. Also, patient development is easier to follow through picture and video exchange on smart devices (Chitty, 2019). Therefore, advocates of remote care see teleconsultation as an addition to their in-house work. It has also become incredibly relevant due to the COVID-19-mandated lockdowns, as a way of assuring patient care despite adverse conditions (Mureşan et al., 2021). On the other hand, critics of digitalization often criticize the idea of remote prescriptions and argue that only with an established VCPR and in person should a practitioner be able to prescribe medication to a patient. As this is being written, remote prescriptions are not legal in Germany. The opposing experts fear that if it were to become a reality, the standard of diagnostic work would suffer (Mars & Auer, 2006) and that the already criticized overuse of antibiotics would increase even further (Massin Teller & Moberly, 2020).

3.5.2 Current State of Telemedical Veterinary Services

Presently, telemedicine is still not widely practiced in veterinary medicine in Germany, even though the profession can benefit from modern technological advancement (Diez et al., 2023).

3.5.2.1 Causes of the growth of telemedical services

The human medical field already acknowledges the value of using advanced telecommunication systems to their advantage and determined ways of applying telemedicine efficiently and accurately. The veterinary field is lagging. One of the reasons for the poor use of telemedicine tools in the veterinary practice is the combination of unwillingness and lack of technical know-how by veterinarians, and a shortage of capable, forward-thinking practitioners in the field. Research has shown that many veterinarians do not favor using telemedical services, no matter their age (Watson et al., 2019). Data show that practitioners as well as students are hesitant towards digitalization itself as well as acquiring knowledge in IT-related subjects compared to workers in the industrial sector or service providers. Consequently, their already weak capabilities to work with modern teletechnology are not improved upon, because opportunities for teletechnology are rarely explored (Richards, 2019). Understandably the deficit in technical knowledge raises questions about internet security. This issue is also often addressed by animal owners when confronted with the topic of telemedicine (Drewry et al., 2019).

Another reason why telemedicine is not fully accepted by the veterinary profession is the issue of remote prescription. Many practicing veterinarians reject this due to the risk of missing

symptoms, difficulty assessing vital signs and other measurements, and mitigation of responsibility which could lead to misdiagnoses. Further, there is a risk for overprescription of antibiotics, which has happened in human telemedicine settings before (Massin Teller & Moberly, 2020). They also lament that the practice of online consultations and counselling has the potential to further competition for clients, among vets, forcing less technology-experienced practitioners to forfeit customers.

3.5.2.2 Practical benefits of veterinary telemedicine

There are prerequisites for routine use of veterinary telemedicine. It is necessary to investigate the interest of existing animal owners in using telemedicine for consultations. Widmar et al. (2020) showed that dog and cat owners, that participated in their survey, were willing to pay for online counselling, subsequently exerting disutility for vets and owners that decline veterinary telemedicine opportunities. Based on this information one could argue that there is a market for telemedicine in the veterinary field that is not being explored. Especially since telemedicine is an effective method to extend business hours and therefore increase overall amount of patient visits, a number that has gone down, partly due to pet owners' increased use of the internet (Volk et al., 2011).

Telemedical considerations during the COVID-19 pandemic were a practical benefit for veterinary medicine. The highly unusual circumstances in connection with the global pandemic induced lockdowns, have shifted the discussion from profitability to necessity, and thereby opened the doors for new telemedical technologies (Smith et al., 2022). As with many other areas of life, veterinary medicine has been impacted by the circumstances in connection with COVID-19. Out of a pool of 188 consultations, the possible impacts of COVID-19 are quantified, showcasing that it had definite effects on routine procedures and everyday appointments, thus highlighting the need for more sophisticated solutions concerning online veteri nary medical care. Practicing remote care wherever possible, would decrease the risk of exposure for both personnel and clients. Advice given using telemedicine has been shown to decrease in-person visits (Littlehales et al., 2020).

Another deciding factor is usability. The outcome of human medicine studies can be compared to the usability of telemedicine in veterinary practice. Eedy & Wootton (2001) and Lee & English (2018) determined the accuracy and efficacy of dermatology-related remote diagnosis at around 70% after reviewing several studies of tele dermatology. As a result, the institutions that were studied were economizing their workflow, cutting back on waiting time for surgeries, and saving money in favor of both patients (£1.70 saved per patient) and healthcare (18%

savings) (Lee & English, 2018; Van Der Heijden et al., 2011). These results can motivate the veterinary field to facilitate change in the same direction.

Overall, veterinary telemedicine offers some economic and ecological benefits that could improve veterinary-accessibility for animal owners that were previously unable to receive veterinary care for example due to geographical barriers. Teleconsulting is arguably the most efficient way to confer with peers. Using virtual meeting platforms, not only retrospective and clinical data can be exchanged, but patients can be viewed by the consultant without having to be present. Especially if the consulting veterinarian is a specialist, the use of teleconsultation can improve the level of care given to a patient. General practitioners could use teleconsultation to immediately refer patients to specialists without having to see them in person (Manzi & Navas de Solis, 2022).

Also, some veterinary tasks could be performed online completely, the best example being post-surgical follow-up examinations. After everyday procedures like spaying or neutering, removal of superficial growths, or dental extractions, the online review of the patient is favorable (Smiley, 2022). Bishop et al. (2018) found in their study, owners were pleased with the results of a remote check-up service and opted to make use of it on other occasions.

Implementation of veterinary telemedicine could also help practice management to optimize workflow. An increased capability to take on cases (Voyer & Jordan, 2018) in combination with improved distribution of labor (by more efficiently distributing patients to specialists after online counselling) would provide preferable conditions for employees. Therefore, this could improve retention of personnel, by creating a more harmonious company culture, within the usually stressful workspace that is the veterinary field.

Finally, like every other part of society, the veterinary medical sector should be hard-pressed to find ways to reduce carbon emissions, waste production, and strive for playing its role in decelerating global climate change. Telemedicine is an eco-friendlier option to treat patients, as it has the potential to reduce carbon dioxide production in connection with the health sector by 40–70 times. Transportation plays a huge part in global warming. Regarding healthcare personnel as well as clients, video telecommunication helps circumventing the need to drive, if remote treatment is a possibility. Conclusively, it is an effective way to reduce the amount of greenhouse gas emissions in relation to medical appointments. If telemedicine was to be used more widely, it could have considerable effects in decreasing emissions (Holmner et al., 2014).

4 MATERIAL AND METHODS

4.1 Digitalization Survey

The digitalization survey aimed to evaluate the acceptance and impact of telemedicine among pet owners in Germany. This study investigated various sociodemographic factors influencing the willingness of pet owners to utilize telemedical consultations. The survey employed a descriptive and correlational research design, targeting a broad spectrum of pet owners across Germany. Data collection took place from March to August 2021 using a comprehensive questionnaire designed on the SurveyMonkey platform, encompassing both closed-ended and open-ended questions (see ANNEX III).

4.1.1 Questionnaire Development, Feasibility Testing, and Data Processing

The questionnaire, initially drafted in Microsoft Word, comprised 16 questions across multiple sections, focusing on sociodemographic information such as place of residence, age, gender, and occupation. It underwent critical review by selected participants and academic faculty, leading to refinements for clarity and relevance. A pilot test with representatives from the target group provided feedback, resulting in final adjustments before broader distribution. Participants were assured of anonymity and data confidentiality, with their consent obtained in compliance with ethical standards. The survey, primarily administered via SurveyMonkey, required approximately five minutes to complete.

The survey targeted potential clients of veterinarians and was disseminated through forums, websites, and social media groups related to animals. Veterinary clinics, practices, and telemedical service providers facilitated distribution by sharing the survey with their customer base. Additionally, National Veterinary Associations in Germany were asked to circulate the questionnaire among animal owners. Invitations, including a link to the survey, were shared via email, Facebook groups, and veterinary news platforms.

A total of 362 participants completed the survey. Data were initially processed in Microsoft Excel for basic evaluation and subsequently transferred to STATA for advanced statistical analysis.

4.1.2 Statistical analysis

The following hypothesis were formed and will be addressed:

Hypothesis testing related to digitalization and telemedicine:

1. H1: If an animal owner has small animals, they are likely to make use of telemedical consultations
   H0: Owning small animals has no effect on likelihood of using telemedical consultations
2. H2: Younger animal owners are more likely to make use of telemedical consultations
   H0: Age of animal owners has no effect on likelihood of telemedical consultation usage
3. H3: Rural and small-town populations are more likely to use telemedical consultations
   H0: There are no regional differences in likelihood of telemedical consultation usage

Data processing began with descriptive statistics to outline the sociodemographic characteristics of the respondents, providing a foundational context for further analysis. Several advanced statistical tests were employed to explore the research questions:

Kruskal-Wallis Test: investigates the differences between regional differences in the likelihood of using telemedical consultations, the analysis could identify whether regional variations influence telemedical consultation usage.

Spearman Correlation: aims to evaluate the relationship between the age of respondents and their likelihood to use telemedical consultations, suggesting that the result could indicate that age could affect telemedical consultation usage.

Wilcoxon Rank Sum Test: aims to compare the likelihood of utilizing telemedical services between small animal owners and others (e.g. horse owners, farmers), analysing whether the type of pet influences telemedical consultation usage.

The significance level was set at $p < 0.05$ for all tests. The results were systematically analyzed to identify key trends and correlations.

4.2 Management characteristics survey

4.2.1 Study Aim and Design

The study's primary objective was to analyze critical management characteristics within German small animal practices, clinics and mixed animal practices treating small animals, focusing on aspects such as management practices, market trends, and business parameters. Adopting a descriptive and correlational research design, the target participants included owners and practice managers of small animal or mixed animal practices across Germany. The data collection took place from November 2020 to March 2021, providing ample opportunity to garner extensive responses and insights. A comprehensive questionnaire consisting of a mix of closed-ended and open-ended questions and questions incorporating different methods such as Likert scales was developed to capture diverse data pertinent to the research objectives. This survey was electronically distributed through emails, links sent to veterinary universities, professional associations, and hosted on platforms like the German Veterinary Association and the Association of Practicing Veterinarians websites. Information leaflets detailed the survey's scope, ensuring participants fully understood the study's purpose. To optimize engagement, abstracts promoting the study were published in veterinary magazines and on various relevant online platforms.

4.2.2 Questionnaire Development and Feasibility Testing

Initially drafted in Microsoft Word, the questionnaire featured 68 diverse questions across 7 comprehensive sections. The questionnaires employed in this research underwent multiple rounds of review and pilot testing to enhance clarity and consistency. Pilot participants provided critical feedback on question wording, format, and length, prompting modifications that improved face validity. However, formal reliability analyses (e.g., Cronbach's alpha) were not systematically conducted for all question sets. Consequently, while the instruments were refined to reduce ambiguity, there remains a possibility of measurement error arising from inconsistent interpretation of items. To mitigate these concerns, closed-ended questions were formulated to minimize subjectivity, and training materials or explanatory notes were provided to participants when necessary. Nonetheless, the potential for residual bias in self-reported data must be acknowledged, as respondents may under- or overestimate certain behaviors or attitudes despite confidentiality measures.The questionnaire is seen in ANNEX IV.

4.2.3 Data Collection Process

All study participants provided written consent, ensuring compliance with ethical standards and voluntary participation. Anonymity and data confidentiality were stringently maintained. The SurveyMonkey platform was primarily used to administer the survey, designed to be completed within 25 minutes. Despite initial low response rates, persistent outreach through professional networks ultimately yielded 301 complete responses. The initial data processing was undertaken in Microsoft Excel, where data sets were evaluated for completeness, with 221 datasets deemed suitable for comprehensive analysis.

4.2.3.1 Sampling Method

A nonprobability (convenience/snowball) sampling strategy was adopted due to practical constraints, including the absence of a comprehensive and publicly available registry of veterinary practices or pet owners. This approach enabled broad initial reach through professional networks, social media groups, and partner clinics; however, it may limit the representativeness of the final sample. Certain subpopulations—such as those less active online or located in regions with limited veterinary infrastructure—might be underrepresented. In addition, the reliance on voluntary participation introduces self-selection bias, wherein individuals with a stronger interest in the topic could be more inclined to respond. While this method facilitated timely data collection and sufficient sample sizes, caution should be exercised when generalizing the findings to the wider population of German veterinary practices or pet owners. Future studies seeking greater external validity might employ stratified or probabilistic techniques, ensuring a more balanced demographic distribution.

4.2.4 Statistical Analysis

Data meticulously transferred from SurveyMonkey to Microsoft Excel underwent preliminary evaluations to ascertain completeness, forming the basis for further advanced statistical examination in STATA.The detailed statistical analysis conducted in STATA was multifaceted. To expand upon the extensive statistical analysis performed in this study and approaching the research questions with precision, I utilized a diversity of statistical techniques and explored various dimensions of veterinary practice management in German small animal practices, clinics and mixed animal practices treating small animals. While the STATA-specific output files (i.e., do-files) are no longer retained, the Excel dataset is available for replication, enabling other researchers to re-run or extend these analyses.

4.2.4.1 Hypothesis:

The key research questions and hypotheses center on management, marketing, and financial outcomes:

1. H4: There is an effect of practice type on number of employees.
   H0: There is no effect of practice type on number of employees.
2. H5: There is a significant associtation between practice type and turnover.
   H0: Turnover is independent of the type of practice.
3. H6: The Number of Employees, Equipment and legal form are decisive for high turnover.
   H0: The Number of Employees, Equipment and legal form are not decisive for high turnover
4. H7: There is an effect of number of staff on use of marketing tools.
   H0: There is no effect of number of staff on use of marketing tools.
5. H8: There is an effect of age on views on the future/ marketing instruments.
   H0: There is no effect of age on views on the future/ marketing instruments.
6. H9: There is an effect of age on views on choosing the marketing tools.
   H0: There is no effect of age on views on choosing the marketing tools.

4.2.4.2 Descriptive Statistics and Demographic Analysis

The basic demographic features (frequencies and percentages) were calculated to provide insights into the residences, states, workplaces, gender, and age distribution among the participants, as presented in ANNEX V. This baseline data served to establish the demographic context for further analysis and ensure a comprehensive understanding of our sample characteristics. The refreshed and analyzed data is shown broken down to the sections of the questionnaire in ANNEX V-XII.

4.2.4.3 Advanced Statistical Analysis Techniques

Chi-Squared Tests were used to investigate associations between practice categorical variables such as the type of residency and workplace and the state of the veterinary practice (geographic distribution). Results from these tests helped identify patterns which might affect practice operations based on geographic characteristics.

One-Way ANOVA was utilized to examine differences among various legal forms of practice and their associated practice characteristics like the length of practice operation and the types of services offered. Significantly different means would indicate the impact of legal structure

on practice operations. Although ANOVA often assumes normality of residuals, explicit normality tests are not shown here. In the context of larger sample sizes and relatively balanced groups, ANOVA remains a reasonable choice.

Logistic Regression was performed to model the probability of achieving **high revenue** (defined as exceeding one million euros). Multiple predictors—such as practice type, number of employees, equipment, and legal form—were included in the model to determine which factors significantly contributed to higher financial performance. This analysis aimed to provide a deeper understanding of how these variables collectively influence the likelihood of exceeding a one-million-euro revenue threshold.The selection of the three variables for the logistic regression analysis was based on their theoretical relevance and prior research findings. For example, the first variable, practice size (e.g., number of employees), was chosen because previous studies have shown that larger practices tend to have different management and operational challenges, which could e.g. influence their use of digital tools and telemedicine or employment of practice managers, service offerings, etc. The second variable, turnover, was selected because financial performance is often a key driver in the adoption of new technologies or operational strategies in businesses, including veterinary practices.

Two-Way ANOVA was conducted to test whether practice type affects the number of employees. The analysis could show whether there are significant differences among different practice types regarding their employee count, revealing insights into operational scale and scope impact staffing needs.

Fisher Exact Test was applied to explore the association between the type of practice and annual revenue to address the challenges of small expected counts in some cells of our contingency table. The result could imply if practice type would be a determinant of revenue.

Multiple Linear Regression was performed to predict financial outcomes (like revenue and revenue distribution) based on multiple predictors including practice type, number of employees, and types of services offered. The analysis aims to provide a deeper understanding of how various factors combinedly influence financial success.

5 RESULTS

5.1 Digitalization

5.1.1 Sociodemographic Characteristics of the Respondents

Most of the respondents lived in the southern states of Germany: 42.8% in Bavaria and 12.3% in Baden-Württemberg, followed by people living in North Rhine-Westphalia (12.2%). Around 46.0% of the respondents came from a rural background, followed by large- town (24.0%), small-town (21.0%), and medium-town inhabitants (9.0%). The gender of the respondents leaned toward the female side, as 247 (68.2%) participants were women. Around 112 participants (30.9%) were between 18 and 24 years of age, 102 (28.2%) between 25 and 34 years, and only 37 respondents (10.2%) were aged between 35 and 44. Around 89.8% (325) of the respondents had pet(s) at the time of the survey and the distribution of pet animal species among the represented owners is shown in **Figure 10**. The 10.2% of respondents who were not pet owners were retained in the analysis to provide a comparative perspective on attitudes toward digitalization and telemedicine. Their inclusion broadens the scope of the findings, offering insights into how non-pet owners perceive veterinary digital tools, which may influence societal acceptance and adoption.

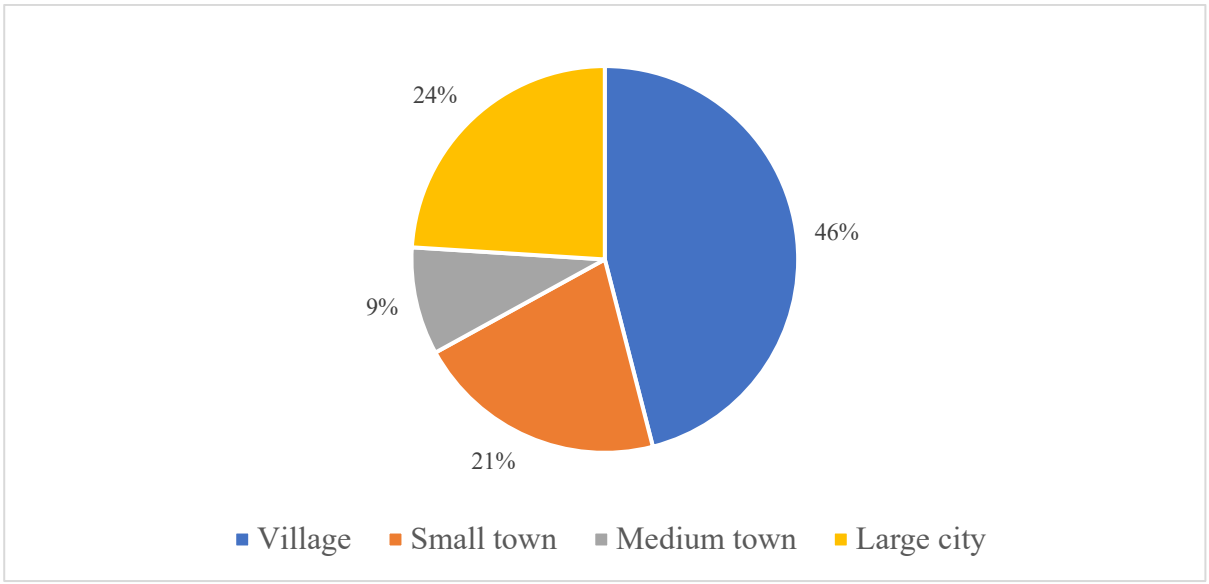

Figure 10. Distribution of respondents of digitalization survey (N = 362)
Note: Large City: >100,000 inhabitants, medium town: 50,000-100,000, small town: 10,000-49,999, village: <10,000

5.1.2 Customer Perception and Acceptance of Veterinary Telemedical Services

In order to contextualise how animal owners' view remote healthcare, participants were asked how likely they are to make use of telemedical services. Based on these values, sociodemographic influences were tested, as well as whether small animal owners in general are open to such procedures according to the following pre-determined hypotheses:

1) H0: Owning small animals has no effect on likelihood of using telemedical consultations
   H1: If an animal owner has small animals, they are likely to make use of telemedical consultations
2) H0: Age of animal owners has no effect on likelihood of telemedical consultation usage
   H2: Younger animal owners are more likely to make use of telemedical consultations
3) H0: There are no regional differences in likelihood of telemedical consultation usage
   H3: Rural and small-town populations are more likely to use telemedical consultations

The testing of the Hypotheses was done using correlation testing, namely the Spearman-, Kruskal-Wallis-, and Wilcoxon rank sum tests. The goal was to identify whether sociodemographic differences (age, place of origin) would significantly influence willingness to participate in telemedical services, and whether the species of the pet would significantly influence said willingness to participate.

The calculations, though not shown in detail in this section, revealed no measurable relationship between regionality and willingness to participate in online consultations ($p=0.8187$ Spearman-test) ($p=0.06$ Kruskal-Wallis-test). Between the age of the respondent and likelihood to make use of online consultations ($p=0.077$ Spearman-test) ($p=0.63$ Kruskal-Wallis-test), there was also no significant correlation. Lastly, there seems to be no connection between owning small animals and likelihood to take part in telemedical consultations ($p=0.595$ Wilcoxon rank sum test). This results in failing to reject all three of the null hypotheses. A possible interpretation of this outcome is, that there are no preferences between different sociodemographic groups and owners of different pets, concerning the use of telemedicine. In combination with the rather high likelihood to take part in online healthcare among the test group, it is arguably more universally accepted than previously assumed. But it is important to note that because of the small sample size and their rather one-sided geographical distribution, these results cannot be seen as a fair representation of the general public. These are therefore merely directions which more broadly distributed surveys could explore.

5.1.3 Limiting Factors of Veterinary Digitalization

Despite that the raw data looked promising since the average respondent appears to be more likely to accept the telemedicine offers than not, it is still necessary to identify the reasons for limiting the potential of digital veterinary healthcare among the possible customers. To identify the limitations, possible factors that would urge respondents to decline online consultations were offered in the survey (**Figure 11**).

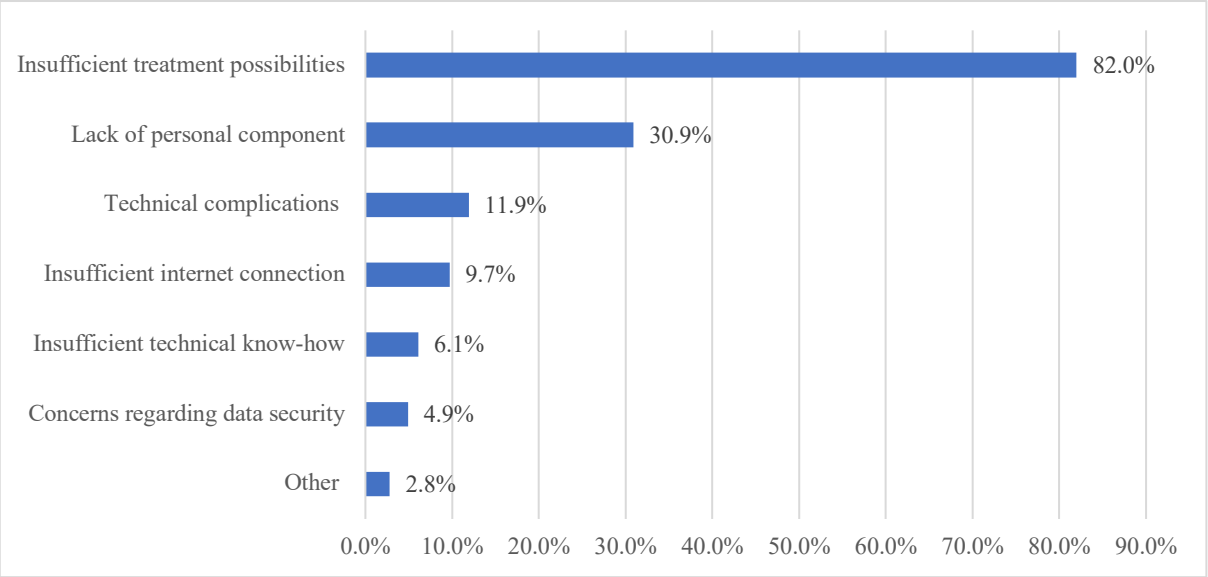

Figure 11. Factors that would urge respondents to decline online consultations (N = 362)
Note: the questions were multiple-choice questions that allowed participants to give more than one answer, number of answers exceeds the number of participants.

The most common reason (82.0% of all participants), why participants would decline a telemedical consultation, was the issue of insufficient treatment possibilities. There was also considerable concern with the lack of personal component (30.9% of all participants) among animal owners. Other inconveniences that could occur alongside online consultations were technical complications (11.9% of all participants) and insufficient internet connection (9.7% of all participants). From the owner's point of view, insufficient technical know-how (6.1% of all participants) as well as concerns regarding data security (5.0% of all participants) were only viewed as minor problems.

5.1.4 Assessing Framework Conditions for Implementation of Digital Healthcare Systems

To judge acceptance of some of these methods, the survey was set up to gain insight into customers' negative experiences with the veterinarians, as well as their perception of possible solutions and improvements. When they were asked about things that would make a visit to the veterinarian undesirable, waiting times (59.2%) and aggressive or rather nervous pets (55.0%) were the two most frequent answers. General stress seems to be another negative factor in connection with a visit to a veterinarian, as it is experienced by 38.4% of participants. 107 respondents (29.6%) were bothered by the travel distance and, similarly, the required time was a nuisance for equally as many respondents (also 29.6%). The costs (11.1%) are not among the priority problems.

The following options were considered preferable for online scheduling: vaccinations (75.4%), follows-ups (61.6%), general examinations (57.7%), post-operative controls (45.3%), and special diagnostics, like ultrasound, x-rays, and blood tests (41.2%). On the other hand, emergencies seem to be a different matter, as only 8.8% of the respondents regarded this situation as online sched ulable. Out of the 24 "Other" answers, 10 (2.8%) were variations of either "general examinations" or "check-ups" and the remaining 14 answers (3.87%) can be summarized as "online scheduling should not be practiced." Also, 215 respondents (59.7%) were in favor of it being legal for veterinarians to diagnose and prescribe virtually, while 145 (40.3%) were against it.

Majority of respondents (70.7%) think that telemedicine would indeed be beneficial, while the rest (29.3%) are not convinced. On the other hand, when asked whether they have ever used telemedical consulting with either a veterinarian or a physician, the responses showed that there was a little experience with the topic

Out of 362 surveyed participants, merely 40 (11.1%) had used telemedical consultation with a veterinarian. Another 20 had had experiences in this regard with a physician (5.5%). A vast majority of 84.25% answered “No” when asked whether they had used any sort of online consultation. So, despite many people regarding it as a tool to a veterinary service, there is little to no use.

The digital tool preferences of the respondents were relatively diverse, excluding Facebook and its messenger (4.1%) and Google Meet (8.8%) which are the two least favorite options. Considering the preferences for videochat-focused tools, Skype (26.0%), FaceTime (29.3%), and Microsoft Teams (29.8%) had similar shares to each other. The exception being Zoom, another video communication platform, with 42.5% approval among participants. As regards to the more text-based digital applications, 37.9% of the respondents considered e-mail a decent option, while WhatsApp gathered 43.7% share overall. Using the telephone to communicate with their veterinarians was the preferred way of more than half of the respondents (51.9%) and thus the most popular tool.

5.2 Veterinary Management and Marketing

5.2.1 Sociodemographic characteristics of veterinarians

The data of this section is further shown in ANNEX V: Descriptive Statistics.

5.2.1.1 Geographical distribution of the participants

Figure 12 shows the distribution of respondents across Germany. The participation of the respondents shows a relatively even distribution across the federal territories, with most participants coming from Schleswig-Holstein, in relation to the practices’ location and the author's network. Thus, Schleswig-Holstein has more representations than other federal states.

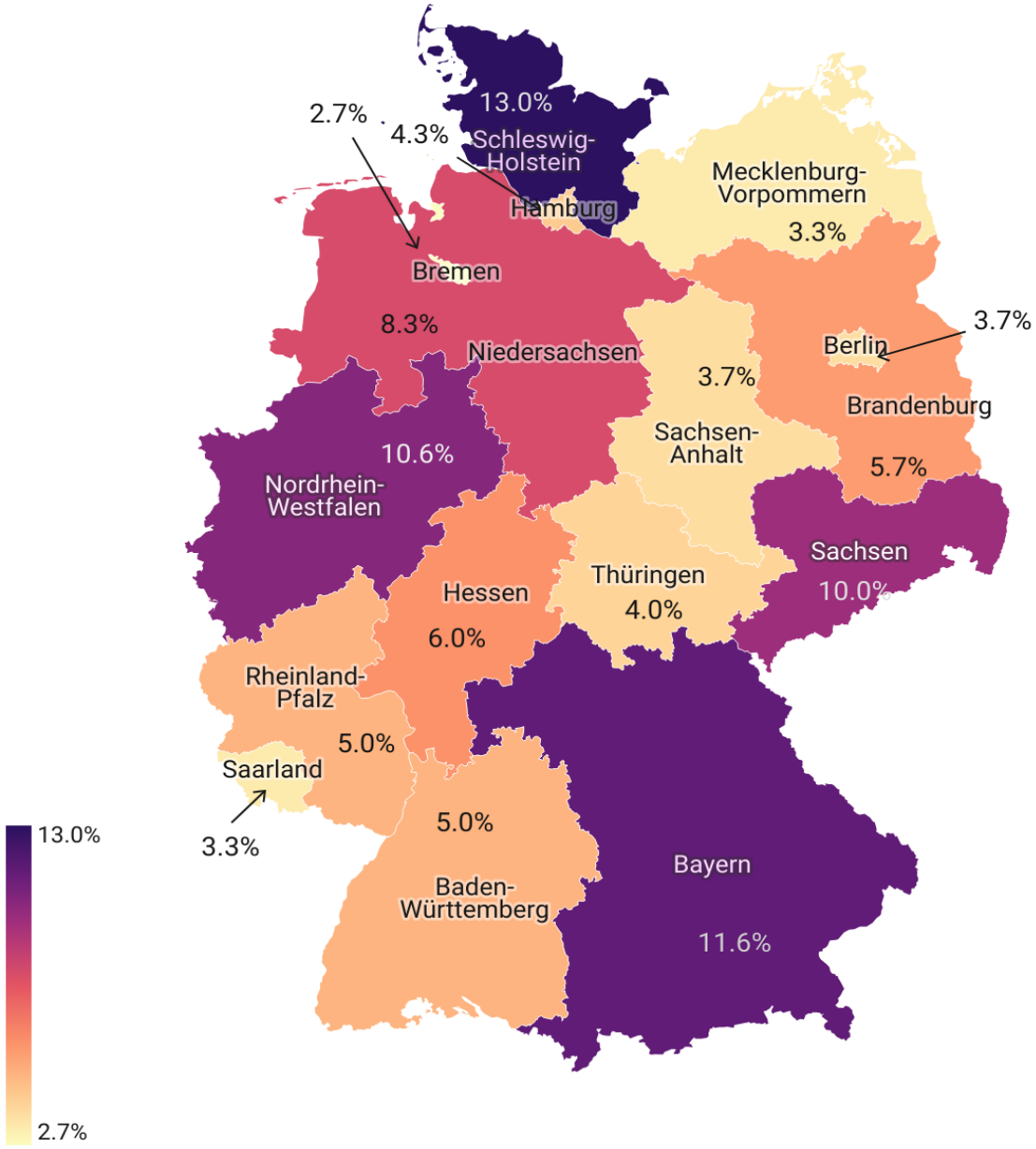

Figure 12. Graphic distribution of surveyed practices to federal states in Germany (N = 301)

Figure 13 presents the geographic distribution of practice owners' residences and workplaces. The data indicates a notable difference between residential areas, primarily villages or small municipalities, and workplace locations, mostly in small towns with populations ranging from 10,000 to 49,999.

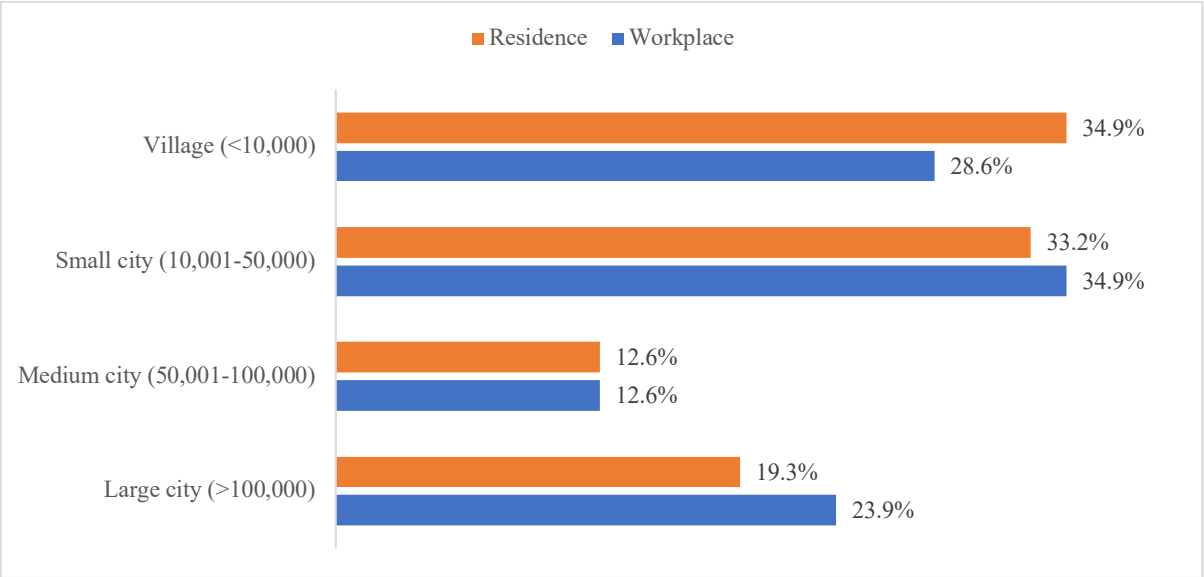

Figure 13. Distribution of workplace and place of residence of participants (N = 301)

5.2.1.2 Gender and age

Figure 14 displays the age and gender distribution of surveyed veterinarians, with the majority falling into the age groups of 45-54 years old (32.9%) and 55-64 years old (33.6%). There is a relatively even distribution across age groups, with the smallest proportions observed among 25-34 years old (6.3%) and 65-74 years old (5.9%), and notable differences in gender representation, particularly in the 35-44 age group with 13 males and 50 females. Gender-wise, there is a higher representation of females across all age groups, particularly evident in the 35-44 age group where females outnumber males by a significant margin. Additionally, the data indicates a trend towards an older demographic among practice owners, with the highest proportions found in the 45-54 and 55-64 age groups.

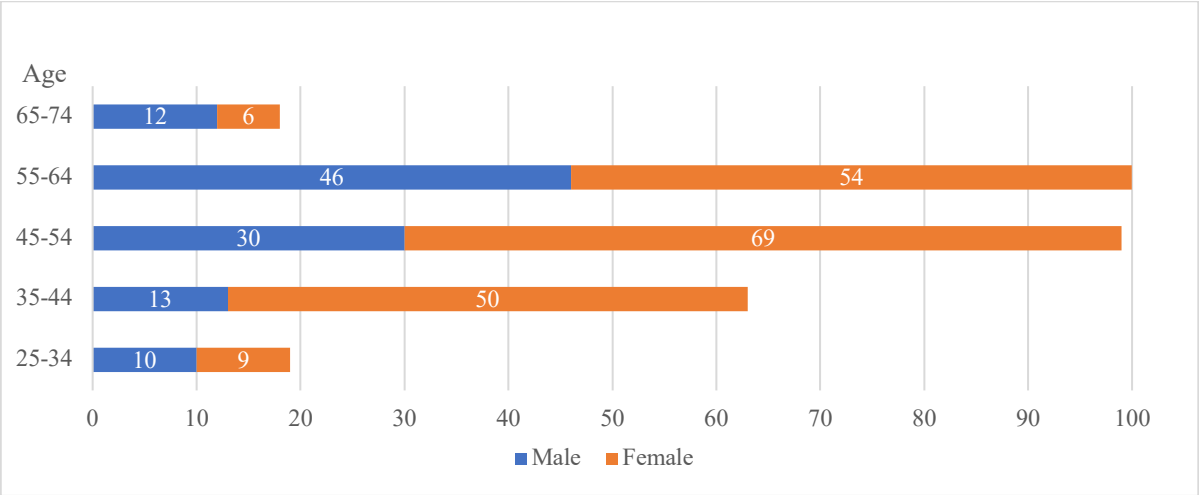

Figure 14. Age and gender of participants in total numbers (N=299)

5.2.1.3 Further education

Figure 15 illustrates the various sources utilized by participants for continuing education and training in the veterinary profession. The data reveals significant differences in the preference for sources, with newspapers/journals being the most utilized (85.7%), followed by webinars (79.3%), courses (73.3%), and congresses (72.3%). Conversely, a smaller proportion of respondents relied on the internet (64.0%), colleagues (56.7%), and consultants (12.0%) for professional development. Additionally, a minority explored alternative sources such as social media, professional policy, and professional literature (2.3%).

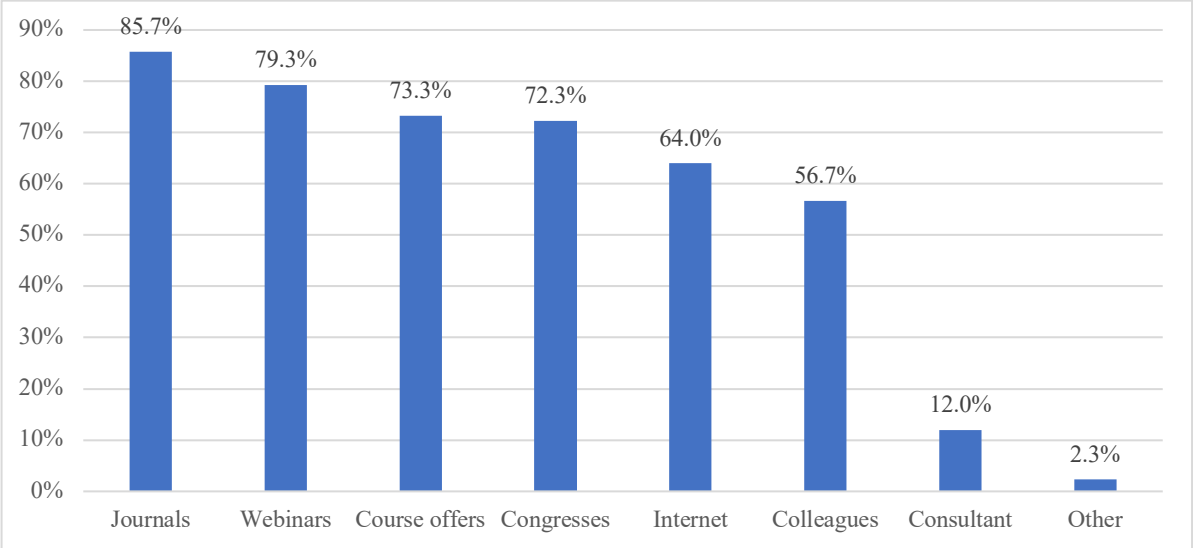

Figure 15. Sources for Postgraduate Training completed by participants (N=300)
Note: the questions were multiple-choice questions that allowed participants to give more than one answer, number of answers exceeds the number of participants.

Figure 16 highlights the continuing education pursuits of the respondents, with surgery being the most commonly undertaken field of further training by practice owners (48 out of 223 respondents). Additionally, internal medicine, management/practice leadership, regenerative medicine (mainly acupuncture and chiropractic, with lesser focus on physiotherapy and osteopathy), dermatology, and dentistry were among the frequently completed disciplines. Conversely, there was minimal participation in further training qualifications in neurology, oncology, orthopedics (2%), and anesthesia (1%). An additional query revealed that a significant majority of participants, totaling 83.8% (N=283), routinely consult their colleagues for clinical advice.

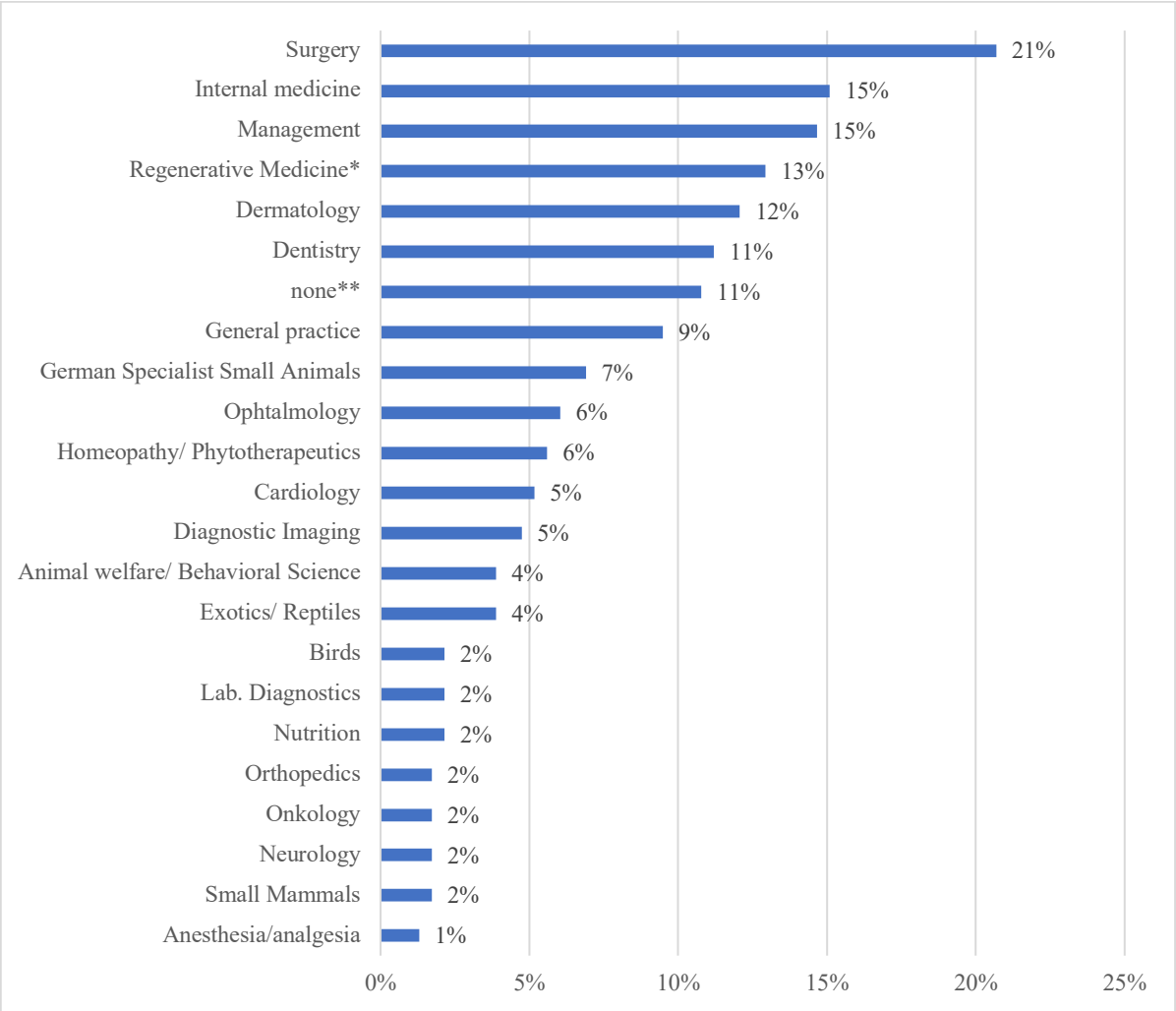

Figure 16. Distribution of postgraduate courses done by participants (N=232)
* Regenerative/ Rehabilitative Medicine – Osteopathy, Physiotherapy, Acupuncture
** no further information was given
Note: the questions were multiple-choice questions that allowed participants to give more than one answer, number of answers exceeds the number of participants.

5.2.2 General characteristics of the surveyed small animal practices and clinics

The data of this section is further shown in ANNEX VI: Practice Characteristics of surveyed practices.

5.2.2.1 Legal form and profile of practices

Figure 17 illustrates that the majority of the respondents work as sole proprietors or freelancers (68.8%). 22.6% of the respondents are structured as civil law partnerships (GbR - Gesellschaft bürgerlichen Rechts), and 7.5% are organized as limited liability companies (GmbH - Gesellschaft mit beschränkter Haftung). Only a very small proportion of participants are in the form of a limited partnership with a limited liability company as the sole general partner (GmbH & Co. KG - Gesellschaft mit beschränkter Haftung & Compagnie Kommanditgesellschaft). This legal structure under German civil law includes limited partners bound to the company by their respective shares in the company's capital. Only one participant's practice is situated in the legal form of a public limited company (AG - Aktiengesellschaft). This data is also supported by information provided by the BPT (Ripper, 2022b). Additionally, the number of business partners was also analyzed (**Figure 18**). The findings broadly reflect the previously analyzed legal forms. 60.9% of the respondents do not have a business partner, signifying sole proprietorship. Furthermore, about 25.1% have one more partner, and 9.0% have two business associates.

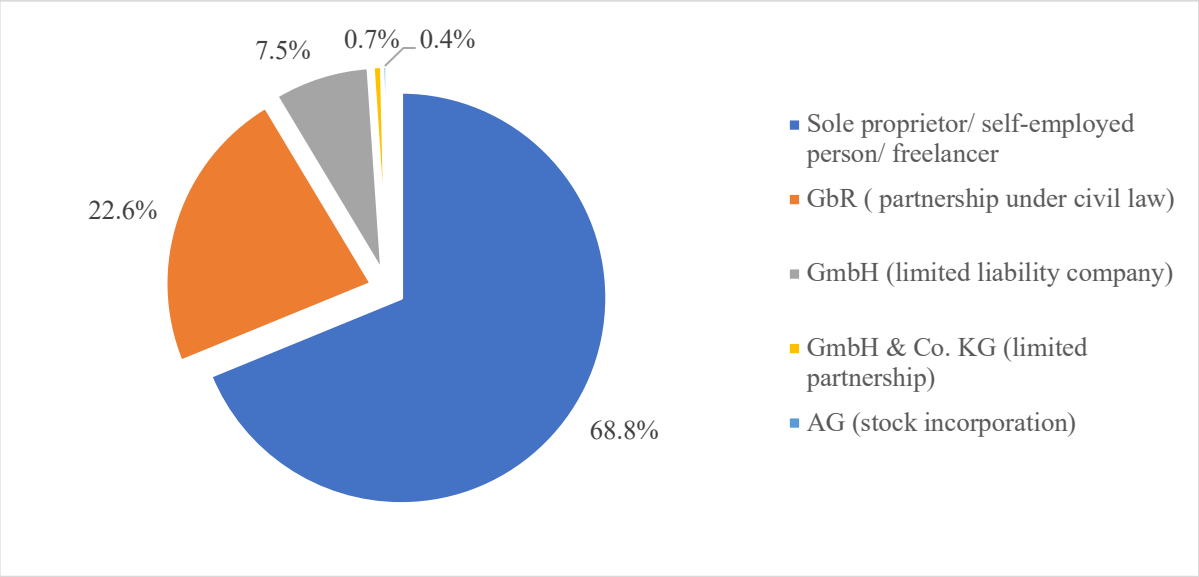

Figure 17. Legal form of surveyed vet practices (N=279)

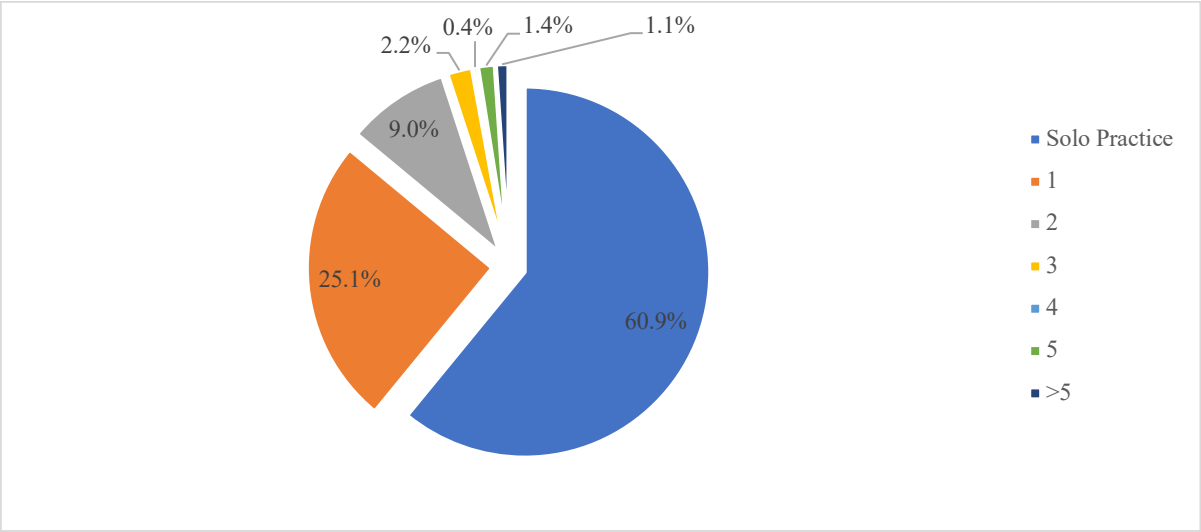

Figure 18. Number of associates of surveyed vet practices (N=279)

In this study, the investigation primarily focused on practice owners involved in small animal medicine exclusively or within a mixed practice setup, without delving into further details regarding the type of practice (e.g., small animal, farm animals, exotics, or horses). However, a categorization was conducted based on the practice type, distinguishing between small animal practices, center/practice at clinic level, small animal clinics, and mixed practices. Notably, approximately 56.3% of the respondents were affiliated with small animal practices, while mixed practices accounted for 22.9%. Furthermore, an inquiry was made regarding small animal centers or clinic-level practices, a trend that has seen an increase in recent years, with around 10.0% of respondents identifying with this type. Lastly, approximately 7.2% of participants reported belonging to a small animal clinic (**Figure 19**). Others included mobiles practices, referral practices or practices without distinctions in the questioned catergories.

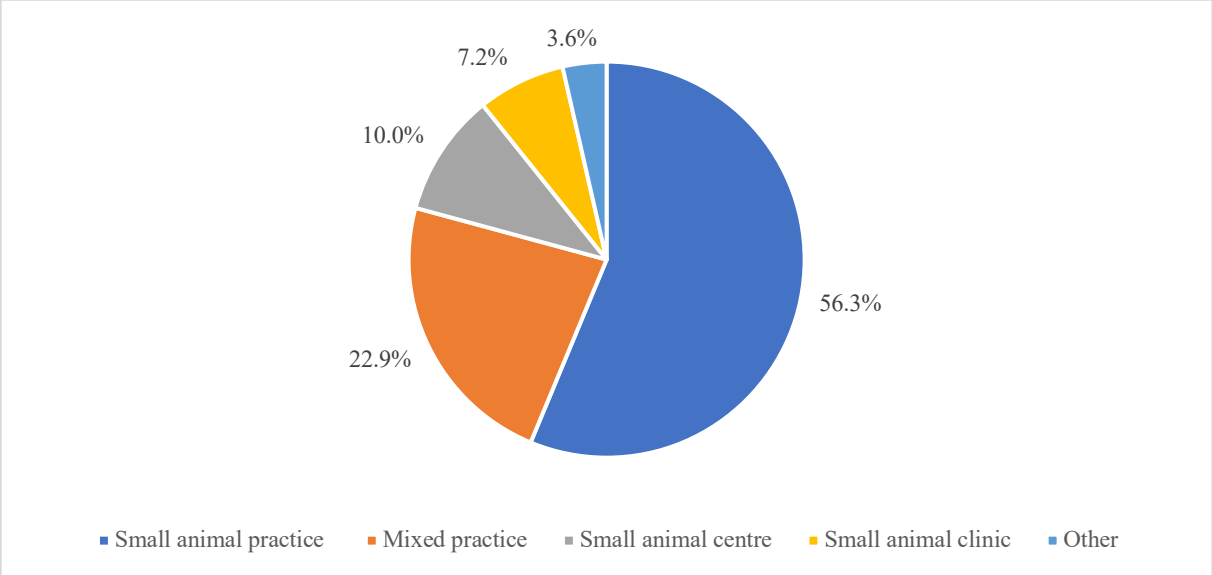

Figure 19. Practice type of surveyed vet practices (N=279)

Figure 20 illustrates the age of the practices and the results show that that the majority of practices have been operational for more than a decade (75.3%).

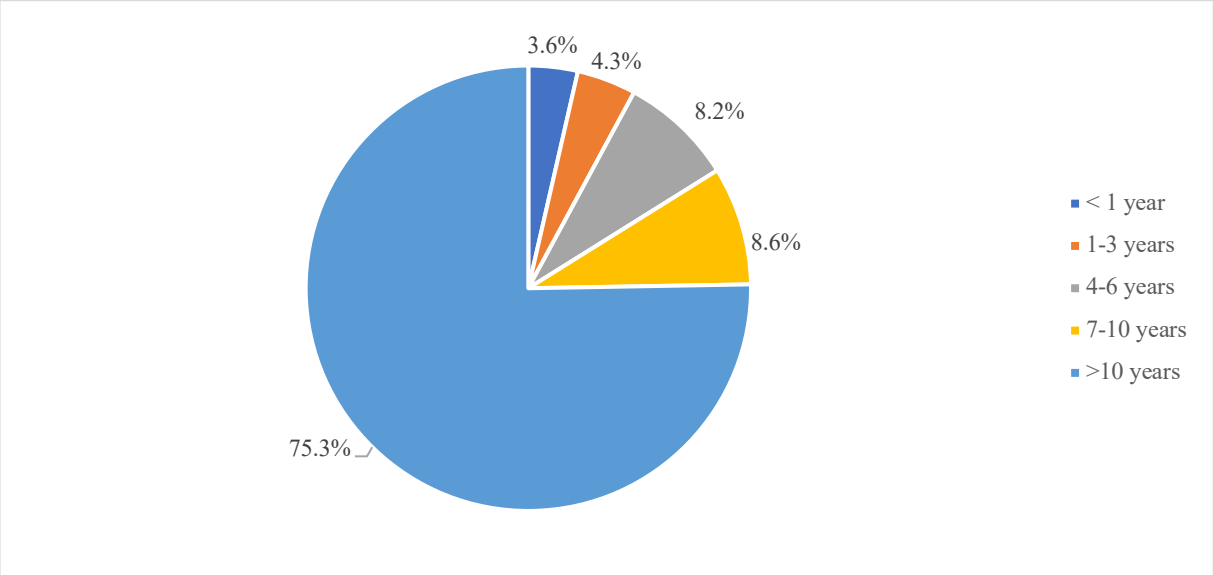

Figure 20. Period of existence of surveyed vet practices (N=279)

5.2.2.2 Size of the practices

The average practice size was 226.3 m2, with a large standard deviation (270.9 m2) due to variations in structural sizes (N=268). The waiting area size (N=276) varied, with 47.5% of respondents having a waiting area of 10-20 m2 and 40.2% having an area over 20 m2. In terms of parking availability (N=274), participants reported an average of 8 parking spaces, with a range from 0 to 60 (!). The importance of the reception area was rated highly by respondents (Mean=1.8, SD=1.25, Likert scale from 1 to 5 (1 - highly important and 5 – not important). 53.8% of the surveyed practices had a separate entrance/exit, for euthanasia, etc. (N=279).

5.2.2.3 Premises in the practice

Figure 21 displays the distribution of the average number premises in the surveyed practices. Concerning treatment rooms (N=279), the majority (44.80%) reported having 2 treatment rooms, followed by one treatment room (23.30%) and 3 treatment rooms (14.70%). Only a small proportion had 4 or more treatment rooms. Regarding X-ray rooms (N=275), 86.18% had one, 10.18% had none, and a few had multiple X-ray rooms. For ultrasonography rooms (N=253), about half had a room for ultrasound, with the remaining respondents lacking their own ultrasound room. The majority of respondents (84.01%) had a dedicated pharmacy room. Waiting rooms (N=278) were common, with most respondents having one. Office space varied depending on the practice size, with a majority having at least one office. Reception areas were prevalent (75.46%), while a small proportion had multiple receptions. Regarding storage rooms

(N=269), most participants had one storage room. The majority (72.04%) did not have separate wards for dogs and cats. Having operating tables (N = 274) was common, with 50% having one table, followed by smaller percentages with more tables. More data is shown in ANNEX VII: Premises Characteristics of surveyed practices.

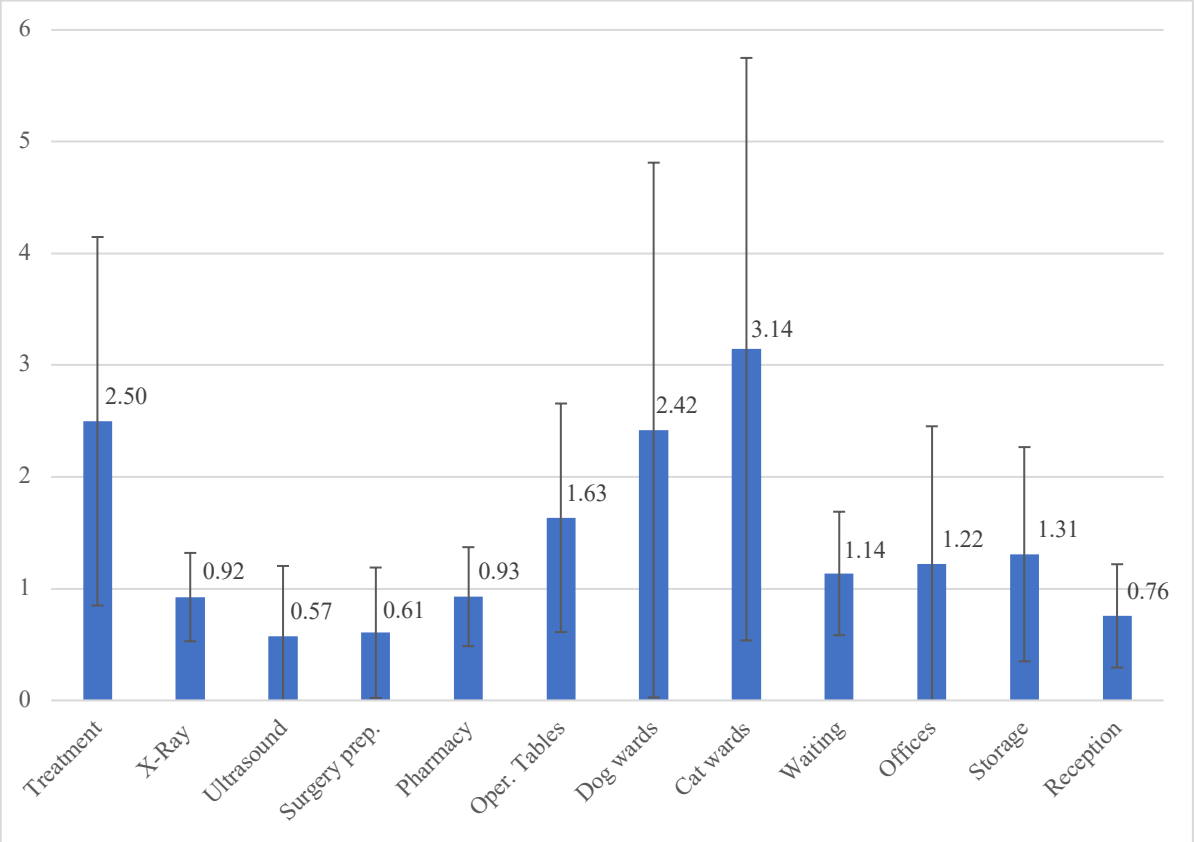

Figure 21. Mean number of premises in surveyed practices (N=279)
Note: Graph shows mean number in columns and Standard Deviation in lines

Figure 22 displays the average numbers of employees per surveyed practice. On average, each participating practice includes one practice owner, along with one to five full-time equivalent veterinarians and two to five full-time equivalent veterinary technicians. Additionally, there is an average of 1.1 interns or trainees and one to two receptionists. Hygiene and maintenance staff members average one to two employees, while other staff, such as accountants, office personnel, apprentices, and paraprofessionals, range from one to three persons. More data is shown in ANNEX VIII: Employee Charcteristics of surveyed practices.

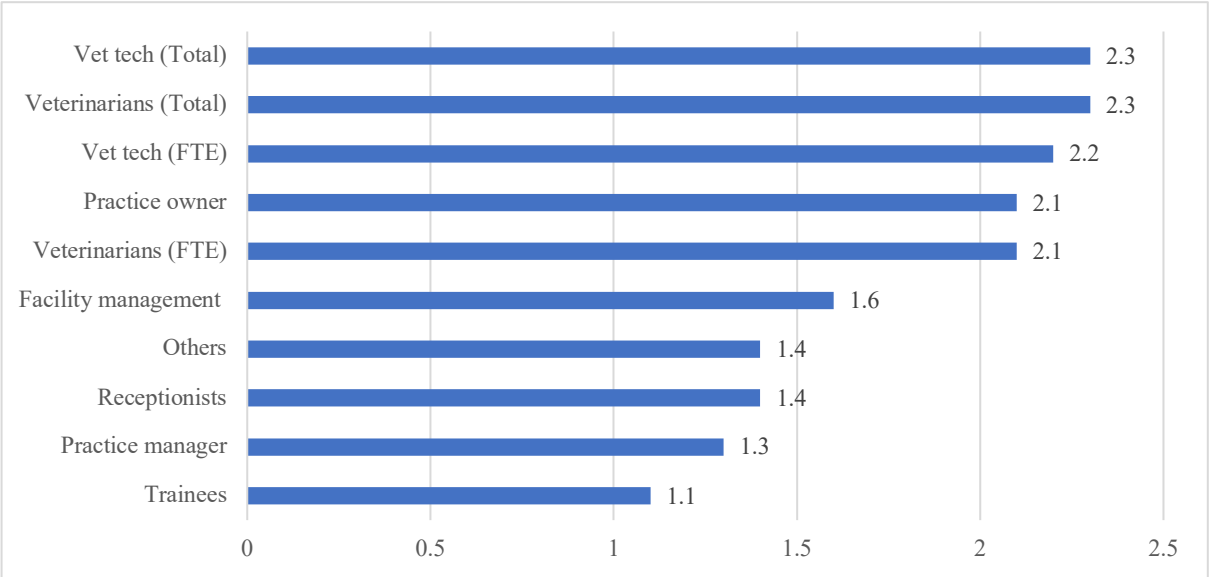

Figure 22. Average number of professionals by surveyed practices (N=275)
Employee number categories: (1: 0; 2:1; 3:2-5; 4:6-10; 5:11-25 employees)

The specialization and number of specialists within the surveyed practices was low. Most frequently, there were no specialists or employees specializing in one field in the practices surveyed. Specializations in the fields of surgery, internal medicine, dentistry or small animal veterinary medicine were the most common specializations. See also ANNEX VIII: Employee characteristics of surveyed practices.

The Average number of employees by surveyed practices is shown in **Figure 23.**

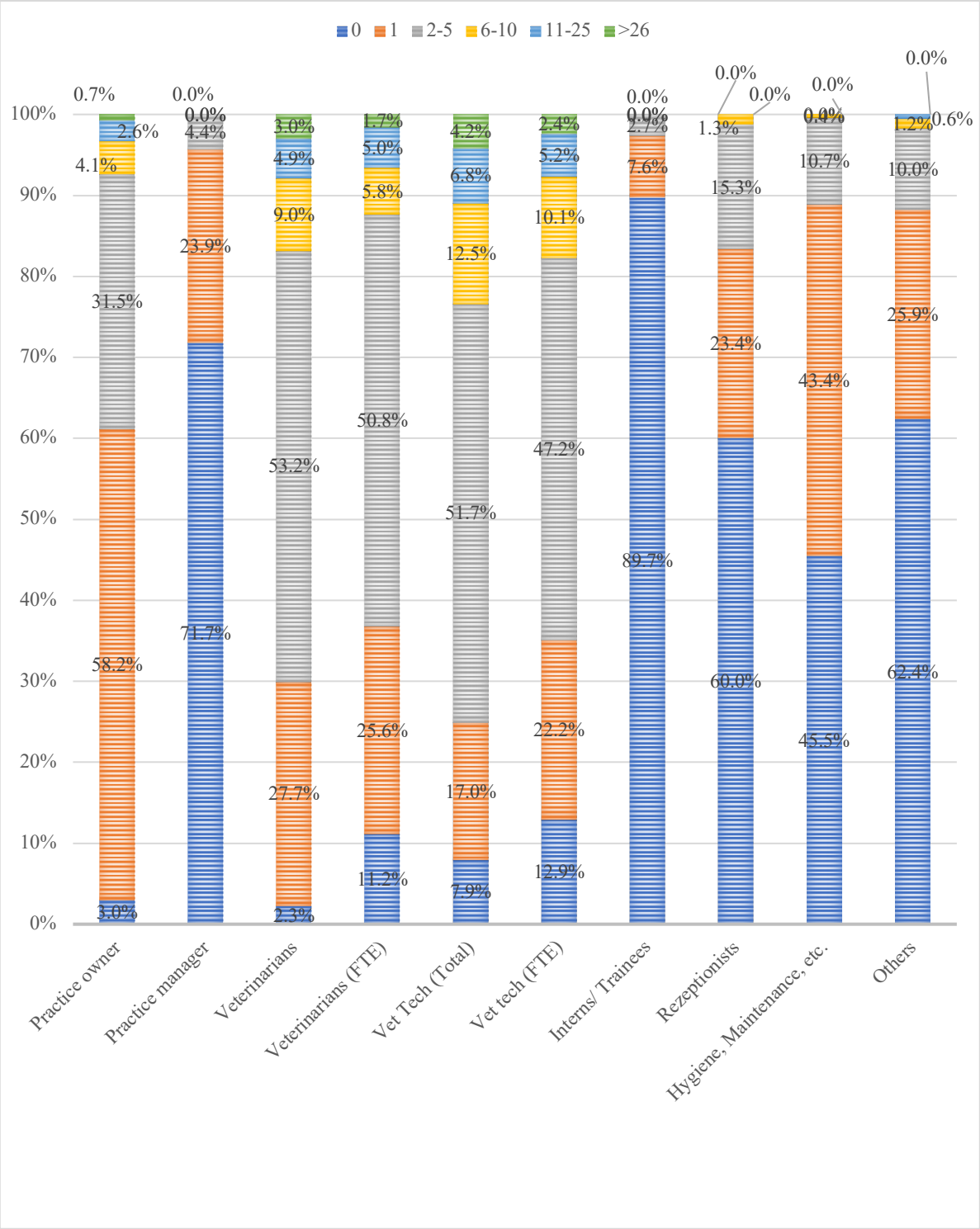

Figure 23. Average number of professionals in the surveyed practices (N=275)

5.2.2.4 Relationship Between Practice Type and Number of Employees

The research question whether the type of practice is decisive for the number of employees was analyzed in **Table 4.** A One-Way ANOVA was conducted to compare the average number of employees across different practice types.

Hypotheses

- H0: There is no effect of practice type on number of employees.
- H4: There is an effect of practice type on number of employees.

A summary of the One-Way ANOVA results appears in the table below:

Table 4. Relationship between Practice Type and Number of Employees (H4)

Practice Type	N	Mean	SD
Mixed practice	64	8.41	±5
Small animal clinic	20	22.05	±5.04
Small animal practice	156	8.04	±3.86
Small animal center	28	14.36	±4.07
Other	10	8.3	±4.57

Note: One Way ANOVA, p-value < 0.001

The p-value (< 0.001) indicates a statistically significant difference in the average number of employees among the various practice types. Small animal clinics employ substantially more staff on average (Mean = 22.05) than other practice types, suggesting practice type is decisive for staffing levels and employment of an practice manager in this study population. There is significant difference in the average employees of mixed practice (Mean: 8.41; SD ± 5), average employees of small animal clinic (Mean: 22.05; SD ± 5.04), average employees of small animal practice (Mean: 14.36; SD ± 4.07), and average employees of other practice (Mean: 8.3; SD ± 4.57) (p-value < 0.001).

5.2.2.5 Opening hours and emergency services

Opening hours play a crucial role in determining the accessibility and availability of veterinary services to pet owners. The analysis revealed that the majority of surveyed veterinary practices maintain typical opening hours of 6-8 hours from Monday to Friday, with Wednesday being an exception. On Wednesdays, most respondents reported having less than 5 hours of regular clinic hours. This observation can be attributed to the traditional practice in Germany, where a high portion of doctors, dentists, and veterinarians do not work Wednesday afternoons. However, it is noteworthy that 33.7% of practices still offer regular opening hours of 6-8 hours on Wednesdays. Interestingly, the survey findings indicate that a significant proportion of practices offer limited office hours, less than 5 hours, on Saturdays. In contrast, the majority (87.1%) do not offer any services on Sundays, reflecting a common trend of reduced clinic hours over the weekend (**Figure 24)**.

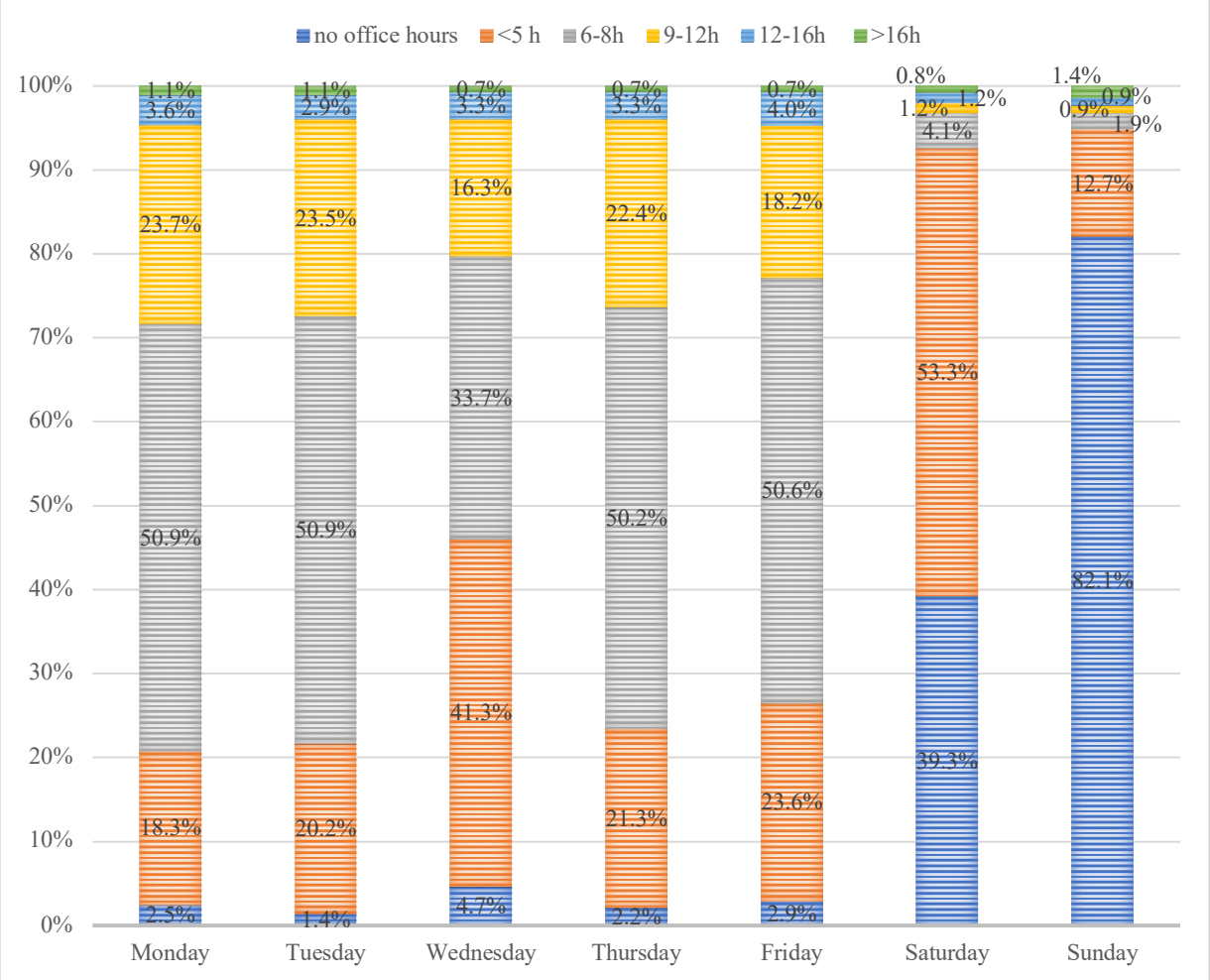

Figure 24. Distribution of the surveyed practices' regular office hours (N=279)

The emergency service times of the surveyed practices were also investigated (N=279). It was evaluated whether emergency services are offered, since most of the respondents do not have a clinic status and therefore do not have to offer emergency services, but are legally obligated to participate in an emergency service on the basis of the professional code of conduct. The results show that the majority of all respondents contribute to an emergency service in some form (**Figure 25)**.

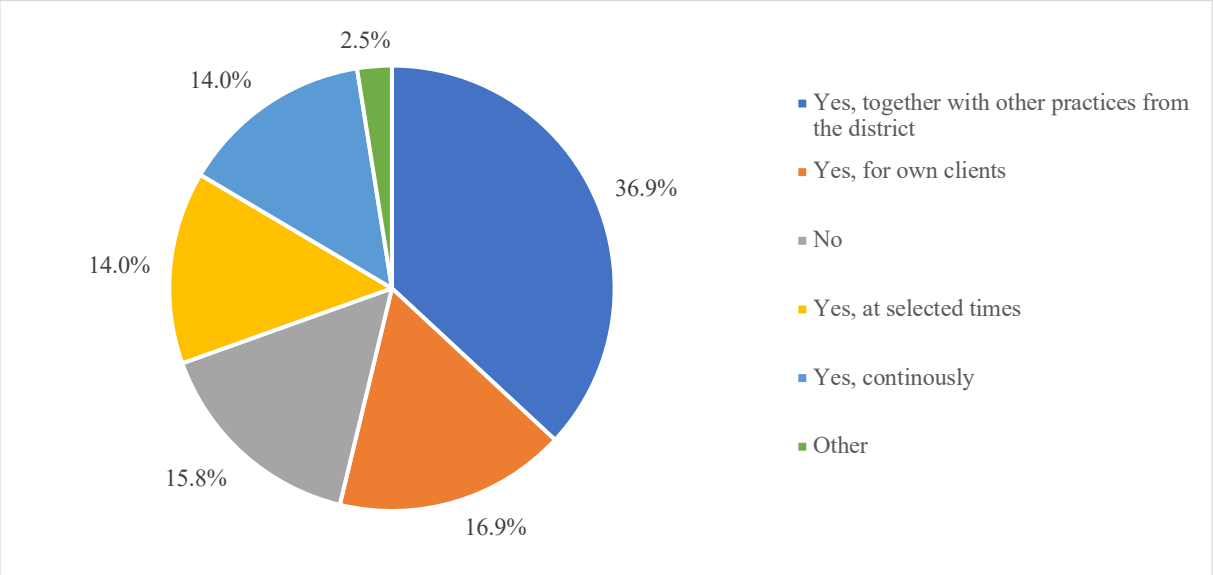

Figure 25. Availability of emergency services in the surveyed practices (N=279)

Within the framework of the survey, the average weekly working hours of the practice owners were analysed. It was expected that due to the nature of being self-employed, the working hours would exceed 40 hours per week on a regular basis. The majority (40.7%) have average weekly working hours of 40-50 hours (**Figure 26)**. Detailed data is shown in ANNEX IX: Opening and Working hours of surveyed practices.

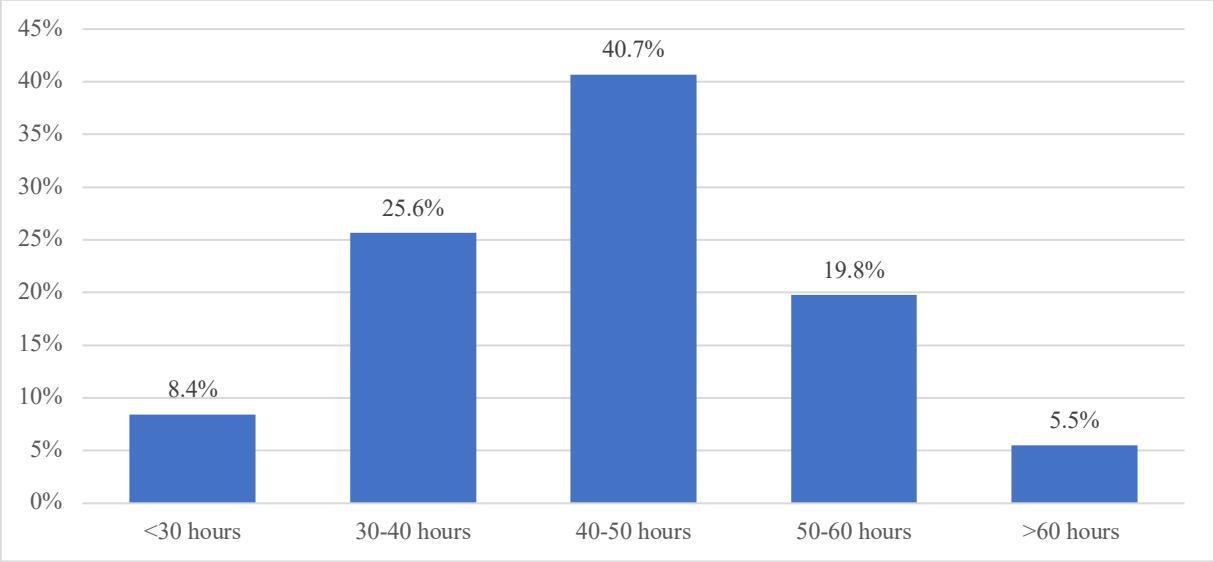

Figure 26. Average weekly working hours of surveyed practice owners (N=273)

5.2.2.6 Software

The participants were surveyed regarding their choice of practice software. **Figure 27** illustrates that a significant proportion of the surveyed practices utilize EasyVet (41.2%), with Vetera being the next most commonly used software (12.2%). Remarkably, a relatively novel internet-based software is already adopted by 4.1% of the respondents. Additionally, the data reveals that a minor percentage of 5.4% do not employ any practice management software and still rely on a traditional file card system. The use of practice software' financial functions (N=221) shows only slightly more than half of participants regularly make use of them (59.7%).

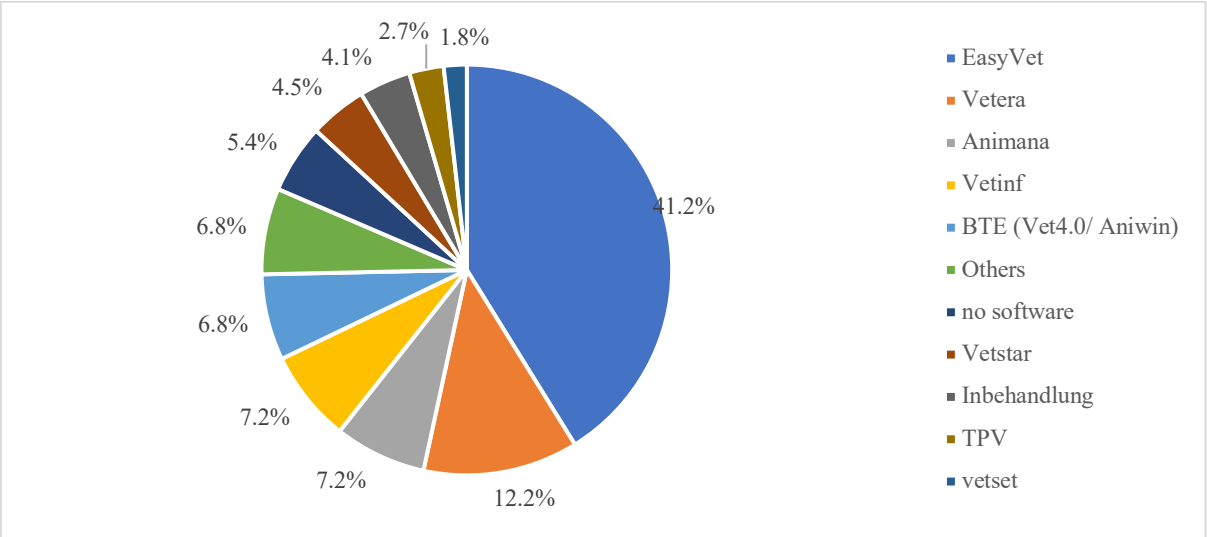

Figure 27. Practice management software used in the surveyed vet practices (N=221)

5.2.2.7 Service profile

Figure 28 indicates that most veterinary practices offer a wide range of services and facilities, including pharmacies (96.4%), feed sales, ultrasound machines, laboratories, X-ray capabilities, and dental procedures. Additionally, there is a notable balance between practices offering hospitalization and mobile care services. Furthermore, a percentage of practices have invested in advanced diagnostic equipment such as CT scanners and magnetic resonance tomographs, primarily associated with high-level practices with high revenue rates. After closer analysis of the other answers section of the remaining 3.7% without a pharmacy, it becomes clear that they solely work on a rehabilitative basis (physiotherapy, osteopathy, acupuncture).

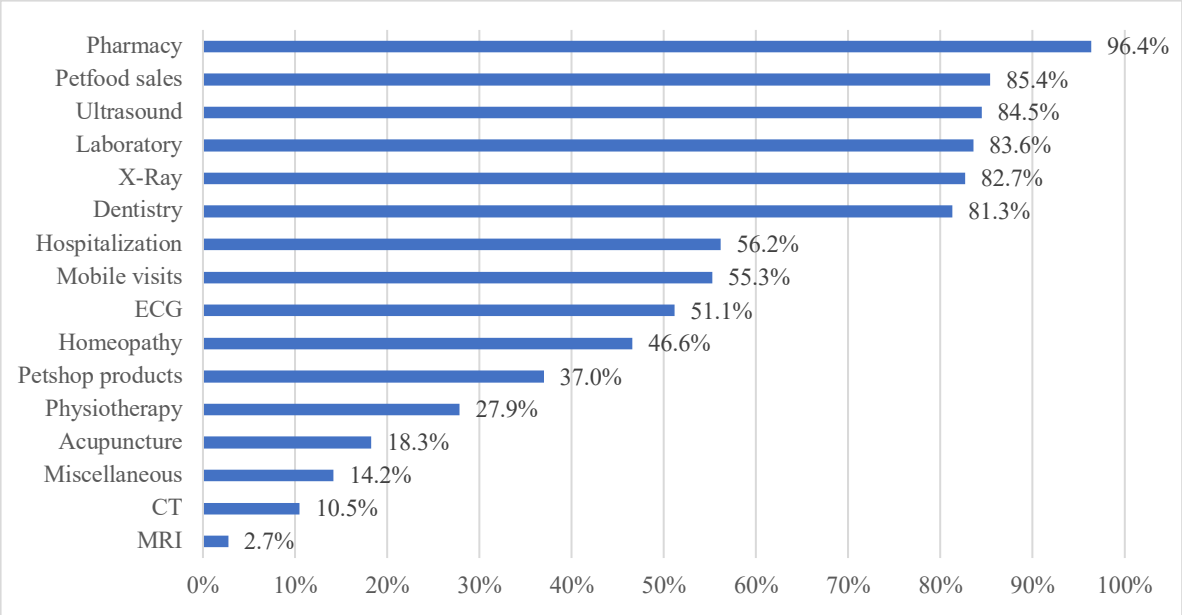

Figure 28. Services provided in the surveyed vet practices (N=219)
Note: the questions were multiple-choice questions that allowed participants to give more than one answer, number of answers exceeds the number of participants.

5.2.3 Business management evaluation

The data of this section is further shown in ANNEX X: Management and Finances Characteristics of surveyed practices.

5.2.3.1 Legal, accounting support

The inquiry into the utilization of external legal and accounting support was also conducted. It was expected that the engagement of external accountants is influenced by the substantial proportion of practices lacking practice managers. The findings indicate that approximately two-thirds of the respondents engage in such practices (66.1%, N = 221). The majority of respondents expressed that they do not necessitate the retention of a lawyer on a continuous basis (87.3%, N = 221).

5.2.3.2 Strategic and operational controlling

Figure 29 illustrates that the majority of respondents prefer to handle most management tasks independently as business owners. Interestingly, only 13.2% of respondents delegate most management tasks to a practice manager, despite a higher percentage of respondents indicating the presence of a practice manager, as revealed in question 23. In Germany and all over the world veterinary technicians play a crucial role in veterinary practice management. They are highly skilled professionals who assist veterinarians in various aspects of animal care, medical procedures, and administrative tasks. In the realm of practice management, veterinary technicians contribute in several ways: e.g. Inventory Management, Human Ressources, Client Communication and clinical support. Therefore in the overall management of a veterinary practice they interact with all different facets of veterinary practice management apart from the final decision making which is done by practice owners.

Moreover, the research question regarding whether the type of practice and the employment of a practice manager depend on the number of employees was investigated. The ANOVA test yielded a *p-value* less than 0.05. This suggests that the type of practice significantly influences the number of employees and the decision to employ a practice manager (H4; Table 4.).

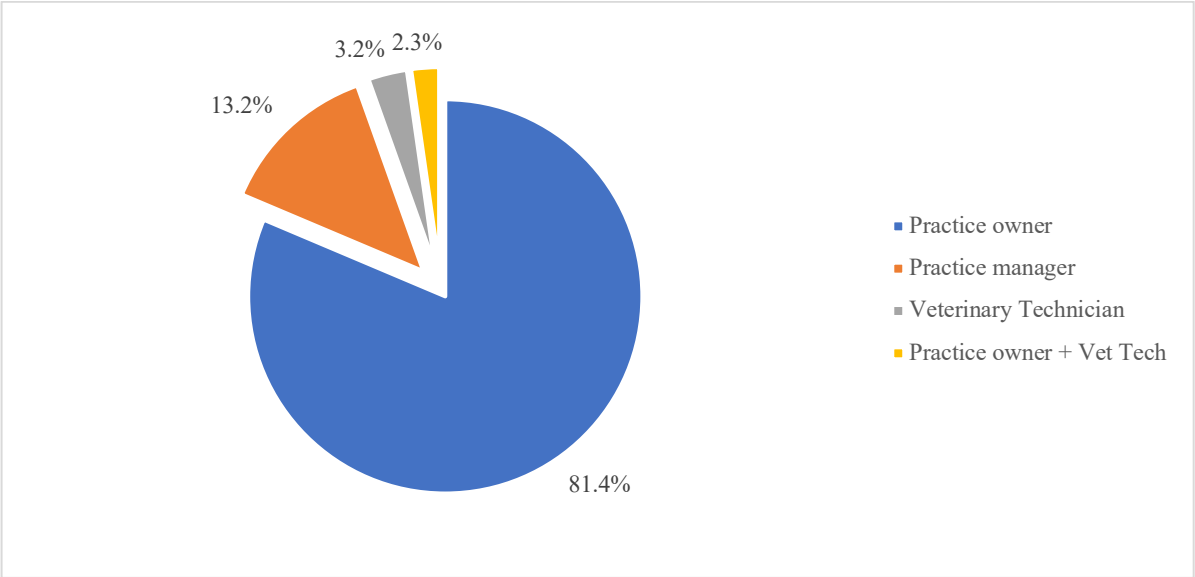

Figure 29. Execution of management tasks in the surveyed vet practices (N=221)

The majority of respondents engaged in monthly overall financial analysis of the practice (55.2%), followed by a surprising 15.8% who conducted it quarterly. The majority of respondents sets operational goals annually (32.6%), followed by 26.2% who do so semi-annually. Surprisingly, a significant proportion (15.8%) never establish operational and strategic goals (**Figure 30)**.

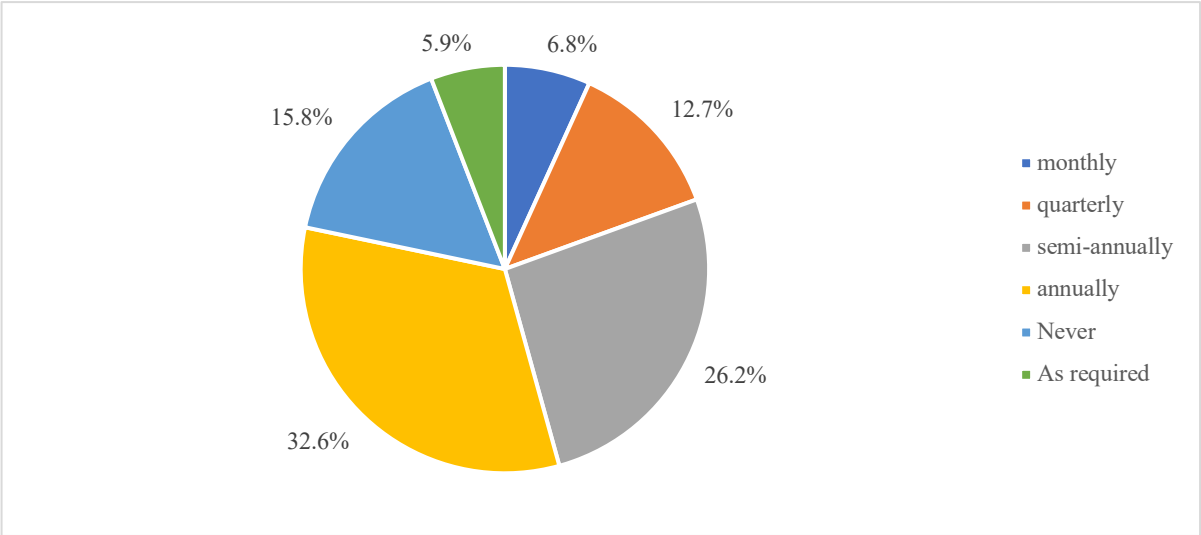

Figure 30. Frequency of operational goal setting in the surveyed vet practices (N=221)

5.2.3.3 Patient revenue

Fee system

In Germany, veterinarians adhere to a governmental fee system known as the GOT (Gebührenordnung für Tierärzte), which categorizes fees for specific services. This fee structure underwent revision and saw the addition of services in November 2022, following a study conducted by the German government to assess the economic conditions of veterinary practices and address the ongoing shortage of veterinarians. Generally, practice owners have the option to select between a 1-fold and 3-fold rate (or factor). In exceptional circumstances, such as emergencies and emergency services, veterinarians may bill their services at a 4-fold rate. Participants were queried about their average GOT factor utilized for services during regular consultation hours, based on the "old" fee system employed before November 2022. Responses ranged from 1-fold to a maximum of 2.8-fold, with an average rate of 1.54 and a standard deviation of 0.36. Notably, the survey did not encompass the average factor for emergency services.

Patient turnover and revenues

In order to be able to make an assessment of the average daily patient flow, the respondents were asked to indicate the average number of patients (dogs, cats, small mammals, other) per day. No further subdivision was made for the answer option “Other”. The results show that more dogs are presented than cats, and only a relatively small proportion of small mammals are presented (**Table 5)**.

Table 5. Average patient visits per day in the surveyed vet practices

Species	**Mean (SD)**
Canine mean (SD)	18.43 (±16.80)
Feline mean (SD)	14.76 (±12.60)
Small Mammals (mean (SD)	4.17 (±3.89)
Other mean (SD)	4.78 (±19.78)

The examination delved into the average number of vaccinations administered, revealing that an average of 26 vaccinations per week were administered (Mean: 25.95; SD ±16.77, N=217). Additionally, to glean insights into the revenue within German the surveyed practices, the average surgical procedures performed were scrutinized. However, it is prudent to interpret the findings with caution due to the significant disparity observed between the number of employees and the size of the practices. **Table 6** illustrates the outcomes, indicating that soft

tissue procedures (7.7 per week) exceed orthopedic and other procedures (1.9 and 4.5, respectively) 7.7, while dental procedures (4.5) surpass orthopedic and other procedures.

Table 6. Average number of weekly surgeries of German practices surveyed (N=221)

Surgeries	Mean (SD)
Soft tissue* (n=214)	7.68 (±8.50)
Orthopedic (n=154)	1.95 (±5.45)
Dental (n=201)	4.50 (±5.68)
Other (n=81)	2.91 (±4.46)

*Note soft tissue – all surgery on soft tissues

The investigation centered on the examination of monthly new customer/client figures, based on a sample of 221 participants. It is noteworthy that a significant majority of respondents (75.6%) do not scrutinize this critical performance metric, with only 24.4% monitoring their monthly new customer growth.

Further questioning included the distribution and amount of revenue. The participants were asked about their net annual revenue. Due to the very high proportion of small scale vet practices, it was assumed that the majority of participants had an annual revenue of up to 250,000€ and up to 500,000€ (**Figure 31)**.

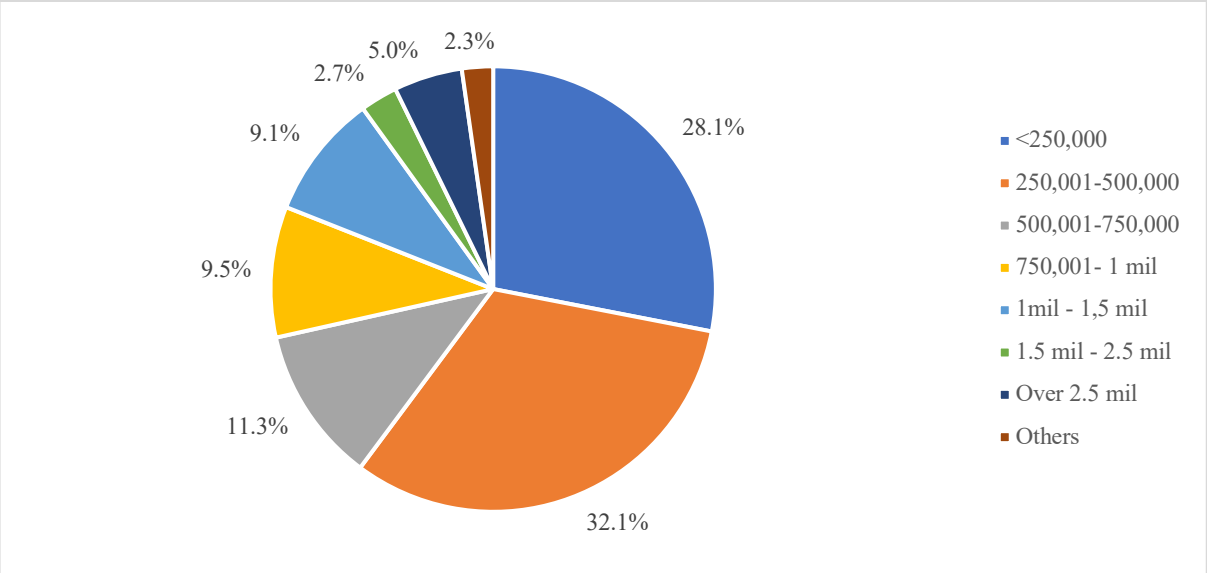

Figure 31. Annual net revenue in the surveyed vet practices (in €) (N=221)

Participants provided insights into the distribution of revenue, indicating that services account for approximately 69.1% (SD ±12.0), while sales constitute about 30.9% (SD ±12.0) of the total revenue (N = 204). To assess the revenue distribution by animal type, participants (N = 221) were queried regarding the share of dog, cat, and small mammal revenue in the annual practice income. Findings revealed that, on average, dogs contribute to over half of the revenue (55.2%; SD ±13.3), followed by cats at approximately 37.7% (SD ±11.6), and small mammals at about 7.1% (SD ± 5.4). This distribution aligns with patient visits, as dogs constitute the majority of clinic visits, thus generating higher revenue per visit compared to cats and other pets.

Data on the lowest and highest average quarterly revenue over the past three years 2018-2021 were gathered to assess the seasonality of veterinary services for small animals in the German market (**Table 7).** Results indicate that the peak revenue occurs from July to September for most practices, followed by October to December, April to June, and January to March. Notably, manual analysis revealed that some respondents reported no discernible differences, while others attributed variations to new practice openings.

Conversely, over half of the respondents (54.8%) reported the lowest average sales from January to March. Fewer respondents cited October to December (11.3%), July to September (10.4%), and April to June (9.5%) as periods of low revenue. Interestingly, a significant number provided individual responses, indicating varied perceptions regarding sales fluctuations, including new practice openings and fluctuations around December/January.

Table 7. Lowest and Highest Averaged Revenue 2018-2021

Months	Lowest	N	Highest	N
January- March	54.75%	122	11.76%	26
April- June	9.50%	23	16.29%	36
July-September	10.41%	23	42.53%	94
October-December	11.31%	25	19.91%	44
Other	14.03%*	31	9.50%*	21
Total		224		221

*No differences, newly established practice, etc.

Results regarding the average revenue per patient visit in the practice are presented in **Figure 32**. For dog patients, the majority (63.0%) generated an average revenue of 51-100€ per visit, with a notable proportion (19.9%) yielding 101-250€. Feline patient revenue varied less, with 47.6% reporting 51-100€ and 39.2% less than 50€ per visit. Small mammal patients generally resulted in revenue below 50€, as reported by 83.6% of participants.

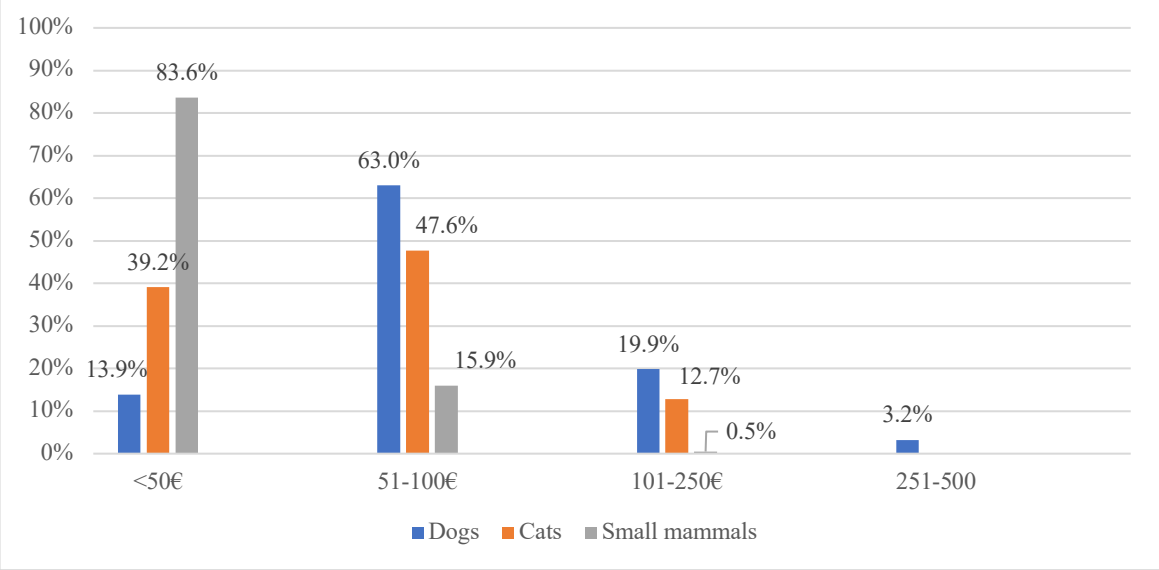

Figure 32. Average revenue per small animal patient in the surveyed vet practices (N=220)

5.2.3.4 Relationship Between Practice Type and Annual Turnover

The research question whether the type of practice is associated with annual turnover was investigated. A Fisher's Exact Test was employed to examine the relationship between two categorical variables: practice type and annual turnover. Fisher's Exact Test was chosen due to low expected frequencies in some cells.

Hypotheses

- H0: Turnover is independent of the type of practice.
- H5: There is a significant association between practice type and turnover.

The results of Fisher's Exact Test (*$p>0.05$*; **Table 8**) suggest that there is no statistically significant association between the revenue and the type of practice. This implies that variations in revenue are not dependent on the type of practice. In other words, the type of practice does not appear to influence the financial performance, as measured by revenue, in a significant manner.

Table 8. Association between practice type and annual revenue (H5)

Annual Revenue	**Mixed practice N (%)**	**Small animal clinic N (%)**	**Small animal practice N (%)**	**Small animal center N (%)**	**Other N (%)**
<250,000	12 (25.5)	1 (6.7)	38 (32.2)	5 (23.8)	3 (37.5)
250,000-500,000	14 (29.8)	3 (20.0)	38 (32.2)	7 (33.3)	4 (50.0)
500,001-750,000	5 (10.6)	2 (13.3)	14 (11.9)	2 (9.5)	1 (12.5)
750,001- 1 million	3 (6.4)	2 (13.3)	13 (11.0)	2 (9.5)	0 (0.0)
1 million – 1.5 million	6 (12.8)	2 (13.3)	8 (6.8)	2 (9.5)	0 (0.0)
1.5 million – 2.5 million	2 (4.3)	3 (20.0)	1 (0.8)	0 (0.0)	0 (0.0)
Over 2.5 million	4 (8.5)	2 (13.3)	2 (1.7)	3 (14.3)	0 (0.0)
Other	1 (2.1)	0 (0.0)	4 (3.4)	0 (0.0)	0 (0.0)
Total N	***64***	***20***	***156***	***28***	***10***

Note: Fisher exact test; *$p = 0.086$*

5.2.3.5 Number of employees, Equipment or Legal form Predictors of High turnover (>1 million €)

The research question which factors (number of employees, equipment level, and legal form) decisively influence a practice's likelihood of high turnover was investigated. A Logistic Regression was performed with a binary dependent variable "High Turnover" (>1 million) vs. "Low Turnover" (≤1 million).

Hypotheses

- H0: Number of employees, equipment, and legal form are not decisive for high turnover.
- H6: Number of employees, equipment, and legal form are decisive for high turnover.

The results show that the number of employees significantly affects the revenue, with a p-value less than 0.05 (**Table 9)**. This analysis did not differentiate between veterinarian, veterinary technician employees and other staff. Further investigations could explore these distinctions.

Table 9. Factors determining practice revenue >1 million €/year (H6)

High Revenue (>1 million€)				
Predictors	Odds Ratios	std. Error	Statistic	*p*
Number of Employees	0.92315	0.02876	-2.56698	***0.01****
Legal Form (AG - Aktiengesellschaft as reference)				
Sole Proprietorship	0.000	0.00311	-0.00897	0.993
Civil Law Partnership (GbR)	0.000	0.00095	-0.00979	0.992
Limited Partnership with a Limited Liability Company as General Partner (GmbH & Co. KG)	0.000	0.0000	-0.01501	0.988
Limited Liability Company (GmbH)	0.000	0.00013	-0.01113	0.991
Practice Equipment	1.61161	0.64907	1.18496	0.236

Note: $p < 0.05$

Logistic regression results confirm the number of employees as the sole determinant of revenue. The number of employees plays a crucial role in determining practice revenue. The negative effect observed implies that an increase in the number of employees is linked to higher odds of falling into the category of high revenue compared to low revenue. This suggests that practices with more extensive staffing may experience greater revenue generation, possibly due to increased capacity to handle client volume or to offer a wider range of services.

5.2.3.6 Change of revenues

This section examined the impact of the COVID-19 pandemic on the revenue of small animal practices. A significant majority of practices (92.8%) reported an increase in revenue since the pandemic's onset in 2020, averaging 10.7% (SD±7.66). Changes in patient revenue over recent years were also assessed, and 83.6% of the surveyed practices reported an increase. Furthermore, respondents noted an increase of 87.3% in revenue per patient. Additionally, most respondents anticipate increase in revenues in the future for dogs, cats and other pets (**Table 10)**.

Table 10. Expected patient revenue for 2022-2024 in the surveyed vet practices

Animals	Increase	Consistent	Decrease	Total
Canine	83.87%	14.75%	1.38%	217
Feline	86.57%	12.50%	0.93%	216
Small Pets	77.93%	20.66%	1.41%	213

The majority of practice owners (82.8%) planned to increase service prices within the next years (2022-2024), indicating a proactive response to potential economic shifts. This inclination suggests a strategic approach to maintaining profitability and adapting to changing market conditions. Conversely, a notable minority (6.3%) expressed no intention to raise prices, possibly reflecting concerns about client retention or market competitiveness.

Regarding investment priorities for practice development, respondents demonstrated a preference for tangible assets (medical equipment and tools) and service enhancements over management and marketing initiatives. Investment in practice equipment (63.8%), special or supplementary services (63.4%), and training (62.0%) emerged as the top choices, underscoring a commitment to enhancing service quality and expanding service profile. This strategic focus aligns with industry reports highlighting personnel, equipment, and material supplies as major cost drivers in the Germany small animal practices. However, the relatively lower prioritization of management and marketing investments (26.7% and 26.2%, respectively) suggests a potential area for improvement in strategic planning and business development. Additionally, diverse suggestions from respondents regarding alternative investments, such as change in practice location/premises and client-focused communication trainings, would highlight a range of perspectives on practice management and development strategies (**Figure 33)**.

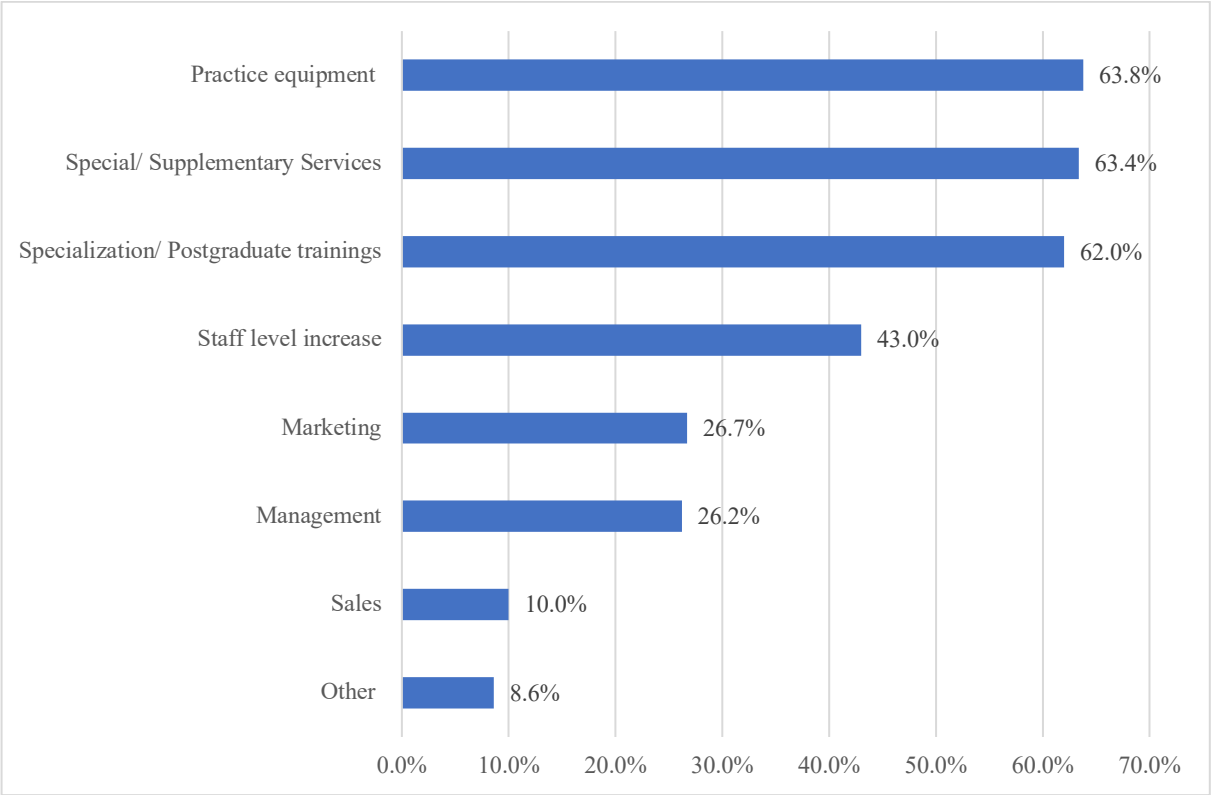

Figure 33. Investment plans to develop the practice in the surveyed vet practices (N=220)
Note: the questions were multiple-choice questions that allowed participants to give more than one answer, number of answers exceeds the number of participants.

Further analysis focused on evaluating perspectives on revenue enhancement using a Likert scale from 1 to five, where 1 = strongly agree and 5= strongly disagree (N=217). Respondents moderately acknowledged the potential for increased practice revenue through enhanced management practices (2.24). Similarly, participants viewed marketing initiatives fairly favorably as contributors to enhanced revenue, with a mean score of 2.46 (N=217).

Furthermore, participants showed a moderate level of agreement or neutrality regarding the criticality of active investment in marketing endeavors for attracting new clients in the future, as indicated by an average score of 2.67.

5.2.3.7 Marketing in the German vet practices

The study found that 90.9% of participants considered the first visit to be the most crucial, highlighting its significance in veterinary practice. Regarding marketing tools, the most commonly utilized ones were websites, vaccination reminders, Google My Business, and Facebook. Notably, these tools were predominantly managed by the practice staff (**Figure 34**).

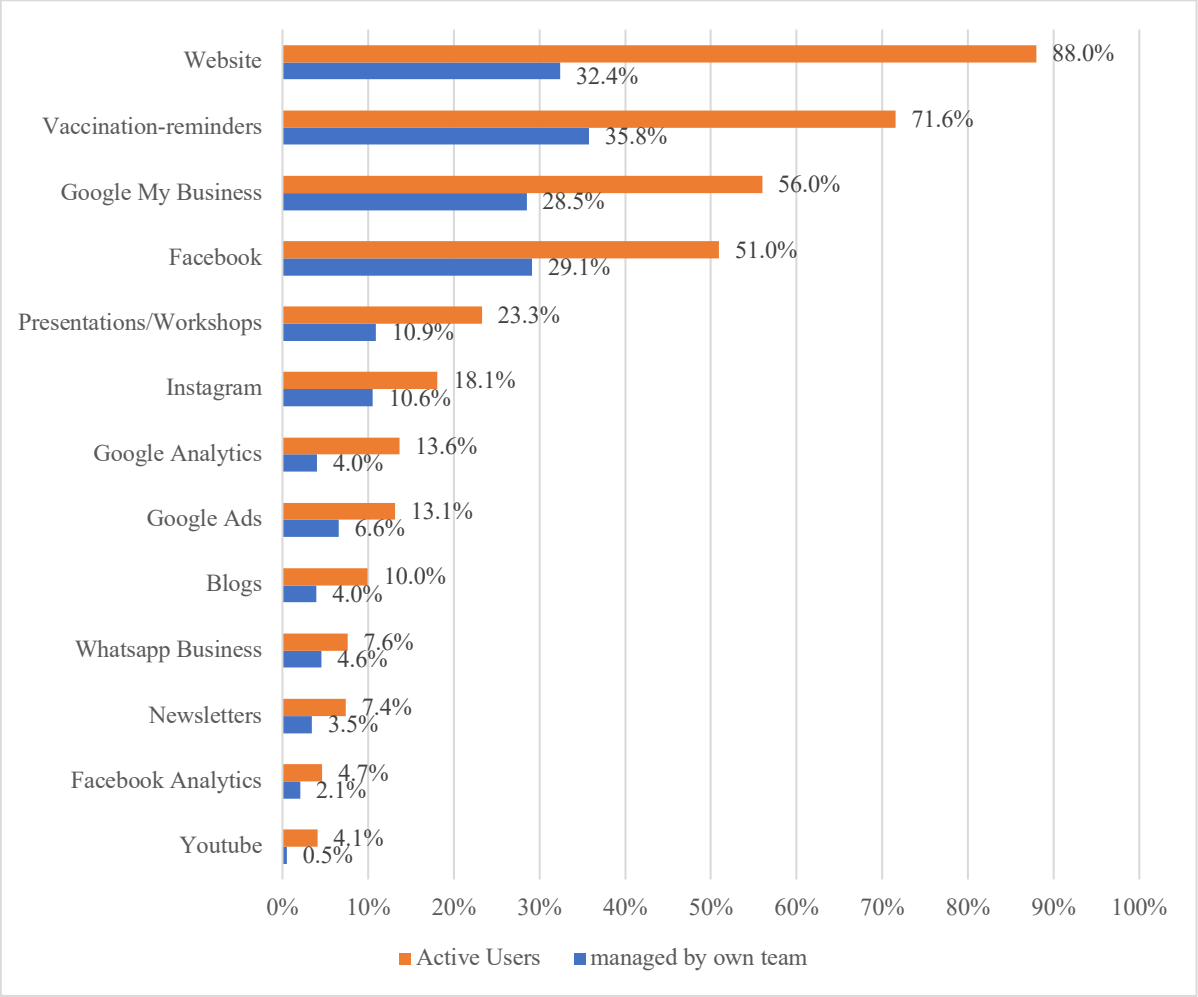

Figure 34. Marketing instruments used by surveyed practices (N=219)
Note: the questions were multiple-choice questions that allowed participants to give more than one answer, number of answers exceeds the number of participants.

Furthermore, the study explored additional marketing tactics implemented by surveyed practices. Partnerships with other businesses were a common strategy, with pharmaceutical companies being the most prevalent partners (67.6%). Animal welfare organizations, animal physiotherapists, osteopaths, and feed manufacturers also featured prominently among respondents' partnerships.

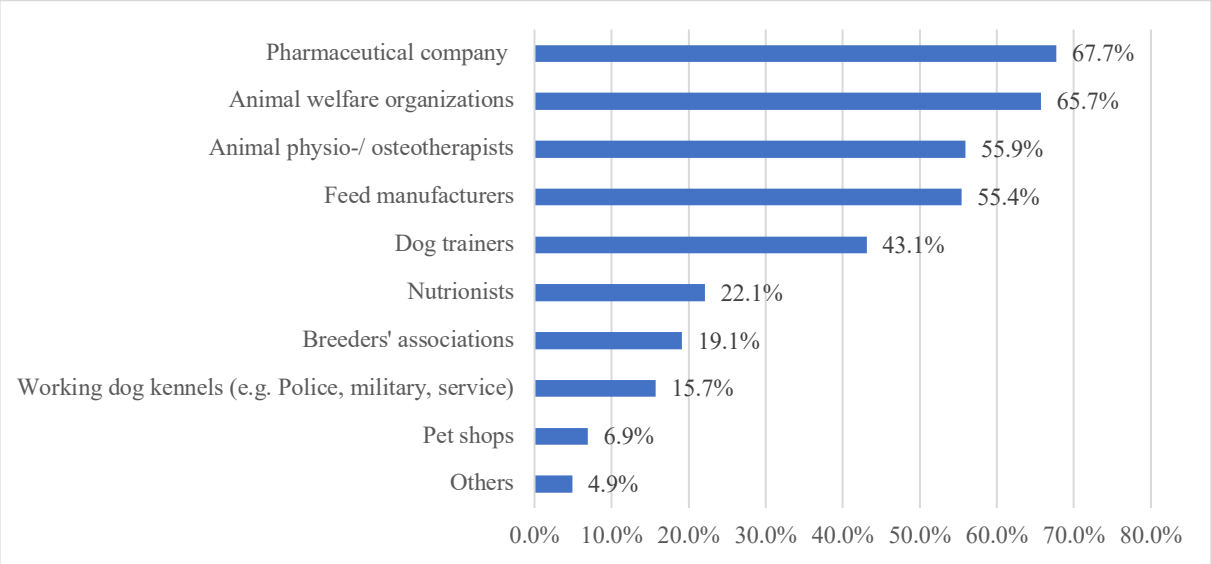

Figure 35. Collaborations of the surveyed vet practices (N=204)
Note: the questions were multiple-choice questions that allowed participants to give more than one answer, number of answers exceeds the number of participants.

In the final part of the section, participants expressed their views on various marketing-related issues and future trends in veterinary practice, using a Likert scale ranging from 1 to 5 where 1 = strongly agree and 5 = strongly disagree).

The findings revealed a unanimous agreement among participants regarding the importance of educating consumers in a professional manner, with an average rating of 1.31. This indicates the recognition of the role of client education in promoting pet health and compliance with treatment plans. However, there was a more neutral stance toward the significance of the practice's location, with an average rating of 2.6. This suggests a general sense of assurance among practitioners in their ability to meet the needs of their clients regardless of geographical considerations. Respondents perceived the impact of competitors on veterinary service sales as relatively insignificant, with an average rating of 3.42. The result reflects a level of confidence among participants in their ability to attract and retain clients in a competitive market.

The responding vets generally expressed confidence and competence in delivering their services, with an average rating of 1.6, highlighting the value placed on teamwork and shared

knowledge within the veterinary community. The recognition of effective communication with customers as crucial underscores the role of client communication skills in fostering trust and satisfaction, ultimately contributing to client retention and practice success. Regarding cooperation and collegiality, participants agreed that they have a professional exchange with their colleagues, with an average rating of 2.06. Communication with customers was deemed crucial, with an average rating of 1.31, reflecting the importance of effective client communication in practice management. Respondents also recognized the importance of adequately informing customers about examination and treatment costs, with an average rating of 1.71. Therefore, veterinary practitioners acknowledges the importance of transparent communication regarding examination and treatment costs, indicating a commitment to ethical and open financial interactions with clients. Moreover, they agreed on the importance of dedicating sufficient time to thoroughly examine each patient and to provide appropriate advice to the owner, with an average rating of 1.96. This indicates a commitment to providing high-quality care and personalized attention, essential elements in building strong client relationships and ensuring optimal patient outcomes. The findings on this section are shown in ANNEX XI: Customer Experience & Marketing Characteristics of surveyed practices

5.2.3.8 Effect of number of staff on the use of marketing tools

The research question does a higher number of staff relate to increased usage of marketing tools, potentially managed by in-house teams was analysed. Multiple One-Way ANOVA tests were performed to examine how the mean number of employees varied across different categories of marketing tool usage (e.g., having no marketing tool vs. using it vs. using it with an in-house team).

Hypotheses

- H0: There is no effect of the number of staff on the use of marketing tools.
- H7: There is an effect of the number of staff on the use of marketing tools.

The analysis revealed that Facebook was the only tool significantly influenced by the number of employees, albeit the number of users was limited ($p = 0.008$).

5.2.3.9 Effect of age on views regarding future marketing instruments

The research question does age influence respondents' views on future marketing instruments (e.g., telemedicine)? Though labeled "ANOVA" in the heading, a Kruskal-Wallis Test was conducted (as shown in Table 11) to compare the mean ranks of respondents' views across age categories.

Hypotheses

- H0: There is no effect of age on views regarding future/marketing instruments.
- H8: There is an effect of age on views regarding future/marketing instruments.

Table 11. Age groups and view on future marketing or telemedicine tools (H8)

Age groups	*N*	*Mean (Likert)*	*SD*
25 to 34	19	2.58	±1.08
35 to 44	61	2.91	±1.22
45 to 54	99	2.55	±1.24
55 to 64	101	2.62	±1.24
65 to 74	18	2.46	±0.88

Note: Likert scale (1: strongly agree; 5: 5:strongly disagree); (Kruskal Wallis Test; *p=0.569*)

With a p-value of 0.569, the test indicates no significant difference across age groups in their views on future marketing instruments. Hence, age does not significantly influence how respondents perceive these instruments.

5.2.3.10 Impact of veterinarians' age on choosing marketing tools

The research question do older colleagues use fewer marketing tools than younger colleagues was analyzed. A One-Way ANOVA compared the mean number of marketing tools used across multiple age categories (Table 12).

Hypotheses

- H0: There is no effect of age on the number of marketing tools chosen.
- H9: There is an effect of age on the number of marketing tools chosen.

Table 12. Impact of veterinarians' age on choosing marketing tools (H9)

Levels	*N*	*Mean*	*SD*
25 to 34	19	1.84	±2.03
35 to 44	61	2.75	±2.72
45 to 54	99	2.57	±2.37
55 to 64	101	2.57	±2.47
65 to 74	18	2.17	±1.92

Note: Likert scale (1: strongly agree; 5:strongly disagree); (One-Way ANOVA; *p=0.649*)

As p = 0.649, there is no statistically significant difference among age groups in the average number of marketing tools used, indicating older colleagues do not differ substantially from younger ones in this respect.

5.2.4 Future and trends

A substantial majority of respondents (94.0%) expressed belief in an increased demand for specialized veterinarians, while only a small fraction (6.0%) held the opposite view (N=204). The overwhelmingly positive outlook suggests a recognition among respondents of evolving needs within the veterinary field, likely driven by advancements in specialized treatments and technologies. The majority of the respondents (76.5%) foresaw an increase in the number of employed veterinarians (N=217). The expectation of a rising number of employed veterinarians reflects a perception of growth and expansion within veterinary practices and clinics, potentially fueled by increased demand for veterinary services. The survey participants exhibited a neutral opinion on the potential role of telemedicine and telemedical services in shaping the future of the veterinary profession (mean score: 2.64 on a Likert scale from 1 to 5, where 1 = strongly agree, 5 = strongly disagree).

The survey revealed that a significant proportion of veterinarians (70.1%) called for greater political influence and support for the development of the veterinary profession, followed by calls for structural reforms in veterinary education (e.g., student intake, admission criteria) (65.0%), and integration of economics into the curriculum (64.2%) (**Figure 36**). The findings on this section are also shown in ANNEX XII: Perspective on future trends of surveyed practices.

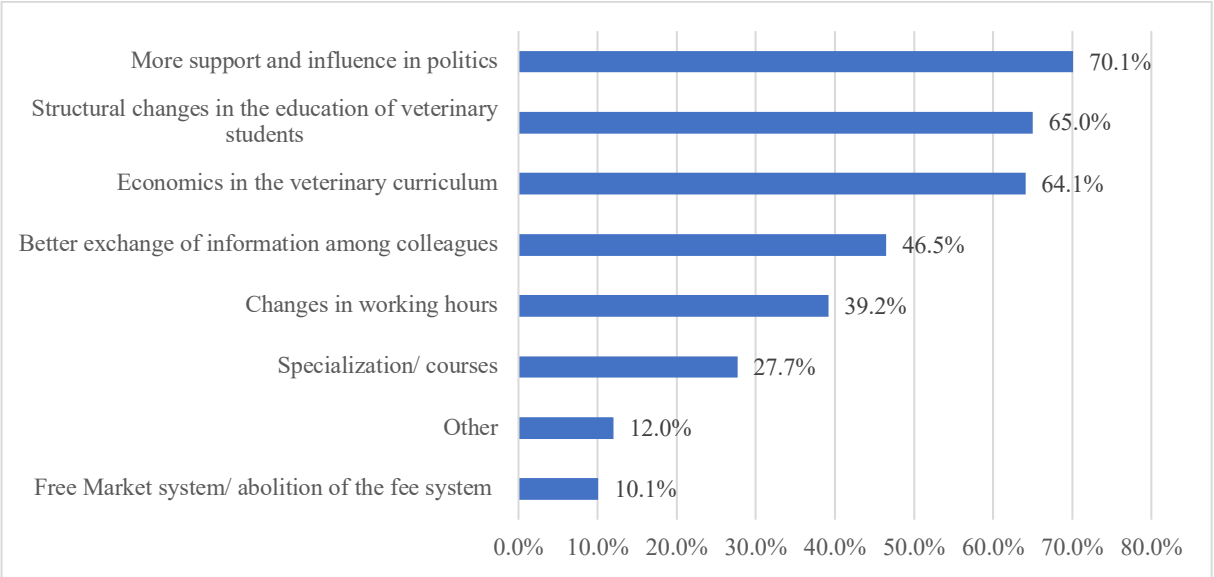

Figure 36. The vets' opinion on the development for the vet profession (N=217)

6 DISCUSSION

6.1 Digitalization

In contemporary society, digitalization is pervasive, extending its influence into every sphere, including medicine. However, the adoption of digital technologies within veterinary medicine has been relatively slower compared to other medical fields. While there has been notable progress in telemedicine among veterinarians, its application in direct vet-to-patient interactions lags behind human medicine. A critical aspect often overlooked in existing literature is the distinctive role of veterinarians as service providers to the owners rather than the patients themselves. Hence, understanding client perceptions and acceptance of veterinary telemedicine is crucial, aligning service provision with client expectations (Diez et al., 2023).

The aim of the study was to assess the general perception of veterinary telemedicine among clients and to identify common problems that can be addressed with digital solutions. The result of the survey showed that the primary reason for declining online consultations by pet owners was perceived limitations in treatment options rather than technological issues. The most common reason identified for customers declining online consultations was insufficient treatment possibilities. Technological problems were not seen as such substantial issues as the literature would suggest (Drewry et al., 2019). Data security was for example not seen as a big problem (5.0%) by this study group.

Previous studies also implied that in general customers are willing to pay for telemedical services (Widmar et al., 2020), which is somewhat supported by the fact that people partaking in this questionnaire are overall likely to use online consultations. It is therefore feasible to argue that an increased supply of, e.g., teleconsultations can be a source of additional income for veterinarians, alongside established benefits for patient healthcare such as less stress for owner and animal. As Bragg et al. (2015) established, there are measurable differences in physiological values of patients due to in-house physical examinations. This study also found that aggressive and nervous behaviour of patients, likely due to stress during visits, was a problem for more than half of animal owners.

The results of this study also showed that while many pet owners expressed interest in engaging with telemedicine consultations and viewed them as valuable assets to veterinary institutions, only a small fraction (11.1%) had actually utilized online consultations with a veterinarian. The reasons behind this low uptake remain uncertain based solely on the survey data collected. Further investigation into these inconsistencies is recommended. Nonetheless, the survey data indicates that, in general, pet owners are open to utilizing telemedical services if provided. This suggests that veterinary institutions could benefit financially and professionally by prioritizing

telemedicine initiatives, which conclusion is supported by other studies (Voyer & Jordan, 2018). Additionally, implementing online scheduling for routine services is advisable. Survey participants expressed a preference for booking appointments online for basic procedures such as vaccinations, general check-ups, follow-ups, post-operative care, and specialized diagnostics (Narakhanti Soenardi & Maxim Bembinov, 2022; Smiley, 2022). This approach might be cost-effective, might save time, therefore allows for more efficient allocation of workforce resources.

6.2 Practice Management

The aim of our study was to examine the main structural characteristics of the management and marketing of pet practices and clinics in Germany. The sample size of the survey (N=301) is in line with several studies conducted by bpt in German practices (Ripper, 2020b, 2020d) and in other countries (Balaban & Güneş, 2021). Another study in Germany reported a significantly larger number of participants (n=1250) (Strecker et al., 2021). The discussion can be divided into separate themes similar to the evaluation: socio-demographic characteristics of the participating veterinarians, their further education and training competencies with special regard to the economic education, the size, and the structural, financial and marketing management characteristics of the surveyed veterinary practices.

6.2.1 Socio-demographic characteristics of the vets

The examination of sociodemographic characteristics, particularly age and gender, among veterinary professionals provides significant insights into the demographic composition of the workforce and its possible implications for the future development of the profession. The age of the vast majority of the survey participants (45-54/55-64 years) is in line with the data provided by BTK for the veterinary population (BTK e.V., 2021). The results from older age groups among practice owners emphasizes the need for succession planning and the development of strategies to facilitate the transfer of practices to younger generations, as explored and recommended by several publications in Germany (Hübner, 2017; Ripper, 2022) and worldwide (Catanzaro, 2006; Dijkman, 2007; Li et al., 2024; Richardson & Osborne, 2006; Stowe, 1998). Additionally, the existing gender inequality in the veterinary profession, marked by a greater representation of women across all age groups, is prompting essential research into gender equality and inclusion. Emerging findings highlight the subtle motivations that drive individuals to choose a career in veterinary medicine. Although both female and male genders show a strong affinity for caring for animals, there are noticeable differences in the ranking of motives, with women often citing emotional ties to animals and men leaning towards altruistic reasons (Horváth et al, 2021; Knights & Clarke, 2019). In addition, the influence of material

considerations on career choice varies across generations, with younger people placing less emphasis on income and placing greater value on intrinsic motives (Rucker, 2002; Stowe, 1998). Understanding these complexities is key to developing targeted interventions to promote gender diversity and equality within the profession.

6.2.2 Further Education and Training

The examination of veterinarians' preferences for continuing education sources and the distribution of further training disciplines provides valuable insights into professional development trends within the field. The continued reliance on conventional sources such as journals, coupled with high participation rates in surgery and internal medicine training, underscores the enduring demand for core clinical competencies, as evidenced in prior research (Cake et al., 2016; Canfield & Krockenberger, 2002; Carr et al., 2022). However, the observed limited engagement with certain specialties such as neurology and anesthesia in small practices may indicate areas warranting targeted educational initiatives to address emerging clinical needs and enhance service provision.

The relatively low percentage of management or leadership training among participants aligns with surveys made by FVE and other relevant bodies, indicating a general lack of business and management skills among veterinarians (FVE, 2023). This underscores the pressing need for enhanced business education within veterinary training programs. Research advocates for strategies aimed at integrating business education into veterinary curricula, with a particular emphasis on fostering inclusivity among hospital staff to effectively deliver such training to the next generation of veterinarians (Hess-Holden et al., 2019b; Jackson & Hauser, 2016b). The growing body of evidence highlighting the importance of business competencies within veterinary education, coupled with the intensifying competition in both the veterinary and non-veterinary services markets, underscores the urgency for reforms in the approach to teaching business skills to future practitioners (Cake et al., 2016; Hess-Holden et al., 2019; Ilgen, 2002; Jackson & Hauser, 2016).

6.2.3 Economic education of veterinarians

In many countries veterinary chambers and associations as well as practicing veterinarians and researchers identified the need for greater incorporation of business skills in the veterinary curriculum. In Europe 80% of the responding veterinarians thought they needed more business training to meet the veterinary market challenges (FVE, 2019). The present situation of the veterinary curriculum depicts the cause of the problem. The German and many international veterinary curriculum lacks substantial business teaching. For example, there is no economics course in the German veterinary curriculum. Looking at other nations, the Dutch curriculum includes obligatory communication course, and the Hungarian curriculum includes mandatory economics (veterinary practice management, and animal health economics) and communication course (10th semester) (UVMB, 2023). The BTK and the German Association of Practising Veterinarians (BPT) have advocated for a stronger economic education for the veterinary students. Scheduled since the spring semester of 2018, an elective course, "Business Administration for Veterinarians," has been offered as a pilot study at the Veterinary University in Hannover. The results of the entrance and exit test show a very positive development of the students so the course was rescheduled for 2019 (TiHo Hannover, 2019). The other universities also showed interest in developing an elective-based course for students. According to the managing director of the BPT, similarly structured studies will show how the learning content can be taught better in order to decide whether the course will be included in the curriculum or whether it will continue to be an elective (Färber, 2019). Similarly, electives concerning communication, practice management and other management related topics in veterinary medicine have been established in other European veterinary universities as well, e.g. at UVMB in Hungary (UVMB, 2024).

During the beginning of the COVID-19 pandemic, E-learning-based webinars have increased substantially (Diez et al., 2023). These webinars, however, mainly deal with clinically related topics, neglecting marketing, management and communication. The veterinary industry, especially the pharmaceutical industry, now offers many webinars free of charge. Whereas other independent webinar platforms mostly have a participation fee. These webinars offer opportunities to develop of the profession. For example, the rise in podcast shows addressing these “hot” topics (DeWilde, 2024). The BPT has already previously shown an interest in the further economics training of veterinarians within the framework of its "bpt-Praxismanager" programme, which trains senior veterinarians in management (bpt, 2023). A new pilot project of the Neu-Ulm University of Applied Sciences (HNU) and the BPT gives reason for optimism. The part-time course "Management in Veterinary Practice" is scheduled for 2 semesters and is

an online based course using Zoom and Moodle as teaching material. The first results showed positive evaluations of the learned course material (HNU, 2021). The University of Veterinary Medicine in Budapest has been offering similar 1-2 days postgraduate trainings in practice management and economics and a 2-semester veterinary expert postgraduate programs in practice management and economics since 2017 (UVMB, 2017).

Cake et al. (2016) suggested that the downside of successfully integrating business skills into the veterinary curriculum will involve students learning business principles in non-traditional way with materials correlating with clinical teaching. This will mean a significant shift from the conventional classroom-based transfer of business lectures to an integrated program. Further research recommends measures to increase hospital staff's inclusion into successfully delivering business education to the next generation of veterinarians (FVE, 2023). The evidence regarding the importance of business within the veterinary teaching curriculum, united with increasing competition in the market for veterinary services as well as non-veterinary services suggests that changes in the approach to teaching business may be the best solution for future practitioners (Cake et al., 2016; Hess-Holden et al., 2019a; Ilgen, 2002; Jackson & Hauser, 2016a).

Several American veterinary universities established elective courses and double degree programs like a DVM/MBA degree to encourage the teaching of business skills actively. (Kogan et al., 2004, 2005). But only small numbers of students are enrolled in such programs and courses throughout the world. As a result, universities and corporations are carrying out specific courses for interested students (Cima, 2014; Kogan et al., 2005). Another approach taken in the US was a summer seminar for final-year veterinary students to help them prepare for their first job in practice. One of the challenges conducted made a hypothetical veterinary clinic profitable. They needed to figure out two fundamental business considerations by finding the gross margin and working out the break-even point. They identified how a 10 per cent rise in prices can double the profit while a 5 per cent discount given across the board can halve it (VetRecord, 2013). Another exciting program and study where measurement of leadership skills development among veterinary students and veterinary professionals participating in an experiential leadership program (the Veterinary Leadership Experience, VLE) was carried out one year after participation. The veterinary students and veterinary professionals who were assessed one year after finishing the VLE reported significant improvement in leadership abilities which were foundational to the program, i.e. self-awareness, self-management, social awareness, relational competence, communication skills, and conflict management skills. The

results support the further need for the implementation of business and leadership skills into the veterinary curriculum (Crowley et al., 2019).

6.2.4 Characteristics of Small Animal Practices and Clinics

The structural characteristics of veterinary practices in Germany, including legal forms of ownership, practice types, and duration of establishment, offer a comprehensive overview of the veterinary landscape. The predominance of sole proprietors in small animal practices in this study highlights the entrepreneurial nature of veterinary medicine and the predominance of independent practitioners, as evidenced by other studies on practice management (Balaban and Güneş, 2021; Hübner, 2017; Kersebohm et al., 2017; Ripper, 2020, 2022). However, the presence of different practice types including mixed practices and pet clinics underlines the diversity and changing dynamics of veterinary service delivery models. This highlights the need for tailored support mechanisms adapted to different practice contexts (Ackerman, 2020). Moreover, current literature indicates a shift in practice types away from mixed practices and small independent practitioners towards specialization and specialized centers for veterinary medicine with economically aligned service concepts, as proposed by many different authors (Ackerman, 2021, 2024; Horváth et al., 2021; Knippenberg, 2014; Scholz & Trede, 2023).

In addition to these factors, another important consideration in the context of the structural characteristics is the consolidation and the rise of corporate veterinary practices and their the impact on the overall diversity and accessibility of veterinary services (Walster, 2001). As corporate entities expand their presence in the market, there is a risk of homogenization of services and a decrease in the variety of practice models available to clients (Gyles, 2014). This could potentially limit choices for pet owners and lead to disparities in access to specialized care, particularly in rural or underserved areas. Thus, while consolidation may offer benefits in terms of efficiency and cost-effectiveness, it is essential to assess its impact on the broader landscape of veterinary care provision and ensure equitable access to high-quality services for all pet owners (Chon et al., 2024; Loeb & Larson-Orhougbe, 2023; Pound, 2018; Sheridan, 2018).

6.2.4.1 Staffing and Infrastructure

The examination of staffing profiles and facility amenities in veterinary practices offers valuable insights into various aspects of practice management. According to Ackerman (2020), staffing levels and the availability of specialized services are crucial factors influencing service capacity, patient care standards, and operational efficiency within veterinary practices (Ackerman, 2020). The variability observed in these areas within the study and in research underscores the need for implementing tailored workforce management strategies and resource allocation mechanisms to optimize practice performance (Feakes & Thomsen, 2021; Osborne, 2008; Sanford & DeBowes, 2024; Shilcock & Stutchfield, 2008a). Moreover, the composition of the practice cohort, mainly small scale independently owned veterinary practices, significantly influences the observed variations in staffing levels, service capacity, and operational aspects. This observation highlights the importance of considering fundamental practice characteristics when interpreting study findings.

Future research could benefit from a focused investigation within specific practice types, annual revenue sizes, and employee demographics to provide a more nuanced understanding of these factors. Despite the wealth of research on veterinary practice management, studies addressing staffing profiles and facility amenities in Germany remain limited to a few (Kersebohm et al., 2017; Strecker et al., 2021). The AVMA has been at the forefront of research in this area, with its studies in the United States being the primary sources of information on the topic (Cron et al., 2000; Volk et al., 2011, 2014). A comprehensive understanding of the dynamics within the veterinary profession necessitates a deeper exploration that extends beyond just the metrics of revenue sizes and practice costs. As highlighted in Ripper's study (2020, 2022), the primary focus was on these financial aspects, potentially overlooking other essential factors such as service profiles, staffing sizes, and areas of specialization (Ripper, 2020a, 2020b). While financial considerations are crucial for evaluating the sustainability and viability of veterinary practices, they do not provide a complete picture of the factors influencing performance and success.

Our findings regarding revenue size and income streams per patient align closely with Ripper's previous research (2020a, 2020b), as well as the results of Ohr (2019) and Strecker et al. (2021). Specifically, our study indicated that small-scale veterinary practices constitute a significant portion of the assessed revenue, reflecting similar trends identified in the literature. However, Ripper and Strecker's inclusion of cost factors adds another layer of complexity to their analysis, which could provide valuable insights. In our current study, avoiding the integration of cost factors allowed us to maintain a manageable scope; however, it also means we might miss

information about the operational efficiency and profitability of these practices (Ohr, 2019; Ripper, 2020a, 2020b; Strecker et al., 2021).

Alongside workforce considerations, the acquisition of advanced diagnostic equipment in certain practices indicates a continued investment in technology and infrastructure. This trend reflects a dedication to fulfilling changing client expectations and clinical requirements. Such investments not only strengthen diagnostic capabilities but also enhance patient care outcomes and improve overall practice efficiency (AVMA, 2011; Carson et al., 2023; Jones et al., 2017b; Kronberger, 2002). However, there is currently a lack of studies examining the German market that effectively assess the diagnostic equipment and its overall impact on economic performance. Therefore, our findings cannot be compared to existing literature due to the absence of studies in the German market that evaluate the diagnostic equipment and its overall economic impact.

6.2.4.2 Business Management and Service Provision

The business management practices and service provision models adopted by veterinary practices hold implications for financial sustainability, client satisfaction, and overall practice viability. The prevalence of regular office hours during weekdays and limited services on weekends reflects established norms within the profession (Abdouttalib et al., 2021; Corah et al., 2019b; Diez & Ózsvári, 2019b; Kayser-Passmann & Knäble, 2011; Shilcock & Stutchfield, 2008b). Our findings on veterinary practice owners' working hours reveals that they typically work 40-50 hours per week with consistent office hours on weekdays and reduced hours on weekends. The provision of out-of-hours emergency services is common, with the majority of practices offering such services either independently or in collaboration with neighboring clinics. Comparative studies across Germany and Europe show similar working hour patterns among veterinary practitioners, suggesting similar approaches to practice management nationally. (FVE, 2023; Kersebohm et al., 2017; Strecker et al., 2021). Understanding these norms helps assess service accessibility and plan for emergency situations, contributing to the advancement of veterinary care standards worldwide. The availability of out-of-hours emergency services reflects the commitment of veterinary professionals to ensuring continuous and timely care for animals in need.

Unfortunately the survey data shows other problems that arise in Germany in terms of out-of hours emergency services. Small animal clinics which are providing 24/7 care have decreased substantially throughout the last 12 years. One of the reasons is the constant overload of practices due to an increasing number of animals but a decreasing amount of personnel (Ohr,

2019). Additionally, small practices with one or two veterinarians struggle with night or weekend shifts, despite being obligated by professional regulations to perform emergency services (Althaus, 2006; Kersebohm et al., 2017). Furthermore, investor chains are increasingly acquiring practices, which automatically relinquishes the clinic status for legal reasons (Pound, 2018; Sheridan, 2018). This has resulted in increased workload for the remaining clinics, posing a significant challenge to the veterinary profession. The consistency of working hours between countries underlines the importance of international cooperation and knowledge exchange in improving veterinary practice management and service delivery.

6.2.4.3 Premises

The size and structural characteristics of veterinary practices are essential considerations for optimizing service delivery and client experience. Balaban and Güneş (2021) pointed out that the average size of veterinary surgeries in Istanbul ranges between 100 and 200 square meters, similar to the findings of the present study. This underscores a prevailing trend towards smaller-sized practices, particularly in regions with a predominant focus on small animal medicine. Moreover, the layout and amenities within veterinary practices play a crucial role in shaping client perceptions and satisfaction (Wessels et al., 2014; Whiting et al., 2017). The absence of multiple entrances in over half of the surveyed practices suggests potential challenges in managing client flow and accessibility. Additionally, the importance of reception areas cannot be overstated, with a significant majority of practice owners prioritizing dedicated premises for reception to create positive first impressions and facilitate efficient client interactions (Chapleo, 2018; Renfrew & AVMA, 2013; Shilcock & Stutchfield, 2008b). Structurally, veterinary practices commonly feature essential components such as treatment rooms, X-ray facilities, and pharmacies. However, the lack of dedicated ultrasound rooms and separate dog and cat wards underscores potential gaps in service provision and patient care. These findings highlight areas for improvement and investment to enhance diagnostic capabilities and optimize hospitalization protocols within veterinary practices (Narakhanti Soenardi & Maxim Bembinov, 2022; Renfrew & AVMA, 2013).

6.2.4.4 Management and goal setting

At the same time, the use of practice management software and the availability of additional services contribute to the efficiency of the practice and the convenience of the clients. This study showed that Easvet and Vetera are the most widely used practice management programs among small animal vet practices in Germany. In this regard, there are no studies, but only statements from the companies which coincide with the results. However, the study's other findings also highlight areas for improvement, such as goal-setting practices and strategic management approaches, to enhance practical performance and long-term success. Studies conducted in Germany (Blättner & Matzner, 2010; Knoop, 2011; Thiele, 2009) and worldwide (Ackerman, 2020, 2021; Shilcock & Stutchfield, 2008e) highlight the importance of goal setting practices and strategic management in veterinary practices, enabling improved performance and long-term success. Researchers emphasise the importance of clear goals to guide decision-making, and strategic management tools to help navigate the complexities of the business environment. Despite acknowledging their importance, studies reveal areas for improvement, prompting interventions such as the adoption of SMART goal-setting frameworks and the introduction of strategic management tools to address gaps and optimise performance in practice (Blättner & Matzner, 2010; Diez, 2020; Osborne, 2012).

6.2.5 Finances

6.2.5.1 Adherence to the GOT Fee System

The GOT (Gebührenordnung für Tierärzte), a mandatory state fee structure for veterinarians, emphasizes the regulatory framework governing fee structures within the profession (Strecker et al, 2021). The revision of the fee structure in November 2022, stimulated by government studies, reflects efforts to address economic challenges and workforce shortages. The observed average GOT factor in this study was 1.54 (prior to the 2022 review), suggesting a moderate fee structure potentially influenced by factors such as cost, competition and customer affordability. However, the lack of data on emergency service fees highlights a limitation of the study, as emergency services are often subject to higher fees, which can significantly affect revenue dynamics. Strecker et al. (2021) observed differences between fees for normal operations and emergency services in veterinary practices in Germany. Veterinarians reported that fees were multiplied by an average of 1.44 during normal opening hours and 2.25 during emergency services. It is worth noting that these results are based on data collected in 2019, before the introduction of regulations requiring a minimum fee of twice the normal fee for emergency services and before the mandatory introduction of the €50 emergency service fee in February 2020.

6.2.5.2 Patient Turnover and Revenue

Survey results on patient turnover and revenue shed light on the clinical workload and service needs in German veterinary practices. In this study, an average of 18 dogs, 15 cats, 4 small mammals and 5 other small pets are treated daily, with an average income of €51-100 per patient for dogs (63.9%) and cats (47.6%). For small pets, the average income was less than €50. The higher proportion of dogs compared to cats and small mammals underlines the importance of dog care in the economics of practices. However, these results also highlight areas for improvement, such as increasing number of patient visits for cats and small mammals or improving revenue streams to enhance practice performance and long-term success. The findings are in line with research by ZZF & IVH (2019) which found that dogs visit vets more often than cats, with 14% of dogs visiting vets three or more times a year compared to only 6% of cats. However, Ohr (2019a) found that the average annual veterinary expenditure per dog is around €227, compared to around €121 for cats. This difference can be attributed to differences in practice ownership and service provision, with small animal practices often charging less and placing more emphasis on preventive care than larger practices. In addition, the seasonality of veterinary services - with the highest revenue in the summer months - reflects fluctuations in

demand, which is influenced by factors such as holiday seasons and outdoor activities. However, the observed discrepancy between staffing levels and practice size requires cautious interpretation, as adequate staffing levels can affect service provision and revenue generation.

6.2.5.3 Impact of COVID-19 Pandemic

The study findings reveal a notable positive impact of the COVID-19 pandemic on small animal practice income, characterized by increased patient revenue and revenue per patient (approx. 10%). This resilience and growth in the face of external challenges highlights the adaptability and agility of veterinary practices in responding to market dynamics, as shown in several publications (Fathke et al., 2020; Mureşan et al., 2021; Ózsvári et al, 2022; Smith et al., 2022; Wu et al., 2023). The trends observed underline the importance of flexibility and innovation in adapting to changing circumstances, with implications for practice management strategies and resource allocation.

6.2.5.4 Factors Influencing High Income

The identification of staffing levels as a significant determinant of high revenue revenues underlines the central role of labour management in revenue generation. Practices with higher staffing levels are more likely to achieve great income, suggesting that resource allocation and team dynamics play an important role in the success of the practice. This finding underscores the need for strategic workforce planning and investment in human capital to optimize practice performance and financial sustainability. In this study, a significant proportion of the practices surveyed reported an income between €250,000 and €500,000, with vet services and the sale of medicines and pet food being the primary sources of revenue, primarily from dog-related services. Ripper (2020) and Strecker et. al (2021) found similar results. Despite the current growth in patient numbers and income per patient, most practices are planning further expansion, raising prices and investing in equipment, special services and training. However, only a minority are planning to invest in marketing and management, highlighting the need to integrate business management skills into veterinary education to support practice sustainability and growth (FVE, 2023).Within the studies findings the score for marketing over management was slightly lower. This finding still underscores the perceived importance of marketing efforts in revenue generation. A comparison between management and marketing revealed a stronger inclination towards the former as a driver of increased revenue. Participants tended to attribute greater significance to improved management practices in driving revenue growth compared to marketing strategies.

6.2.5.5 Future Trends in Veterinary Medicine

Anticipated trends in veterinary medicine, such as an increased demand for specialized veterinarians and employed veterinarians, that were found in this study, were consistent with the findings of other studies (Elte et al., 2023; Knippenberg, 2014; Norkus et al., 2016). These reflect evolving needs and growth opportunities within the profession. The positive outlook suggests optimism about the future path of the profession, with implications for professional development, education and workforce planning. Additionally, the neutral attitude towards telemedicine found in this study and in other surveys (Cushing, 2022; Mitek, 2022; Widmar et al., 2020) underscores the need for further research and exploration of its potential impact on practice dynamics and service delivery models.

6.2.6 Marketing Practices

Insights into marketing practices highlight the increasing reliance on digital tools and partnerships to enhance client engagement and acquisition, as shown by other research throughout the world (DeWilde, 2024; Diez, 2021). Emphasis on client education, effective communication and practice management underscores the importance of holistic approaches to marketing and practice development (Brown, 2018). However, the relatively lower priority given to marketing investments appoints to potential areas for improvement in strategic planning and business development (Feakes & Thomsen, 2021; Milani, 2013).

7 CONCLUSIONS AND RECOMMENDATIONS

The results of this study underscore the profound impact of evolving demographic patterns in the German veterinary profession. The growing feminization of the workforce signifies opportunities for fostering innovation and service diversification; however, it also highlights persistent barriers that female veterinarians encounter in terms of career advancement and practice ownership. At the same time, aging practitioners face logistical and financial obstacles in transitioning clinics to the next generation, with many smaller practices lacking clear succession plans or structured mentoring frameworks. The future stability of the sector thus hinges on addressing both gender equity and generational transitions, as these factors collectively shape the professional landscape and determine whether longstanding practices can adapt effectively.

A recurring theme in the study is the critical role of solid management skills and financial literacy for veterinary professionals. In a market increasingly marked by specialization and corporate consolidation, small and independently owned practices are disadvantaged if they lack in-depth knowledge of finance, marketing, and operational efficiency. Many veterinarians exhibit limited exposure to structured business training, which curtails their capacity to respond proactively to competitive pressures. Introducing or strengthening management-related course offerings in veterinary schools could aid in closing these gaps. Moreover, continuing professional development programs serve as an avenue for seasoned practitioners to update their skills in finance, human resource management, and marketing, thereby bolstering the viability of smaller or rural clinics.

Digital transformation, and telemedicine in particular, emerged as a compelling avenue for innovation while also revealing the challenges of regulatory uncertainty and technological readiness. Although the COVID-19 pandemic cast a spotlight on remote services, many practitioners remain reluctant to embrace digital platforms due to perceived risks concerning data security, reimbursement structures, and client acceptance. The study shows that when properly implemented, telemedicine can enhance client access and streamline operations, especially for owners constrained by distance or time. However, widespread adoption requires clear legal guidelines, greater familiarity with digital tools, and cost-benefit analyses that illustrate tangible returns on investment. Targeted digital training and supportive policy environments could help accelerate the integration of telemedicine into routine care, thus modernizing clinical practice and potentially broadening the service portfolio for independent clinics.

Alongside technological considerations, the financial underpinnings of veterinary practices remain a prominent concern. Shifting fee structures, particularly around emergency and after-hours services, and the surge of corporate veterinary ownership create both competition and opportunities for collaboration. While corporate groups often benefit from economies of scale and sophisticated administrative systems, their expanding presence raises questions about practitioner autonomy, personalization of care, and client satisfaction. Independent practices may find advantages in adopting more strategic approaches to pricing, expanding or diversifying service offerings, and improving internal operational efficiencies. Nonetheless, any adaptation should remain true to the core values of the profession, namely the provision of empathetic, high-quality clinical care that resonates with clients' expectations.

It is important to situate the findings of this study within its methodological boundaries. A nonprobability sampling approach means that particular regions or practice types may be underrepresented, thus limiting the generalizability of certain conclusions. Furthermore, the cross-sectional design offers a static view that cannot account for the temporal evolution of telemedicine usage, changing fee structures, or the long-term impact of corporate consolidation. The reliance on self-reported data opens the possibility of overestimation or underestimation of certain behaviors, thereby imposing caution on the interpretation of results. Moreover, while Germany provides a substantive context for exploring veterinary practice management, the outcomes may not seamlessly apply to jurisdictions governed by different legal and regulatory frameworks.

In light of these findings and limitations, several promising avenues for further inquiry emerge. Longitudinal research would offer valuable insights into how demographic shifts, digital adoption rates, and financial models change over time, capturing a dynamic picture of the profession's evolution. Considering how pivotal gender equity and succession planning are, in-depth qualitative studies examining successful transitions in smaller, family-owned, or female-led clinics could yield replicable strategies that other practices might adopt. Meanwhile, cross-national comparisons would help clarify how varying cultural and regulatory contexts influence veterinary business management, thereby illustrating whether corporate consolidation and technology integration unfold similarly across different countries. Complementary research focusing on the client side of the equation, including attitudes toward remote consultations and perceptions of corporate ownership, could also advance the profession's understanding of client loyalty and satisfaction. Lastly, more comprehensive analyses of diverse fee structures, emergency service models, and economic pressures facing rural practices may illuminate cost-effective methods for veterinarians to maintain competitive yet sustainable operations.

Summarily, this research indicates that demographic realities, economic imperatives, and technological advances are converging to reshape the German veterinary profession. Addressing the workforce's changing profile, closing gaps in management proficiency, and capitalizing on digital opportunities are all critical steps toward strengthening practice resilience. By expanding on the insights offered here – through deeper, longitudinal, and comparative investigations – veterinary stakeholders can cultivate a robust professional landscape that balances profitability and growth with high standards of patient care and practitioner well-being.

8 NEW SCIENTIFIC RESULTS

- No statistically significant differences were found in the use of veterinary telemedicine consultations by pet species, age of owners and place of residence (rural vs. urban areas) in Germany. These results suggest that the use of telemedicine is consistent across these demographic groups. Among pet practices, the primary barrier to telemedicine adoption was perceived limitations to treatment effectiveness, rather than technological concerns, indicating that clients are generally comfortable with digital platforms.
- The type of the surveyed veterinary practices in Germany, whether practice, center, clinic, or mixed animal practice, was significantly related to the number of employees and the decision to employ a practice manager ($p < 0.05$). In contrast, no significant relationship was found between practice type or legal form and revenue ($p > 0.05$), suggesting that higher revenue is predicted by staff size (employee numbers) rather than structural classification or legal form.
- Of the surveyed German veterinary practices with a small animal clinic, the majority was single-owner businesses and was classified as purely small animal practices. The predominant legal form was sole proprietorship, while a minority operated as a civil law partnership (GbR) or limited liability company, and these types were generally associated with a higher number of employees. More than half of the practices surveyed had an annual income of €500 000 or less, reflecting the modest financial operations of many small animal practices.
- The vast majority of the practices surveyed offer pharmacy, dental, X-ray, laboratory and ultrasound services. The average number of patient visits per day was 18.4 for dogs and 14.8 for cats, with soft tissue and dental surgeries being the most common. Dogs accounted for more than half of the practices' revenue, and the average revenue per visit typically ranged between €51 and €100. Within a calendar year the highest income in the practices surveyed was between July and September, while the lowest was between January and March.
- In the COVID-19 pandemic almost all the surveyed practices reported an increase in income with a huge average annual increase in 2020. Following the COVID pandemic, the vast majority of the responding practices planned to increase service prices, with the main investment priorities being in equipment, service expansion and postgraduate training.

- Various marketing tools such as websites, vaccination reminders, Google My Business and Facebook were prevalent in the veterinary practices surveyed, although Facebook use was the only platform that was significantly influenced by the number of employees ($p < 0.05$). Age did not show a significant effect on the adoption and perception of marketing tools, reinforcing the idea that effective communication and customer engagement - especially with first-time clients, which 90.9% of practices considered very important - is key to marketing success.
- Most veterinary respondents expected an increase in demand for veterinary practitioners and specialization, and predicted an increase in the number of employed veterinarians. There is also a strong call for greater political support and influence, and the majority of the participants called for educational restructuring of the veterinary curriculum, including the integration of economics.

9 SUMMARY

Introduction: The veterinary sector in Germany is experiencing significant transformation driven by market consolidation, pet-owner expectations, and advancements in digital technology. As small animal veterinary practices evolve into larger entities, there is a growing emphasis on integrating business management skills to navigate competitive pressures. This dissertation investigates these dynamics, focusing on digitalization, type of practices (practice, center, clinic or mixed animal practice), practice management, and the demographic profile of the veterinary workforce in the German small animal veterinary practices.

Literature Review: The literature review outlines key demographic trends, such as the increase in female veterinarians and an aging workforce, highlighting challenges in practice management and the urgent need for business education. It examines the growing specialization in veterinary services and discusses the potential and barriers of telemedicine amidst industry consolidation and digitalization trends.

Materials and Methods: The study used a dual-method approach. A digitalization survey involved 362 pet owners to assess perceptions and factors affecting telemedicine adoption. A management survey of 301 veterinary practice owners gathered data on demographics, operational practices, and financial metrics in 2020-2021. Statistical analyses, including ANOVA and logistic regression, were conducted using Microsoft Excel and STATA.

Results: No significant differences were found in telemedicine adoption across pet types, owner ages, or geographic locations, with perceived treatment limitations as the main barrier. The vet workforce is primarily aged 45-64 (66.5%) with a strong female presence (62.1%) in Germany, emphasizing the need for succession planning and gender equity. Employee numbers significantly correlated with practice type ($p < 0.05$) but did not directly impact revenue ($p > 0.05$). Most practices are sole proprietorships with turnovers up to €500,000, but higher number of employees is crucial for revenue exceeding €1 million. Essential services such as pharmacies, X-ray, and ultrasound are offered by over 80% of practices, with dogs generating 55.2% of revenue. Within a calendar year the revenue peaks in July-September, with a 10.7% increase noted during the COVID-19 pandemic, indicating industry resilience. Digital marketing tools are prevalent, yet cross-marketing strategies are underutilized.

Conclusions and Recommendations: The findings highlight the critical need for improved workforce strategies and business education in veterinary practices to address market and demographic challenges. Veterinary practices should focus on strategic staffing and expand the use of effective marketing strategies. Veterinary curricula should be revised to include business management and economics, ensuring that new graduates are prepared for industry demands.

10 PUBLICATIONS

10.1 Publications relating to the topic of the dissertation

1. Diez, E., Renner, A., Ózsvári, L., 2023. Digitalization in Veterinary Medicine - The Perception and Acceptance of Digitalized Animal Healthcare by Owners in Germany. Acta Vet Eurasia 49, 69–74. https://doi.org/10.5152/actavet.2022.0117

2. Diez, E., 2022. Corporate culture analysis of a small animal veterinary referral practice in Germany, in: Szilárd, BERKE; Katalin, SZABÓ; Beáta SZÜCS, Pató Gáborné (Szerk.) Organizational Behaviour and Leadership Theory in Practice. Magyar Agrár- és Élettudományi Egyetem Kaposvári Campus, Kaposvár, HU, pp. 23–31.

3. Diez, E., 2021. Cross ist das neue Marketing – aber was bedeutet das eigentlich? Veterinär Spiegel 31, 137–141. https://doi.org/10.1055/a-1494-0103

4. Diez, E., 2020a. Managing A Veterinary Practice: A Guide To Organizational Culture In Veterinary Practice. International Journal of Applied Research in Business and Management 1, 18–26. https://doi.org/10.51137/ijarbm.2020.1.1.2

5. Diez, E., 2020b. Unternehmenskultur ist wichtig! Wie fördern Sie Ihre? Veterinärspiegel 30, 168–172. https://doi.org/10.1055/a-1232-4157

6. Diez, E., Ózsvári, L., 2019. Marketing in German Veterinary Practices: Are Rural Veterinarians Keep Pace with Time? RBS 11. https://doi.org/10.33568/rbs.2407

10.2 Publications not relating to the topic of the dissertation

1. Diez, E., 2024a. The spine: anatomy and deformities (Die Wirbelsäule: Anatomie und Missbildungen). Tierisch Dabei 10–18.

2. Diez, E., 2024b. Helping dogs and cats strengthen their spine with nutrition and exercise (Mit Ernährung und Bewegung Hund und Katze den Rücken stärken). Tierisch Dabei 28–33.

3. Diez, E., 2024c. Painful spine: Spinal disorders (Schmerzhafter Rücken: Wirbelsäulenerkrankungen). Tierisch Dabei 20–27.

4. Diez, E., 2021a. When the shoulder causes lameness (Wenn die Schulter Lahmheitursache ist). Tierisch Dabei 26–31.

5. Diez, E., 2021b. The painful elbow (Der schmerzende Ellenbogen). Tierisch Dabei 18–24.

6. Diez, E., 2021c. Paw lesions & Co. (Verletzungen an Pfote & Co.). Tierisch Dabei 10–17.

7. Ross, F., Wohllebe, A., Diez, E., 2022. The Role of Personal Assistance in the Uptake of Smartphone-Based Tele-Audiology—An Extension of the Technology Acceptance Model. Int. J. Interact. Mob. Technol. 16, 18–31. https://doi.org/10.3991/ijim.v16i12.301

11 APPENDICES

ANNEX I – BIBLIOGRAPHY

Abdouttalib, I., Ndiaye, Y., Ferchiou, A., Raboisson, D., & Lhermie, G. (2021). The Association Between French Veterinary Practice Characteristics and Their Revenues and Veterinarian's Time Use. *Frontiers in Veterinary Science*, *8.675028.* 10 p. https://doi.org/10.3389/fvets.2021.675028

Abood, S. K. (2008). Effectively communicating with your clients. *Topics in Companion Animal Medicine*, *23*(3), p. 143–147. https://doi.org/10.1053/j.tcam.2008.04.007

Ackerman, L. (2002). Business Basics for Veterinarians. New York: ASJA Press. 293 p.

Ackerman, L. (2003). Management Basics for Veterinarians. New York: ASJA Press. 278 p.

Ackerman, L. (2013). Blackwell's Five-Minute Veterinary Practice Management Consult (2. ed). Wiley-Blackwell. 808 p.

Ackerman, L. (2020). Blackwell's Five-Minute Veterinary Practice Management Consult (3. ed). Wiley-Blackwell. 1008 p.

Ackerman, L. (2021). Pet-specific Care for the Veterinary Team. Wiley-Blackwell. 1104 p.

Ackerman, L. (2024). The Future of Small Animal Veterinary Practice. *Practice Management*, *54*(2), p. 223–234. https://doi.org/10.1016/j.cvsm.2023.10.005

Adams, C. L., & Kurtz, S. (2012). Coaching and Feedback: Enhancing Communication Teaching and Learning in Veterinary Practice Settings. *Journal of Veterinary Medical Education*, *39*(3), p. 217–228. https://doi.org/10.3138/jvme.0512-038R

Althaus, J. (ed.). (2006). Praxishandbuch Tierarztrecht. Hannover: Schlütersche. 200 p.

American Animal Hospital Association (2010). Financial & productivity pulsepoints: Vital statistics for your veterinary practice. (6th ed.). Lakewood, Colo: AAHA Press. 223 p.

American Animal Hospital Association (2016). Be a champion:80 tips to work smarter, save money, and show the love to clients and pets. Lakewood, Colo: AAHA Press. 64 p.

American Animal Hospital Association-American Veterinary Medical Association Preventive Healthcare Guidelines Task Force (2011). Development of new canine and feline preventive healthcare guidelines designed to improve pet health. *Journal of the American Animal Hospital Association*, *47*(5), p. 306–311. https://doi.org/10.5326/JAAHA-MS-4007

American Pet Products Association (2023). Pet Industry Trends and Stats. Industry Trends and Stats. https://www.americanpetproducts.org/research-insights/industry-trends-and-stats . Search engine: Google scholar. Key words: pet market. Date of search: 2023.06.10

Arcique, M. A., & Bajwa, J. (2020). Atopic dermatitis in humans and dogs. *The Canadian*

Veterinary Journal = La Revue Veterinaire Canadienne, *61*(1), p. 82–84.

Arkow, P. (2020). Human–Animal Relationships and Social Work: Opportunities Beyond the Veterinary Environment. *Child & Adolescent Social Work Journal*, *37*(6), p. 573–588. https://doi.org/10.1007/s10560-020-00697-x

American Veterinary Medical Association (2021). *Veterinary telehealth: The basics | American Veterinary Medical Association*. https://www.avma.org/resources-tools/animal-health-and-welfare/telehealth-telemedicine-veterinary-practice/veterinary-telehealth-basics Search engine: Google. Key words: veterinary telemedicine. Date of search: 2022.11.20

Bard, A. M., Main, D., Roe, E., Haase, A., Whay, H. R., & Reyher, K. K. (2019). To change or not to change? Veterinarian and farmer perceptions of relational factors influencing the enactment of veterinary advice on dairy farms in the United Kingdom. *Journal of Dairy Science*, *102*(11), p. 10379–10394. https://doi.org/10.3168/jds.2019-16364

Bir, C., Ortez, M., Olynk Widmar, N. J., Wolf, C. A., Hansen, C., & Ouedraogo, F. B. (2020). Familiarity and Use of Veterinary Services by US Resident Dog and Cat Owners. *Animals : an Open Access Journal from MDPI*, *10*(3). 27 p. https://doi.org/10.3390/ani10030483

Bishop, G. T., Evans, B. A., Kyle, K. L., & Kogan, L. R. (2018). Owner satisfaction with use of videoconferencing for recheck examinations following routine surgical sterilization in dogs. *Journal of the American Veterinary Medical Association*, *253*(9), p. 1151–1157. https://doi.org/10.2460/javma.253.9.1151

Blättner, A., & Berger, R. (2020). Die Praxissoftware für das Management sinnvoll einsetzen – so geht's! *team.konkret*, *16*(04), p. 25–30. https://doi.org/10.1055/a-1243-4573

Blättner, A., & Matzner, W. (2010). *Die gesunde Tierarztpraxis: Marketing und Kommunikation ; 5 Tabellen*. Erlangen: Enke. 80 p.

bpt (2021). *Position des Bundesverbandes Praktizierender Tierärzte e.V. (bpt) zur Veterinär-Telemedizin*. https://www.tieraerzteverband.de/bpt/berufspolitik/Positionen/veterinaer-telemedizin/dokumente/bpt-Position-zur-Veterinaer-Telemedizin_15.02.2021.pdf Search engine: Google. Key words: bpt telemedizin. Date of Search:2022.11.20

Bragg, R. F., Bennett, J. S., Cummings, A., & Quimby, J. M. (2015). Evaluation of the effects of hospital visit stress on physiologic variables in dogs. *Journal of the American Veterinary Medical Association*, *246*(2), p. 212–215. https://doi.org/10.2460/javma.246.2.212

Brogdon, R. (2024). Traditional Marketing Is Not Dead in Veterinary Practice. *Practice Management*, *54*(2), p. 369–379. https://doi.org/10.1016/j.cvsm.2023.10.004

Brown, B. (2018). The Dimensions of Pet-Owner Loyalty and the Relationship with Communication, Trust, Commitment and Perceived Value. *Veterinary Sciences*, *5*(4), 95

p. https://doi.org/10.3390/vetsci5040095

Bundestierärztekammer e.V. (2023). Statistik 2022: Tierärzteschaft in der Bundesrepublik Deutschland. *Deutsches Tierärzteblatt 71(7)*, p. 858–868.

Bundestierärztekammer e.V. (2022) Statistik 2021: Tierärzteschaft in der Bundesrepublik Deutschland. *Deutsches Tierärzteblatt 70(6)*, p. 762–772.

Bundestierärztekammer e.V. (2021). Statistik 2020: Tierärzteschaft in der Bundesrepublik Deutschland. *Deutsches Tierärzteblatt 69(5)*, p. 558–568.

Bundestierärztekammer e.V. (2020). Statistik 2019: Tierärzteschaft in der Bundesrepublik Deutschland. *Deutsches Tierärzteblatt 68(7)*, p. 860–870.

Bundestierärztekammer e.V. (2019). Statistik 2018: Tierärzteschaft in der Bundesrepublik Deutschland. *Deutsches Tierärzteblatt 67(6)*, p. 800–810.

Bundestierärztekammer e.V. (2018). Statistik 2017: Tierärzteschaft in der Bundesrepublik Deutschland. *Deutsches Tierärzteblatt 66(6),* p. 786–791.

Bundestierärztekammer e.V. (2017). Statistik 2016: Tierärzteschaft in der Bundesrepublik Deutschland. *Deutsches Tierärzteblatt 65(5)*, p. 616–621.

Bundestierärztekammer e.V. (2016). Statistik 2015: Tierärzteschaft in der Bundesrepublik Deutschland. *Deutsches Tierärzteblatt 64(5)*, p. 688–693.

Bundestierärztekammer e.V. (2015). Statistik 2014: Tierärzteschaft in der Bundesrepublik Deutschland. *Deutsches Tierärzteblatt 63(5)*, p. 670–683.

Bundestierärztekammer e.V. (2014). Statistik 2013: Tierärzteschaft in der Bundesrepublik Deutschland. *Deutsches Tierärzteblatt 62(6)*, p. 778–791.

Bundestierärztekammer e.V. (2013). Statistik 2012: Tierärzteschaft in der Bundesrepublik Deutschland. *Deutsches Tierärzteblatt 61(6)*, p. 780–793.

Bundestierärztekammer e.V. (2012). Statistik 2011: Tierärzteschaft in der Bundesrepublik Deutschland. *Deutsches Tierärzteblatt 60(4)*, p. 506–511.

Bundestierärztekammer e.V. (2011). Statistik 2010: Tierärzteschaft in der Bundesrepublik Deutschland. *Deutsches Tierärzteblatt 59(5)*, p. 608–613.

Bundestierärztekammer e.V. (2010). Statistik 2009: Tierärzteschaft in der Bundesrepublik Deutschland. *Deutsches Tierärzteblatt 58(4)*, p. 500.

Bundestierärztekammer e.V. (2009). Statistik 2008: Tierärzteschaft in der Bundesrepublik Deutschland. *Deutsches Tierärzteblatt 57(5)*, p. 650.

Bundestierärztekammer e.V. (2008). Statistik 2007: Tierärzteschaft in der Bundesrepublik Deutschland. *Deutsches Tierärzteblatt 56(9)*, p.1206.

Cake, M., Bell, M., Williams, J., Brown, F., Dozier, M., Rhind, S., & Baillie, S. (2016). Which

professional (non-technical) competencies are most important to the success of graduate veterinarians? A Best Evidence Medical Education (BEME) systematic review: BEME Guide No. 38. *Medical teacher*, *38*, p. 1–14. https://doi.org/10.3109/0142159X.2016.1173662

Canfield, P. J., & Krockenberger, M. B. (2002). An interactive, student-centered approach, adopting the SOLO taxonomy, for learning to analyze laboratory data in veterinary clinical pathology. *Journal of Veterinary Medical Education*, *29*(1), p. 56–61. https://doi.org/10.3138/jvme.29.1.56

Carr, A. N., Kirkwood, R. N., Petrovski, K. R., & Butaye, P. (2022). Effective Veterinary Clinical Teaching in a Variety of Teaching Settings. *Veterinary Sciences*, *9*(1). 17p. https://doi.org/10.3390/vetsci9010017

Carson, A., Kresnye, C., Rai, T., Wells, K., Wright, A., & Hillier, A. (2023). Response of pet owners to Whistle FIT® activity monitor digital alerts of increased pruritic activity in their dogs: A retrospective observational study. *Frontiers in Veterinary Science*, *10*. 11 p. https://doi.org/10.3389/fvets.2023.1123266

Carson, C. A. (2007). Nonverbal communication in veterinary practice. *The Veterinary Clinics of North America. Small Animal Practice*, *37*(1), p. 49–63; abstract viii. https://doi.org/10.1016/j.cvsm.2006.10.001

Catanzaro, T. E. (2000). Veterinary healthcare services: Options in delivery (1st ed.). Iowa State University Press. 168 p.

Catanzaro, T. E. (2006). Succession planning. *The Veterinary Clinics of North America. Small Animal Practice*, *36*(2), p. 355–371, vi. https://doi.org/10.1016/j.cvsm.2005.11.004

Chapleo, D. (2018). The role of a good receptionist. *The Veterinary Record*, *183*(2), p. 71. https://doi.org/10.1136/vr.k3019

Chitty, J. (2019). Telemedicine – the opportunity in the threat. *Veterinary Record*, *184*(10), p. 322–322. https://doi.org/10.1136/vr.l1072

Chon, E., Hendricks, W., White, M., Rodrigues, L., Haworth, D., & Post, G. (2024). Precision Medicine in Veterinary Science. *Veterinary Clinics of North America: Small Animal Practice*, *54*(3), p. 501–521. https://doi.org/10.1016/j.cvsm.2023.12.006

Christman, A. (2024). The Magic of Customer Service in Veterinary Practice. *Veterinary Clinics of North America: Small Animal Practice*, *54*(2), p. 355–367. https://doi.org/10.1016/j.cvsm.2023.10.009

Cima, G. (2014). Rural business education courses changing hands. *Journal of the American Veterinary Medical Association*, *244*(12), p. 1358.

Clarke, C. J., & Chapman, M. (2012). BSAVA Manual of Small Animal Practice Management and Development. Wiley. 535 p.

Coe, J. B., Adams, C. L., & Bonnett, B. N. (2009). Prevalence and nature of cost discussions during clinical appointments in companion animal practice. *Journal of the American Veterinary Medical Association*, *234*(11), p. 1418–1424. https://doi.org/10.2460/javma.234.11.1418

Cooper, E. A. (2000). Corporate culture and performance: Relating concepts and outcome*s* (S. 6770117) [Doctor of Philosophy, Iowa State University, Digital Repository]. https://doi.org/10.31274/rtd-180813-13575

Corah, L., Lambert, A., Cobb, K., & Mossop, L. (2019). Appointment scheduling and cost in first opinion small animal practice. *Heliyon*, *5*(10), e02567. 3 p. https://doi.org/10.1016/j.heliyon.2019.e02567

Cron, W. L., Slocum, J. V., Goodnight, D. B., & Volk, J. O. (2000). Executive summary of the Brakke management and behavior study. *Journal of the American Veterinary Medical Association*, *217*(3), p. 332–338. https://doi.org/10.2460/javma.2000.217.332

Crowley, S. L., Homan, K. J., Rogers, K. S., Cornell, K. K., Olavessen, L. J., Charles, E. M., & Shaw, D. H. (2019). Measurement of leadership skills development among veterinary students and veterinary professionals participating in an experiential leadership program (the Veterinary Leadership Experience). *Journal of the American Veterinary Medical Association*, *255*(10), p. 1167–1173. https://doi.org/10.2460/javma.255.10.1167

Cushing, M. (2022). What Is Telemedicine, Telehealth, and Teletriage. *Telemedicine*, *52*(5), p.1069–1080. https://doi.org/10.1016/j.cvsm.2022.06.004

Desmond, J. (2022). Medicine, Value, and Knowledge in the Veterinary Clinic: Questions for and From Medical Anthropology and the Medical Humanities. *Frontiers in Veterinary Science*, *9*. 11 p. https://doi.org/10.3389/fvets.2022.780482

DeWilde, C. (2024). Social Media and Digital Marketing for Veterinary Practices. *Practice Management*, *54*(2), p. 381–394. https://doi.org/10.1016/j.cvsm.2023.10.006

Dicks, M. (2014). Factors that affect the supply price–quantity relationship. *Journal of the American Veterinary Medical Association*, *245*(8), p. 902–903. https://doi.org/10.2460/javma.245.8.902

Diez, E. (2020). Managing A Veterinary Practice: A Guide To Organizational Culture In Veterinary Practice. *International Journal of Applied Research in Business and Management*, *1*(1), p. 18–26. https://doi.org/10.51137/ijarbm.2020.1.1.2

Diez, E. (2021). Cross ist das neue Marketing – aber was bedeutet das eigentlich? *veterinär*

spiegel, *31*(03), p. 137–141. https://doi.org/10.1055/a-1494-0103

Diez, E., & Ózsvári, L. (2019). Marketing in German Veterinary Practices: Are Rural Veterinarians Keep Pace with Time? *Regional and Business Studies*, *11*(2). P. 41-47 https://doi.org/10.33568/rbs.2407

Diez, E., Renner, A., & Ózsvári, L. (2023). Digitalization in Veterinary Medicine—The Perception and Acceptance of Digitalized Animal Healthcare by Owners in Germany. *Acta Veterinaria Eurasia*, *49*(2), p. 69–74. https://doi.org/10.5152/actavet.2022.0117

Dijkman, H. (2007). Veterinair ondernemerschap: Visie en innovatie. Congres „De dierenarts als ondernemer." *Tijdschrift voor diergeneeskunde*, *132*(5), 184 p.

Donahue, K. (2022). Teletriage-How Remote Advice Provides Better Care. *Telemedicine*, *52*(5), p. 1081–1086. https://doi.org/10.1016/j.cvsm.2022.06.001

Drewry, J. L., Shutske, J. M., Trechter, D., Luck, B. D., & Pitman, L. (2019). Assessment of digital technology adoption and access barriers among crop, dairy and livestock producers in Wisconsin. *Computers and Electronics in Agriculture*, *165*, 104960. 15p. https://doi.org/10.1016/j.compag.2019.104960

Eedy, D. J., & Wootton, R. (2001). Teledermatology: A review. *British Journal of Dermatology*, *144*(4), p. 696–707. https://doi.org/10.1046/j.1365-2133.2001.04124.x

Elte, Y., Acton, K., Martin, J., Nielen, M., van Weeren, R., Wolframm, I., (2023). Engage and enjoy-investigating predictors of employee engagement and work satisfaction in equine veterinary professionals. *Frontiers in Veterinary Science*, *10*, 1. 11p. https://doi.org/10.3389/fvets.2023.1036388

Essman, S. (2011). Current Concepts in Teleradiology. *Advances in Small Animal Medicine and Surgery*, *24*(10), p. 1–3. https://doi.org/10.1016/j.asams.2011.09.001

Farahani, N., & Pantanowitz, L. (2015). Overview of Telepathology. *Surgical Pathology Clinics*, *8*(2), p. 223–231. https://doi.org/10.1016/j.path.2015.02.018

Fathke, R. L., Rao, S., & Salman, M. (2020). The COVID-19 pandemic: A time for veterinary leadership in one health. *One Health*, *11*. 3p. https://doi.org/10.1016/j.onehlt.2020.100193

Feakes, A., & Thomsen, D. (2021). Key Performance Indicators for Veterinary Business. University of Adelaide. https://set.adelaide.edu.au/animal-veterinary-sciences/vibe/ua/media/165/kpis-uoa-olt-9apr2014.pdf. Search engine: Google scholar. Key words: Key performance indicator veterinary Date of Search: 2022.08.15

Federation of Veterinarians of Europe (2019). Survey of the veterinary profession in Europe. 140p. https://fve.org/publications/survey-of-the-veterinary-profession-in-europe/ Search engine: Google. Key words: Survey vet europe Date of Search: 2023.06.10

Federation of Veterinarians of Europe (2023). FVE - Survey of the Veterinary Profession in Europe 2023. https://fve.org/cms/wp-content/uploads/FVE-Survey-2023-updated-13-Dec-23.pdf. Search engine: Google scholar. Key words: Survey vet europe Date of Search: 2024.06.15

FEDIAF (2024). FEDIAF Annual Report 2023. https://europeanpetfood.comingsoon.site/wp-content/uploads/2023/07/FEDIAF_Annual-Report_2023.pdf. Search engine: Google. Key words: pet industry europe Date of Search: 2023.06.10

Felsted, K. E. (2024). Veterinary Practice Profitability: You Have to Measure It to Manage It. *Practice Management*, *54*(2), p. 395–407. https://doi.org/10.1016/j.cvsm.2023.10.003

Gabay, G., Moskowitz, H. R., Rotondo, K. J., & Aspros, D. G. (2014). Understanding the Mind of the Pet Owner for Veterinary Services. *Services Marketing Quarterly*, *35*(1), p. 1–18. https://doi.org/10.1080/15332969.2014.856729

Gray, C., Fox, M., & Hobson-West, P. (2018). Reconciling Autonomy and Beneficence in Treatment Decision-Making for Companion Animal Patients. *The Liverpool Law Review*, *39*(1),p. 47–69. https://doi.org/10.1007/s10991-018-9211-4

Gray, C., & Moffett, J. (2013). *Handbook of veterinary communication skills*. Wiley.

Gyles, C. (2014). Corporate veterinary medicine. *The Canadian Veterinary Journal = La Revue Veterinaire Canadienne*, *55*(6), p. 515–518.

Gyles, C. (2019). Veterinary telemedicine. *The Canadian Veterinary Journal = La Revue Veterinaire Canadienne*, *60*(2), p. 119–122.

Heiko Färber. (2019). Ökonomische Ausbildung der Veterinärmedizinstudierenden—Leserbrief zum Beitrag „veterinärmedizinischer Fakultätentag“ in der Rubrik „BTK aktuell“, DTBI. 6/2019, p.782. *Deutsches Tierärzteblatt*, *08/2019*, 1089 p.

Hess, L. (2017). Telemedicine: The Future of Veterinary Practice. *Journal of Avian Medicine and Surgery*, *31*(2), p. 165–171. https://doi.org/10.1647/1082-6742-31.2.165

Hess-Holden, C. L., Jackson, D. L., Morse, D. T., & Monaghan, C. L. (2019). Understanding Non-Technical Competencies: Compassion and Communication among Fourth-Year Veterinarians-in-Training. *Journal of Veterinary Medical Education*, *46*(4), p. 506–517. https://doi.org/10.3138/jvme.0917-131r1

Holbrook, M. B. (1994). The Nature of Customer Value: An Axiology of Services in the Consumption Experience. In R. Rust & R. Oliver, *Service Quality: New Directions in Theory and Practice* (p. 21–71). SAGE Publications, Inc. https://doi.org/10.4135/9781452229102.n2

Holmner, Å., Ebi, K. L., Lazuardi, L., & Nilsson, M. (2014). Carbon Footprint of Telemedicine

Solutions—Unexplored Opportunity for Reducing Carbon Emissions in the Health Sector. *PLoS ONE*, *9*(9), e105040. 10p. https://doi.org/10.1371/journal.pone.0105040

Horváth, L., Bendzsel, D., & Ózsvári, L. (2021). The gender shift in veterinary medicine and its impact on veterinary profession in Hungary (in Hungarian). *Magyar Állatorvosok Lapja, 143. (8)*, p. 479–496.

Hübner, S. (2017). Zur Entwicklung des tierärztlichen Berufsstandes in Deutschland seit dem Jahr 2000—Eine empirische Verbleibstudie mit Geschlechtervergleich. *Dissertation at University of Leipzig, Germany*. 75p.

Ilgen, D. R. (2002). Skills, knowledge, aptitudes, and interests for veterinary practice management: Fitting personal characteristics to situational demands. *Journal of Veterinary Medical Education*, *29*(3), p. 153–156. https://doi.org/10.3138/jvme.29.3.153

Jackson, E., & Hauser, S. (2016). The Evidence Base for Developing a Veterinary Business Management Curriculum. *Veterinary Evidence*, *1*(2). 11p. https://doi.org/10.18849/ve.v1i2.38

Jones, K., Case, J. B., Evans, B., & Monnet, E. (2017). Evaluation of the economic and clinical feasibility of introducing rigid endoscopy and laparoscopy to a small animal general practice. *Journal of the American Veterinary Medical Association*, *250*(7), p. 795–800. https://doi.org/10.2460/javma.250.7.795

Kayser-Passmann, D., & Knäble, M. (2011). Die Tierarztpraxis—Gründen mit Erfolg. Hannover: Schlütersche. 132p.

Kersebohm, J. C., Lorenz, T., Becher, A., & Doherr, M. G. (2017). Factors related to work and life satisfaction of veterinary practitioners in Germany. *Veterinary Record Open*, *4*(1), e000229. 10p. https://doi.org/10.1136/vetreco-2017-000229

Knights, D., & Clarke, C. (2019). Gendered practices in veterinary organisations. *Veterinary Record*, *185*(13), p. 407–407. https://doi.org/10.1136/vr.104994

Knippenberg, R. (2014). Factors that shift the relationship between the price of veterinary services and the quantity demanded. *Journal of the American Veterinary Medical Association*, *245*(6), p. 647–648. https://doi.org/10.2460/javma.245.6.647

Knoop, S. (2011). Tierärztliche Betriebswirtschaftslehre (1. ed). Göttingen: Cuvillier. 241 p.

Kogan, L. R., Butler, C. L., Lagoni, L. K., Brannan, J. K., McConnell, S. M., & Harvey, A. M. (2004). Training in client relations and communication skills in veterinary medical curricula and usage after graduation. *Journal of the American Veterinary Medical Association*, *224*(4), p. 504–507. https://doi.org/10.2460/javma.2004.224.504

Kogan, L. R., McConnell, S. L., & Schoenfeld-Tacher, R. (2005). Response of a veterinary

college to career development needs identified in the KPMG LLP study and the executive summary of the Brakke study: A combined MBA/DVM program, business certificate program, and curricular modifications. *Journal of the American Veterinary Medical Association*, *226*(7), p. 1070–1076. https://doi.org/10.2460/javma.2005.226.1070

Kronberger, C. (2002). The veterinary technician's role in laser surgery. *The Veterinary Clinics of North America. Small Animal Practice*, *32*(3), p. 723–735, viii. https://doi.org/10.1016/s0195-5616(02)00012-8

Küeper, A. M., & Merle, R. (2021). Partners in Sickness and in Health? Relationship-Centered Veterinary Care and Self-Educated Pet Owners in Germany: A Structural Equation Model. *Frontiers in Veterinary Science*, *7*. 17p. https://doi.org/10.3389/fvets.2020.605631

Lee, D. E. (2006). Marketing Veterinary Services. *Veterinary Clinics of North America: Small Animal Practice*, *36*(2), p. 281–295. https://doi.org/10.1016/j.cvsm.2005.11.003

Lee, J. J., & English, J. C. (2018). Teledermatology: A Review and Update. *American Journal of Clinical Dermatology*, *19*(2), 253–260. https://doi.org/10.1007/s40257-017-0317-6

Li, K., Mooney, E., McArthur, M., Hall, E., & Quain, A. (2024). A comparison between veterinary small animal general practitioners and emergency practitioners in Australia. Part 2: Client-related, work-related, and personal burnout. *Frontiers in Veterinary Science*, *11*. 13p. https://doi.org/10.3389/fvets.2024.1355511

Littlehales, R., Noble, P. M., Singleton, D. A., Pinchbeck, G. L., & Radford, A. D. (2020). Impact of Covid-19 on veterinary care. *Veterinary Record*, *186*(19), p. 650–651. https://doi.org/10.1136/vr.m2495

Littlewood, K. E., Beausoleil, N. J., & Kinobe, R. T. (2021). Two Domains to Five: Advancing Veterinary Duty of Care to Fulfil Public Expectations of Animal Welfare Expertise. *Animals : an Open Access Journal from MDPI*, *11*(12). 21p. https://doi.org/10.3390/ani11123504

Loeb, J., & Larson-Orhougbe, O. (2023). Corporate rules in France have 'consequences'. *Veterinary Record*, *193*(4), p. 137–137. https://doi.org/10.1002/vetr.3370

MacKay, C. (2009). Discussion of changing trends in practice management continues. *Journal of the American Veterinary Medical Association*, *234*(7), 874 p.

Madden, S. (2013). The evaluation of practice management in an American Small Animal Clinic. Thesis SZIU-FVS, Dep. of State Vet. Medicine and Agricultural Economics, Budapest. Thesis 99p.

Magalhães-Sant'Ana, M., Peleteiro, M. C., & Stilwell, G. (2020). Opinions of Portuguese Veterinarians on Telemedicine—A Policy Delphi Study. *Frontiers in Veterinary Science*,

7, 549p. https://doi.org/10.3389/fvets.2020.00549

Mamalis, L. A. (2024). Building Value for Veterinary Practice Sale. *Practice Management*, *54*(2), p. 409–421. https://doi.org/10.1016/j.cvsm.2023.10.013

Manzi, T., & Navas de Solis, C. (2022). Small Animal Teleultrasound. *Telemedicine*, *52*(5), p.1141–1151. https://doi.org/10.1016/j.cvsm.2022.05.004

Mars, M., & Auer, R. E. J. (2006). Telemedicine in veterinary practice. *Journal of the South African Veterinary Association*, *77*(2), p.75–78. https://doi.org/10.4102/jsava.v77i2.348

Massin Teller, L., & Moberly, H. K. (2020). Veterinary Telemedicine: A literature review. *Veterinary Evidence*, *5*(4). 26p. https://doi.org/10.18849/ve.v5i4.349

Milani, M. (2013). Service versus product communication. *The Canadian Veterinary Journal = La Revue Veterinaire Canadienne*, *54*(2), p. 183–184.

Milani, M. (2016). Avoidance and enhancing screen-based communication. *The Canadian Veterinary Journal = La Revue Veterinaire Canadienne*, *57*(8), p. 891–892.

Mitek, A. (2022). Technology Basics for Telemedicine: What Practitioners Need to Know. *Telemedicine*, *52*(5), p. 1109–1122. https://doi.org/10.1016/j.cvsm.2022.06.003

Mitek, A., Jones, D., Newell, A., & Vitale, S. (2022). Wearable Devices in Veterinary Health Care. *Telemedicine*, *52*(5), p. 1087–1098. https://doi.org/10.1016/j.cvsm.2022.05.001

Mureşan, A. N., Morariu, S., Baisan, R. A., Costea, R., & Mureşan, C. (2021). The Impact of COVID-19 Pandemic During Lockdown on the Veterinary Profession in Romania: A Questionnaire-Based Survey. *Frontiers in Veterinary Science*, *8*. 9p. https://doi.org/10.3389/fvets.2021.737914

Narakhanti Soenardi & Maxim Bembinov. (2022). An assessment of client and clinician satisfaction in veterinary teleconsultation compared to in-person consultations. *Veterinary Evidence*, *7*(3). 17p. https://doi.org/10.18849/ve.v7i3.578

Neill, C. L., Salois, M. J., & Williams, R. B. (2023). The economics of veterinary medicine: Emerging challenges and opportunities for economists. *Choices*, *38*(1). 9p.

Nihad Fejzić, Abdullah Muftić, Sabina Šerić-Haračić, & Emina Muftić. (2023). The impact of digital presence and use of information technology on business performance of veterinary practices: A case study of Bosnia and Herzegovina. *Frontiers in Veterinary Science*, *10*. 11p. https://doi.org/10.3389/fvets.2023.1208654

Norkus, C. L., Liss, D. J., & Leighton, L. S. (2016). Characteristics of the labor market for veterinary technician specialists in 2013. *Journal of the American Veterinary Medical Association*, *248*(1), p. 105–109. https://doi.org/10.2460/javma.248.1.105

Ohr, R. (2019). *Heimtierstudie: Ökonomische und soziale Bedeutung der Heimtierhaltung in*

Deutschland. Universität Göttingen. https://www.uni-goettingen.de/de/document/download/52bbce3b8ebcfef2faa77d50d72a0b21.pdf/Heimtierstudie%202019%20final%20korr.pdf Search engine: Google scholar. Key words: pet economics germany Date of Search: 2023.06.10

Osborne, D. (2008). The cost of keeping non-DVM staff. *The Canadian Veterinary Journal = La Revue Veterinaire Canadienne*, *49*(9), p. 915–916, 918, 920.

Osborne, D. (2012). Time to practice smarter. *The Canadian Veterinary Journal = La Revue Veterinaire Canadienne*, *53*(9), p. 1005–1007.

Ózsvári, L. (2008). Marketing management in small animal practice (in Hungarian). *KAMARAI ÁLLATORVOS* 2008(*1)*, p. 32–37.

Ózsvári, L. (2014). Practice management in Hungarian small animal veterinary clinics. In *Illés B. CS. – Dunay A. – Slocinska A. (eds.): New trends in Management in the 21st Century. Monograph. Czestochowa University of Technology, Czestochowa, 413* (p. 347–358).

Ózsvári, L. (2024). *Basics of Communication*. University of Veterinary Medicine Budapest. https://univet.hu/en/education/courses/basics-of-communication/

Ózsvári, L., Biro, O., & Szmodits, Zs. (2002). Business plan for the establishment of a small animal clinic part. III. (in Hungarian) *KisállatPraxis 3*(3), p. 44–51.

Ózsvári, L., & Gyurcsó, A. (2017). *Postgraduate Training*. University of Veterinary Medicine Budapest. https://univet.hu/en/education/postgraduate-training/

Ózsvári, L., Vetter, Sz., & Vizi, V. (2022). Dog-keeping habits in Hungary during the COVID19 pandemic – Preliminary results of a 2021 national representative (in Hungarian). *Magyar Állatorvosok Lapja, 144. (1)*, p. 3–12.

Pang, D. S. J., Pang, J. M., Payne, O.-J., Clement, F. M., & Faber, T. (2020). Teleconsulting in the time of a global pandemic: Application to anesthesia and technological considerations. *The Canadian Veterinary Journal = La Revue Veterinaire Canadienne*, *61*(10),p. 1092–1100.

Pizzolon, C. N., Coe, J. B., & Shaw, J. R. (2019). Evaluation of team effectiveness and personal empathy for associations with professional quality of life and job satisfaction in companion animal practice personnel. *Journal of the American Veterinary Medical Association*, *254*(10), p. 1204–1217. https://doi.org/10.2460/javma.254.10.1204

Pound, B. (2018). Large corporate acquisitions and the shortage of vets. *Veterinary Record*, *182*(16), p. 464–464. https://doi.org/10.1136/vr.k1692

Puddle, T. (2015). Marketing essentials for veterinary practices. *In Practice*, *37*(5), p. 259–261. https://doi.org/10.1136/inp.h1940

Renfrew, Jill. & American Animal Hospital Association. (2013). AAHA's complete guide for the veterinary client service representative. Lakewood, Colo: AAHA Press. 144p.

Richards, I. (2019). Telemedicine – the threat in the opportunity. *Veterinary Record*, *185*(1), p. 25–25. https://doi.org/10.1136/vr.l4535

Richardson, F., & Osborne, D. (2006). Veterinary practice manager le gestionnaire vétérinaire. *The Canadian Veterinary Journal = La Revue Veterinaire Canadienne*, *47*(7), p. 702–706.

Ripper, H.-P. (2020a). Praxiskostenvergleich 2018 (Teil 2). *bpt info*, *05(2020*, p. 15–16.

Ripper, H.-P. (2020b). Praxiskostenvergleich 2018 (Teil 3). *bpt info*, *06/2020*, p. 12.

Ripper, H.-P. (2022). Eigene Praxis? Die Rahmenbedingungen sind gut! *Bpt Jahresbericht 2021*, p. 69.

Roca, R. Y., & McCarthy, R. J. (2019). Impact of Telemedicine on the Traditional Veterinarian-Client-Patient Relationship. *Topics in Companion Animal Medicine*, *37*, 100359. 4p. https://doi.org/10.1016/j.tcam.2019.100359

Rucker, M. (Peggy) J. (2002). Gender Changes and the Future of our Profession. *Journal of Veterinary Medical Education*, *29*(2), p. 63–65. https://doi.org/10.3138/jvme.29.2.63

Sánchez-Vizcaíno, F., Noble, P.-J. M., Jones, P. H., Menacere, T., Buchan, I., Reynolds, S., Dawson, S., Gaskell, R. M., Everitt, S., & Radford, A. D. (2017). Demographics of dogs, cats, and rabbits attending veterinary practices in Great Britain as recorded in their electronic health records. *BMC Veterinary Research*, *13*(1), p. 218. https://doi.org/10.1186/s12917-017-1138-9

Sanford, J. R., & DeBowes, R. M. (2024). Top Veterinary Practice Issues that Negatively Affect Culture, Retention, and Performance. *Practice Management*, *54*(2), p. 423–440. https://doi.org/10.1016/j.cvsm.2023.10.014

Scholz, E., & Trede, F. (2023). Veterinary professional identity: Conceptual analysis and location in a practice theory framework. *Frontiers in Veterinary Science*, *10*. 11p. https://doi.org/10.3389/fvets.2023.1041475

Shaw, J. R. (2006). Four Core Communication Skills of Highly Effective Practitioners. *Veterinary Clinics of North America: Small Animal Practice*, *36*(2), p. 385–396. https://doi.org/10.1016/j.cvsm.2005.10.009

Shaw, J. R., Adams, C. L., Bonnett, B. N., Larson, S., & Roter, D. L. (2008). Veterinarian-client-patient communication during wellness appointments versus appointments related to a health problem in companion animal practice. *Journal of the American Veterinary Medical Association*, *233*(10), p. 1576–1586. https://doi.org/10.2460/javma.233.10.1576

Sheridan, J. (2018). Large corporate acquisitions and the shortage of vets. *Veterinary Record*,

182(16), p. 464–465. https://doi.org/10.1136/vr.k1689

Shilcock, M., & Stutchfield, G. (2008a). Chapter 7—Managing Human Resources – The Importance of Staff, Recruitment and Discipline. In M. Shilcock & G. Stutchfield (ed.), *Veterinary Practice Management (Second Edition)* (p. 53–69). W.B. Saunders. https://doi.org/10.1016/B978-0-7020-2920-2.50010-8

Shilcock, M., & Stutchfield, G. (2008b). Chapter 11—Client Care. In M. Shilcock & G. Stutchfield (ed.), *Veterinary Practice Management (Second Edition)* (p. 103–112). W.B. Saunders. https://doi.org/10.1016/B978-0-7020-2920-2.50014-5

Shilcock, M., & Stutchfield, G. (2008c). Chapter 12—Sales and Marketing. In M. Shilcock & G. Stutchfield (ed.), *Veterinary Practice Management (Second Edition)* (p. 113–125). W.B. Saunders. https://doi.org/10.1016/B978-0-7020-2920-2.50015-7

Shilcock, M., & Stutchfield, G. (2008d). Chapter 13—Understanding Financial Accounts. In M. Shilcock & G. Stutchfield (ed.), *Veterinary Practice Management (Second Edition)* (p. 127–136). W.B. Saunders. https://doi.org/10.1016/B978-0-7020-2920-2.50016-9

Shilcock, M., & Stutchfield, G. (2008e). Chapter 14—Management Accounts and Financial Planning. In M. Shilcock & G. Stutchfield (ed.), *Veterinary Practice Management (Second Edition)* (S. 137–147). W.B. Saunders. https://doi.org/10.1016/B978-0-7020-2920-2.50017-0

Smiley, A. (2022). Asynchronous Veterinary Telemedicine. *Telemedicine*, *52*(5), p. 1135–1140. https://doi.org/10.1016/j.cvsm.2022.05.003

Smiley, A. J. (2022). Veterinary Remote Care. *Telemedicine*, *52*(5), ix. 1 p. https://doi.org/10.1016/j.cvsm.2022.07.001

Smith, S. M., George, Z., Duncan, C. G., & Frey, D. M. (2022). Opportunities for Expanding Access to Veterinary Care: Lessons From COVID-19. *Frontiers in Veterinary Science*, *9*. 20 p. https://doi.org/10.3389/fvets.2022.804794

Statista. (2023). Heimtiermarkt Deutschland 68p. https://de.statista.com/statistik/studie/id/7127/dokument/haustiere---statista-dossier/. Search engine: Google scholar. Key words: pet economics germany Date of Search: 2023.06.10

Stowe, J. D. (1998). Veterinary practice management. Boom or bust: The impact of changing demographics on today's practice. *The Canadian Veterinary Journal = La Revue Veterinaire Canadienne*, *39*(6), p. 379–382.

Strecker, O., Haunhorst, E., Helfmeier, M., Spinelli, M., Ebert, V., Paustian, M., & AFC Public Services GmbH. (2021). Prüfung der finanziellen und strukturellen Auswirkungen

hinsichtlich der angemessenheit der Gebührensätze der Gebührenordnung für Tierärzte (GOT*)*. *Bundesanstalt für Landwirtschaft und Ernährung (BLE) für das Bundesministerium für Ernährung und Landwirtschaft (BMEL)*. 170p.

Szücs, L., Bárdos, K., Máté, M., & Ózsvári, L. (2023). Motivation factors for the Hungarian veterinary students' carrier choice between 2016 and 2020 (in Hungarian). *Magyar Állatorvosok Lapja*, *145*(9), p. 555–569. https://doi.org/10.56385/magyallorv.2023.09.555-569

Thiele, S. (ed.). (2009). Die gesunde Tierarztpraxis: Kundenorientierung und Positionierungsstrategien (1. ed). Göttingen: Enke. 144p.

UVMB (2024). Basics of Communication. University of Veterinary Medicine Budapest. https://univet.hu/en/education/courses/basics-of-communication/ Search engine: Google. Key words: vet curriculum Budapest. Date of Search: 2024.02.04

UVMB (2023). Veterinary Curriculum. University of Veterinary Medicine Budapest. https://univet.hu/wp-content/uploads/2023/06/Curriculum-English-2023_24.pdf. Search engine: Google. Key words: vet curriculum Budapest. Date of Search: 2024.02.04

UVMB (2021). German veterinary students at the university of veterinary medicine Budapest from 1989-2019. (Unpublished data given within a personal interview with Ózsvári, L.)

UVMB (2017). Postgraduate Training. University of Veterinary Medicine Budapest. URL https://univet.hu/en/education/postgraduate-training/ Search engine: Google. Key words: vet curriculum Budapest. Date of Search: 2023.01.23

Van Der Heijden, J. P., De Keizer, N. F., Bos, J. D., Spuls, P. I., & Witkamp, L. (2011). Teledermatology applied following patient selection by general practitioners in daily practice improves efficiency and quality of care at lower cost. *British Journal of Dermatology*, *165*(5), p. 1058–1065. https://doi.org/10.1111/j.1365-2133.2011.10509.x

Verdon, D. (2011). *Pet owners push back on prices*. DVM360 News. https://www.dvm360.com/view/pet-owners-push-back-prices. Search engine: Google scholar. Key words: veterinary economics Date of Search: 2023.06.10

VetRecord (2013). Getting down to business. *The Veterinary Record*, *173*(5), p. 104. https://doi.org/10.1136/vr.f4562

Volk, J. O., Felsted, K. E., Thomas, J. G., & Siren, C. W. (2011). Executive summary of the Bayer veterinary care usage study. *Journal of the American Veterinary Medical Association*, *238*(10), p. 1275–1282. https://doi.org/10.2460/javma.238.10.1275

Volk, J. O., Thomas, J. G., Colleran, E. J., & Siren, C. W. (2014). Executive summary of phase 3 of the Bayer veterinary care usage study. *Journal of the American Veterinary Medical*

Association, *244*(7), p. 799–802. https://doi.org/10.2460/javma.244.7.799

Voyer, J., & Jordan, T. (2018). Veterinary Telemedicine: A System Dynamics Case Study. *Systems*, *6*(1), 6p. https://doi.org/10.3390/systems6010006

Vredenburg, S. D. (2009). Changing trends in practice management. *Journal of the American Veterinary Medical Association*, *234*(3), p. 324.

Walster, C. (2001). Corporate practice. *The Veterinary Record*, *148*(13), 419p.

Watson, K., Wells, J., Sharma, M., Robertson, S., Dascanio, J., Johnson, J. W., Davis, R. E., & Nahar, V. K. (2019). A survey of knowledge and use of telehealth among veterinarians. *BMC Veterinary Research*, *15*(1), p. 474. https://doi.org/10.1186/s12917-019-2219-8

Wessels, R., Lam, T., & Jansen, J. (2014). Communication in practice: The vet's manual on clienthusiasm (1. ed). Nijmegen: Communication in Practice. 230p.

Whiting, M., Alexander, A., Habiba, M., & Volk, H. A. (2017). Survey of veterinary clients' perceptions of informed consent at a referral hospital. *Veterinary Record*, *180*(1), 20p. https://doi.org/10.1136/vr.104039

Widmar, N. O., Bir, C., Slipchenko, N., Wolf, C., Hansen, C., & Ouedraogo, F. (2020). Online procurement of pet supplies and willingness to pay for veterinary telemedicine. *Preventive Veterinary Medicine*, *181(3)*. 11p. https://doi.org/10.1016/j.prevetmed.2020.105073

Wilke, V. L., Robinson, D. A., Evans, R. B., Rothschild, M. F., & Conzemius, M. G. (2005). Estimate of the annual economic impact of treatment of cranial cruciate ligament injury in dogs in the United States. *Journal of the American Veterinary Medical Association*, *227*(10), p. 1604–1607. https://doi.org/10.2460/javma.2005.227.1604

Wu, H., Bains, R. S., & Preston, C. (2023). Physical health caregiver, mental wellness supporter, and overall well-being advocate: Women's roles towards animal welfare during the COVID-19 emergency response. *International Journal of Disaster Risk Reduction*, *92*, 103719. 13p. https://doi.org/10.1016/j.ijdrr.2023.103719

ZZF, I. (2023). Der Deutsche Heimtiermarkt 2022 (p. 4). https://www.zzf.de/fileadmin/ZZF/Dokumente/Heimtiermarkt/ZZF_IVH_Der_Deutsche_Heimtiermarkt_Anzahl_Heimtiere_2022.pdf. Search engine: Google scholar. Key words: pet economics germany Date of Search: 2023.06.10

ZZF, & IVH (2019). Deutscher Heimtiermarkt und Heimtierpopulation 2018. https://www.zzf.de/publikationen/marktdaten.html?L=0. Search engine: Google scholar. Key words: pet economics germany Date of Search: 2023.06.10

ZZF, & IVH (2021). Heimtiermarkt 2020 und Anzahl der Heimtiere in Deutschland. https://www.zzf.de/fileadmin/files/ZZF/Marktdaten/ZZF_IVH_Folder_Der_deutsche_Hei

mtiermarkt_2020_und_Anzahl_der_Heimtiere_in_Deutschland.pdf. Search engine: Google scholar. Key words: pet economics germany Date of Search: 2023.06.10

ANNEX II – ACKNOWLEDGEMENTS

I would like to express my deepest gratitude to everyone who has supported me throughout this Ph.D. journey.

First and foremost, I extend my sincere thanks to my advisor, Dr. László Ózsvári, for his steadfast guidance, encouragement, and invaluable expertise. His profound knowledge in veterinary economics and management has been a cornerstone in shaping my research and has significantly influenced the direction and quality of my work. I am truly grateful for his mentorship, which has been instrumental in helping me navigate this academic path.

My heartfelt thanks go to my family for their unwavering support, love, and patience. Their constant encouragement has been my source of strength and motivation, reminding me to persevere through challenges and stay committed to my goals.

I am equally grateful to my friends and colleagues who have been a constant source of support. Their advice, discussions, and camaraderie have enriched this experience, making the difficult moments more manageable and the successes more rewarding.

Special thanks are due to all the participants and survey respondents who generously contributed their time and insights to this study. Their participation has been crucial in providing the data and perspectives necessary for this research.

Finally, I would like to extend my appreciation to everyone who has supported me in countless ways, whether through words of encouragement, practical help, or simply by believing in me. Each of you has played a vital role in helping me reach this milestone, and for that, I am deeply grateful.

ANNEX III – QUESTIONNAIRE OF DIGITALIZATION STUDY

Analysis of the perception and acceptance of telemedicine services in veterinary medicine

1. Where do you live ? Large City: >100.000 inhabitants, medium town: 50.000-100.000, small town: 10.000-49.999, rural: <10.000
2. Sex? Male Female diverse
3. How old are you? 18-24 25-34 35-44 45-54 55-64 65-74 75+
4. What region are you from? All German States were listed
5. What is your occupation? Public Health and Medicine, Students or Pupils, Service Sector, Pedagogues and Social Workers, Administrators, Agricultural/Nature/Environmental Workers, Economists, Pensioners, Natural Sciences, Information Technology, Construction and Architecture, Art and Design, Metal/Steel Engineering Industry, Production, Law (Policemen, Lawyers), Electronics and Technology, Journalism, Logistics and Traffic Sector, Other.
6. Are you a pet owner? Y/N
7. If yes what kind of pets?

Small Animals Large Animals Farm Animals Exotics Birds

8. If you do own a pet, would you be willing to accept a telemedicine-based consultation? Y/N
9. Does your pet appear nervous/frightened/stressed during a visit to your vet?
10. Do you think the law should make it legal for vets to diagnose an animal based on findings from a virtual consultation? Y/N
11. Do you think the law should make it legal for vets to prescribe medication to a patient based on findings from a virtual consultation? Y/N
12. What are the reasons why you would refuse a telemedical consultation/examination? (MCQ)
    Concerns about data protection, Fear of breach of privacy, Lack of examination options, Insufficient internet connection, Lack of personal component, Technical complications, Other.
13. Do you mind waiting times at the vet? Y/N
14. Do you think that online appointments are more efficient? Y/N
15. Are you in any way bothered by your journey to your vet? (MCQ)
    Distance, Time required, Petrol costs, Animal does not tolerate journey, Other.
16. For what kind of appointments do you prefer online appointments booking? (MCQ)

Vaccination, Check-up, Post-surgery check-up, Emergency, General examination, Ancillary diagnostics (ultrasound, x-ray, CT/MRI, etc.), Other.

17. Do you think telemedicine would be an asset to your practice/clinic? Y/N
18. In which area do you see the most potential for telemedicine? (MCQ)
    Small animal medicine, Equine medicine, Livestock/herd health, Monitoring, Pathology.
19. For which population group do you see telemedicine as particularly beneficial? (MCQ)
    General population, Rural population, Urban population, Geographically isolated people, Elderly people/retirement homes, Physically impaired/Disabled, Other.
20. Which medium/website would you prefer to use to communicate with your vet online? (MCQ)
    Skype, Zoom, Facebook, WhatsApp, Microsoft Teams, Messenger, Email, FaceTime, Other.
21. Have you already used telemedicine providers? Y/N
22. How useful do you think telemedical counselling in emergency services is? Y/N
23. Do you think veterinary medicine should be more digitalized? Y/N

ANNEX IV – QUESTIONNAIRE OF PRACTICE MANAGEMENT STUDY

Section 1 – Sociodemographic information

1. Where is your residency? (m - mandatory)

o Big city (> 100.000) o Middle city (50.001-100.000) o Small town (10.001-50.000)
o Village (<10,000)

2. In which state are you living in? (m)

o Baden-Württemberg o Bayern o Berlin o Brandenburg o Bremen o Hamburg o Hessen o Mecklenburg-Vorpommern o Niedersachsen o Nordrhein-Westfalen o Rheinland-Pflanz o Saarland o Sachsen o Sachsen-Anhalt o Schleswig-Holstein o Thüringen

3. Where is your workplace? (Multiple answers possible!) (m)

o Big city (> 100.000) o Middle city (50.001-100.000) o Small town (10.001-50.000)
o Other (<10,000)

4. Gender (o - optional) o Male o Female
5. How old are you? (m) o 24-30 o 31-40 o 41-50 o 51-60 o 61-70 o 70+
6. How do you keep up to date with new developments within the profession and in your specialization? (o)

o Course offers o Magazines/ journals o Colleagues o Congresses o Internet o Consultant
o Other: _____

7. What further training have you personally done? (e.g. surgery, dermatology, practice management, ...) (m) _____
8. Do you regularly consult other colleagues or consultants? (o)

   Yes No

Section 2. Practice type

9. Which legal form is your veterinary practice? (m)

o Sole proprietor/ self-employed person/ freelancer o GbR (partnership under civil law)

o GmbH (limited liability company) o GmbH & Co. KG (limited partnership)

o AG (stock corporation)

10. How many business partners do you have? (m) _____

11. Which one of the following is your practice type? (m)

o Small animal practice o Small animal practice at clinic level/ small animal centre

o Small animal clinic o Mixed practice

12. If you have a mixed practice, what is the percentage of small animal patients? (%) (m)

13. How old is your practice? (m) _____ years

14. How important is the reception area to you? (1: very important, 5: not important) (o)

15. What are your consultation hours (number of hours per day)? (o)

	Official hours		Real hours		On call	Emergency hours
	AM	PM	AM	PM	AM/PM	AM/PM
Monday						
Tuesday						
Wednesday						
Thursday						
Friday						
Saturday						
Sunday						

16. Do you offer emergency servies?

o Yes, for our own clients o Yes, at selected times o Yes, always

o Yes, together with other practices in the district o No o Other: _____

17. How many of the rooms do you have in your practice/clinic? (o)

o treatment rooms: ___ o X-ray: ___ o Ultrasound: ___ o surgery preparation: ___

o Pharmacy: ___ o Surgery tables: ___ o Station: o Dog Boxes: ___ o Cat boxes: ___

o Waiting room: __ o offices ___ o storage rooms___o reception__

18. Dogs and cats wards separated (o) Yes No

19. Separated entrance and exit (i.e. for euthanasia)(o) Yes No

20. Size of the practice/clinic: (m) ___ m2

21. Size of the waiting room: (m) ___ m2

22. How many parking spaces/lots are available for your customers next to the clinic? (o)

Number: ___

Section 3: Staff

23. Please indicate the number of employees in the following table. (m)

Type of employee	No.
Practice owner	
Practice manager	
Veterinarians (persons in total)	
Veterinarians (full-time equivalent)	
Technicians in total	
Technicians (full-time equivalent)	
Trainees/ Interns	
Receptionist	
Cleaning, etc.	
Others	

If the practice owner is the practice manager leave practice manager blank

24. Indicate the number of specialists in the relevant field within your practice (mixed order- not alphabetical as the original version is in german, for means of comparison) (m) (multiple answers possible)

o Anesthesiology o Cardiology o Diagnostic Imaging o Dermatology o Dietetics o Dentistry
o Internal medicine o Neurology o Oncology o Ophtalmology o Orthopedics
o Rehabilitation o Small animals o Surgery o Others:

25. How many working hours per week do you have on average? (m)

o <30 hours o 30-40 hours o 40-50 hours o 50-60 hours o >60 hours

Section 4: Management, Controlling and Finances

26. Which practice software do you use? Please specify! (o) _____

27. Do you use the financial functions of the software to be constantly up to date? (o)

Yes No

28. Do you employ an external accountant? (o) Yes No

29. Do you hire a lawyer constantly? (o) Yes No Occasionally

Controlling

30. Who is carrying out the management in the practice? (m)

o CEO o practice manager o veterinary technician o other o none

31. How often do your carry out analysis of the benchmark numbers of the revenue and costs? (o)

o biweekly o monthly o quarterly o halfyearly o yearly o none/ never

32. Who and how often do you set new operational and strategic goals? (o)

o monthly o quarterly o half-yearly o yearly o never

33. What GOT rate do you use during normal office hours? (m) _____ factor

34. How many patients do you treat on average per day? (m)

o dogs: _____ o cats: _____ o small mammals: _____ o Others: ___

35. How many vaccinations do you give each week on average? (o) o Number: _____

36. Average number of surgeries per week: (m)

o Soft tissue surgery: _____ o Orthopedic surgery: _____ o dental treatments: _____

o Other: _____

37. Do you measure your monthly increase in pet owners? (m) Yes No

38. What is the annual revenue of your practice? (m)

o <250.000€ o 250.000-500.000 o 500.001-750.000€ o 750-1.000.000€ o 1mil. - 1,5mil.

o 1,5 mil. - 2,5 mil. € o Over 2,5 mil.€

39. How much of the revenue is by sales and how much is by service? (m)

o service: ___ % o sales: ____%

40. Which animal species accounts for which part of the revenue? (o)

o dogs: _____ % o cats: _____ % o small mammals: _____% o Other: _____

41. Which were the months with the lowest average sales in the last 3 years? (o)

Months: _____

42. Which were the months with the highest average sales in the last 3 years? (o)

Months: _____

43. What is the average revenue per patient? (m)

Average revenue per patient			
Revenue	Dogs	Cats	Small mammals
<50€			
50-100€			
101-250€			
251-500€			
501-750€			
>750€			

44. What changes in revenue did you observe during the corona crisis? (m)

o An increase of ____ % per month o A reduction of _____% per month

45. What changes in the number of patients have you observed in recent years? (m)

Increase Stagnation Decline

46. What changes in sales per patient have you observed in recent years? (m)

Increase Stagnation Decline

47. Are you planning to increase your prices for your services next year? (o)

Yes No Maybe

48. What investment do you think would be the best to promote the development of your business? (m)(multiple answers)

o Professional development o Practice equipment o specialized / additional services o more employees / veterinarians o Sales o Marketing o Others: _____

Section 5: customer experience and marketing

49. Do you agree with the statement that the first visit is the most important? (m) Likert scale

50. Which marketing tools do you actively use? (mark with x) (m)

	Yes	No	Carried out by own team
Vaccination reminders			
Newsletter			
Exit interview			
Website			
Blog			
Google my business			

Google Ads			
WhatsApp Business			
Facebook			
Facebook Analytics			
Instagram			
Youtube			
Tik-Tok			
Presentations/ Workshops			
Others____			

51. What services do you offer? (m) (multiple answers)

o Pharmacy o CT o MRI o X-ray o Ultrasound o Laboratory o ECG o Dental station o Acupuncture o Sale of animal feed o House calls o Homeopathy o Physiotherapy o Animal care products o Grooming o Hospital o Others:

52. Which organisations do you work with? (o)

o Animal welfare organisations o Dog trainers o Feedstuff producers o Pet shops o Breeders clubso working dog kennels (police, rescue services, etc. o Others: _____

Section 6: Future trends

53. Do you think that the demand for specialized veterinarians will be increasing? (m)

    Yes No

54. Do you think that the number of employed veterinarians in veterinary practices and clinics will increase in the future? (o)

    Yes No I do not know

55. During the last couple of years the number of employed veterinarians showed a steady increase in female veterinarians. Do you think the feminisation of the profession is due to this development? (m)

    Yes No I do not know

56. If you could decide in which area the profession should improve in the future, how would you decide (multiple choice possible) (m)

o Changes in working hours o Structural changes in the training of veterinarians (study places, NC, etc.) o Economics in the curriculum of the study o Better information exchange among colleagues o Specialization and course offers o Free market economy/ abolition of the fee system o Other:_____

57. How do you think the revenue of patients will change in the future?

(please mark with x) (m)

Revenue per patient			
	Decline	Stagnation	Increase
Dogs			
Cats			
Small mammals			

Section 7: personal opinions

Please rate the following statements on a scale of 1 to 5 (1: agree completely; 5: disagree not at all) (all mandatory)

58. I consider it important to educate the client in a professional manner.
59. The location of the practice property is of utmost importance.
60. My sales of veterinary services are significantly influenced by my competitors.
61. I feel confident and competent in the application of my services.
62. I maintain a good and professional exchange with my colleagues.
63. I consider communication with the customer to be very important.
64. I consider it particularly important to inform the customer adequately about the costs of the examinations and treatments.
65. I have enough time to examine each patient thoroughly and advise the owner adequately.
66. I think that sales can be significantly increased by improving management.
67. Active investment in the marketing of the practice will be of decisive importance in the future in the acquisition of new customers.
68. Telemedicine can play a significant role in the future of veterinary medicine

ANNEX V – DESCRIPTICE STATISTICS OF DEMOGRAPHIC CHARACTERISTICS

Demographic Characteristics (N =301, Section 1)

Questions	Levels	N
Residency	Village/ municipality (<10,000 inhabitants)	105 (34.9)
	Large city (>100,000 inhabitants)	58 (19.3)
	Small town (10,0001-50,000 inhabitants)	100 (33.2)
	Medium-sized town (50.001-100,000 inhabitants)	38 (12.6)
State	Baden-Württemberg	15 (5.0)
	Bayern	35 (11.6)
	Berlin	11 (3.7)
	Brandenburg	17 (5.6)
	Bremen	8 (2.7)
	Hamburg	13 (4.3)
	Hessen	18 (6.0)
	Mecklenburg-Vorpommern	10 (3.3)
	Niedersachsen	25 (8.3)
	Nordrhein-Westfalen	32 (10.6)
	Rheinland-Pfalz	15 (5.0)
	Saarland	10 (3.3)
	Sachsen	30 (10.0)
	Sachsen-Anhalt	11 (3.7)
	Schleswig-Holstein	39 (13.0)
	Thüringen	12 (4.0)
WorkPlace	Village/ municipality (<10,000 inhabitants)	86 (28.6)
	Large city (>100,000 inhabitants)	72 (23.9)
	Small town (10,0001-50,000 inhabitants)	105 (34.9)
	Medium-sized town (50.001-100,000 inhabitants)	38 (12.6)
Gender	Diverse	2 (0.7)
	Male	112 (37.2)
	Female	187 (62.1)
Age	25 to 34	19 (6.3)
	35 to 44	62 (20.6)
	45 to 54	99 (32.9)
	55 to 64	101 (33.6)
	65 to 74	18 (6.0)
	Other	2 (0.7)
Up to date with new developments		
	Courses on offer	220 (73.1)
	Webinars	238 (79.1)
	Journals/ magazines	257 (85.4)
	Colleagues	170 (56.5)
	Congresses	217 (72.1)
	Internet	192 (63.8)
	Consultants	36 (12.0)
	Other (please specify)	7 (2.1)
	Yes	237 (78.7)
	No	46 (15.3)

ANNEX VI – PRACTICE CHARACTERISTICS OF SURVEYED PRACTICES

Practice Characteristics (N =301, Section 1)

Questions	Levels	N
Legal Form	AG – stock corporation	1 (0.3)
	Sole Proprietor/ self-employed person/ freelancer	192 (63.8)
	GbR (partnership under civil law)	63 (20.9)
	GmbH & Co. KG (limited partnership)	2 (0.7)
	GmbH (Gesellschaft mit beschränkter Haftung) (LLC)	21 (7.0)
	NA	22 (7.3)
Practice Type	Mixed animal practice	64 (21.3)
	Small animal clinic	20 (6.6)
	Small animal practice	157 (52.2)
	Small animal centre/ practice on clinic level	28 (9.3)
	Other	10 (3.3)
	NA	22 (7.3)
Practice Length	< 1 year	10 (3.3)
	>10 years	210 (69.8)
	1-3 years	12 (4.0)
	4-6 years	23 (7.6)
	7-10 years	24 (8.0)
	NA	22 (7.3)
Offer Emergency Services?	Yes for own clients	47 (15.6)
	Yes, always	39 (13.0)
	Yes, at selected times	39 (13.0)
	Yes, together with other practices in the district	103 (34.2)
	No	44 (14.6)
	Other (please specify)	7 (2.3)
	NA	22 (7.3)
Dogs/Cats wards seperated	Yes	78 (25.9)
	No	201 (66.8)
	NA	22 (7.3)
Separate Entrance	Yes	129 (42.9)
	No	150 (49.8)
	NA	22 (7.3)
Room Size	10-20	131 (43.5)
	> 20	111 (36.9)
	< 10	34 (11.3)
	NA	25 (8.3)
Area Importance (mean (SD))		1.80 (1.25)
Buisness Partners (mean (SD))		0.87 (2.58)
Rezeption (mean (SD))		0.78 (0.45)
Clinic Size (mean (SD))		228.54 (294.15)
Num Lots (mean (SD))		8.29 (7.99)

ANNEX VII – PREMISES CHARACTERISTICS OF SURVEYED PRACTICES

How many of the rooms do you have in your practice/clinic?

	0	1	2	3	4	5	6	7	>8	NA
Treatment rooms	2 (0.7)	65 (21.6)	125 (41.5)	41 (13.6)	15 (5.0)	11 (3.7)	4 (1.3)	8 (2.7)	8 (2.7)	22 (7.3)
X-ray room	28 (9.3)	237 (78.7)	9 (3.0)	1 (0.3)						26 (8.6)
Ultrasound room	111 (36.9)	127 (42.2)	12 (4.0)	3 (1.0)						48 (15.9)
Surgery preparation	87 (28.9)	144 (47.8)	11 (3.7)	1 (0.3)						58 (19.3)
Pharmacy	27 (9.0)	226 (75.1)	15 (5.0)	1 (0.3)						32 (10.6)
Operating tables	9 (3.0)	137 (45.5)	90 (29.9)	20 (6.6)	14 (4.7)	2 (0.7)	1 (0.3)	1 (0.3)		27 (9.0)
Dog wards	52 (17.3)	62 (20.6)	55 (18.3)	33 (11.0)	16 (5.3)	12 (4.0)	9 (3.0)	6 (2.0)	23 (7.6)	33 (11.0)
Cat wards	40 (13.3)	25 (8.3)	71 (23.6)	35 (11.6)	37 (12.3)	4 (1.3)	11 (3.7)	5 (1.7)	42 (14.0)	31 (10.3)
Waiting room	18 (6.0)	208 (69.1)	49 (16.3)	1 (0.3)	2 (0.7)					23 (7.6)
Offices	60 (19.9)	143 (47.5)	32 (10.6)	23 (7.6)	4 (1.3)	3 (1.0)	3 (1.0)	1 (0.3)	1 (0.3)	31 (10.3)
Storage rooms	21 (7.0)	171 (56.8)	53 (17.6)	13 (4.3)	9 (3.0)	1 (0.3)			1 (0.3)	32 (10.6)
Reception (%)	62 (20.6)	203 (67.4)	4 (1.3)							32 (10.6)

ANNEX VIII – EMPLOYEE CHARACTERISTICS OF SURVEYED PRACTICES

lease indicate the number of employees in the following table (N(%)

Variables	0	1	2-5	6-10	11-25	>26	NA
Practice owner	8 (2.66)	157 (52.16)	85 (28.24)	11 (3.65)	7 (2.33)	2 (0.66)	31 (10.30)
Practice Manager	165 (54.82)	55 (18.27)	10 (3.32)				71 (23.59)
Veterinarians (total)	6 (1.99)	74 (24.58)	142 (47.18)	24 (7.97)	13 (4.32)	8 (2.66)	34 (11.30)
Veterinarians (full-time equivalent)	27 (8.97)	62 (20.60)	123 (40.86)	14 (4.65)	12 (3.99)	4 (1.33)	59 (19.60)
TFA (total)	21 (6.98)	45 (14.95)	137 (45.51)	33 (10.96)	18 (5.98)	11 (3.65)	36 (11.96)
TFA (full-time equivalent)	32 (10.63)	55 (18.27)	117 (38.87)	25 (8.31)	13 (4.32)	6 (1.99)	53 (17.61)
Interns / trainees	201 (66.78)	17 (5.65)	6 (1.99)				77 (25.58)
Receptionists	141 (46.84)	55 (18.27)	36 (11.96)	3 (1)			66 (21.93)
Hygiene personnel, maintenance, etc.	110 (36.54)	105 (34.88)	26 (8.64)	1 (0.33)			59 (19.60)

Indicate the number of specialists in the relevant field within your practice *(N(%)*						
Variables	0	1-3	4-6	7-10	>10	NA
Anesthesiology	180 (59.80)	24 (7.97)			1 (0.33)	96 (31.89)
Imaging	165 (54.82)	39 (12.96)	1 (0.33)			96 (31.89)
surgery	129 (42.86)	80 (26.58)	4 (1.33)	1 (0.33)		87 (28.90)
dermatology	158 (52.49)	54 (17.94)				89 (29.57)
Dietetics	170 (56.48)	31 (10.30)	1 (0.33)			99 (32.89)
Internal Medicine	137 (45.51)	63 (20.93)	8 (2.66)			93 (30.90)
cardiology	143 (47.51)	65 (21.59)				93 (30.90)
neurology	181 (60.13)	20 (6.64)	2 (0.66)			98 (32.56)
oncology	185 (61.46)	16 (5.32)				100 (33.22)
ophthalmology	168 (55.81)	41 (13.62)	1 (0.33)			91 (30.23)
Orthopedics ... 66	153 (50.83)	49 (16.28)	5 (1.66)	1 (0.33)		93 (30.90)
rehabilitation	165 (54.82)	34 (11.30)		1 (0.33)		101 (33.55)
Dentistry	141 (46.84)	70 (23.26)	1 (0.33)			89 (29.57)
FTA for small animals	141 (46.84)	52 (17.28)	13 (4.32)	1 (0.33)	1 (0.33)	93 (30.90)
No specialists	126 (41.86)	55 (18.27)	5 (1.66)	5 (1.66)	4 (1.33)	106 (35.22)

ANNEX IX – OPENING AND WORKING HOURS OF SURVEYED PRACTICES

What are your opening hours?

Days	<5 hours	>16 h	12-16 h	6-8 h	9-12 h	No consultation h	NA
Monday	51 (16.9)	3 (1.0)	10 (3.3)	142 (47.2)	66 (21.9)	7 (2.3)	22 (7.3)
Tuesday	56 (18.6)	3 (1.0)	8 (2.7)	141 (46.8)	65 (21.6)	4 (1.3)	24 (8.0)
Wednesday	114 (37.9)	2 (0.7)	9 (3.0)	93 (30.9)	45 (15.0)	13 (4.3)	25 (8.3)
Thursday	59 (19.6)	2 (0.7)	9 (3.0)	139 (46.2)	62 (20.6)	6 (2.0)	24 (8.0)
Friday	65 (21.6)	2 (0.7)	11 (3.7)	139 (46.2)	50 (16.6)	8 (2.7)	26 (8.6)
Saturday	129 (42.9)	2 (0.7)	3 (1.0)	10 (3.3)	3 (1.0)	95 (31.6)	59 (19.6)
Sunday	27 (9.0)	3 (1.0)	2 (0.7)	4 (1.3)	2 (0.7)	174 (57.8)	89 (29.6)

Working Hours (%)	
<30 hours	23 (7.6)
>60 hours	15 (5.0)
30-40 hours	70 (23.3)
40-50 hours	111 (36.9)
50-60 hours	54 (17.9)
<NA>	28 (9.3)

ANNEX X – MANAGEMENT AND FINANCE CHARACTERISTICS OF SURVEYED PRACTICES

Variables	Labels	N (%)
Financial Function (%)	Yes	132 (43.9)
	no	89 (29.6)
	NA	80 (26.6)
External Accountant (%)	Yes	146 (48.5)
	no	75 (24.9)
	NA	80 (26.6)
Hire Lawyer (%)	Yes	28 9.3)
	no	193 (64.1)
	NA	80 (26.6)
Carry Management (%)	Business owner	178 (59.1)
	None	1 0.3)
	Practice manager	28 9.3)
	Other	7 2.3)
	TFA	7 2.3)
	NA	80 (26.6)
Analysis Revenue (%)	half-yearly	21 7.0)
	yearly	12 4.0)
	monthly	122 (40.5)
	Never	7 2.3)
	Other	6 2.0)
	quarterly	35 (11.6)
	biweekly	18 6.0)
	NA	80 (26.6)
Goals (%)	half-yearly	58 (19.3)
	yearly	72 (23.9)
	monthly	15 5.0)
	Never	35 (11.6)
	Other (please specify)	13 4.3)
	quarterly	28 9.3)
	NA	80 (26.6)
How many patients do you treat on average per day?		
Dog Treatment (mean (SD))		18.43 (16.80)
Cat Treatment (mean (SD))		14.76 (12.60)
Pet Treatment (mean (SD))		4.17 (3.89)
Other Treatment (mean (SD))		4.78 (19.78)
Vaccination (mean (SD))		25.95 (16.77)
Soft tissue surgery (mean (SD))		7.68 (8.50)
Orthopedics (mean (SD))		1.95 (5.45)
Dental surgery (mean (SD))		4.50 (5.68)
Other (mean (SD))		2.91 (4.46)

Revenue analysis

Pet Monthly Increase (%)	Yes	54 (17.9)
	No	167 (55.5)
	NA	80 (26.6)
Annual Turnover (%)	*<250,000*	62 (20.6)
	1 million - 1.5 million	20 6.6)
	1.5 million - 2.5 million	6 2.0)
	250,000-500,000	71 (23.6)
	500,001-750,000	25 8.3)
	750,001- 1 million	21 7.0)
	Other	5 1.7)
	Over 2.5 million	11 3.7)
	NA	80 (26.6)

How much of the revenue is by sales and how much is by service?	
Service (mean (SD))	2259.81 (22634.56)
Sale (mean (SD))	4557.40 (56917.72)

Which animal species accounts for which part of the turnover?	
Dog turnover (mean (SD))	52.42 (15.48)
Cats Turnover (mean (SD))	37.25 (12.16)
Pet Turnover (mean (SD))	8.01 (10.63)

Month Lowest Average (%)	April June	21 7.0)
	January - March	121 (40.2)
	July September	23 7.6)
	October-December	25 8.3)
	Other (please specify)	31 (10.3)
	NA	80 (26.6)
Month Highest Average (%)	April June	36 (12.0)
	January - March	26 8.6)
	July September	94 (31.2)
	October-December	44 (14.6)
	Other (please specify)	21 7.0)
	NA	80 (26.6)
Average Turnover/ Dog (%)	<50 €	30 (10.0)
	€ 101-250	43 (14.3)
	251-500	7 2.3)
	€ 51-100	136 (45.2)
	NA	85 (28.2)
Average Turnover/ Cat (%)	<50 €	83 (27.6)
	> 500 €	1 0.3)
	€ 101-250	27 9.0)
	€ 51-100	101 (33.6)
	NA	89 (29.6)
Average Turnover/ Small mammals(%)	<50 €	168 (55.8)
	€ 101-250	1 0.3)
	€ 51-100	32 (10.6)
	NA	100 (33.2)
Sale Corona Increse (mean (SD))	April June	10.68 (7.66)
Sale Corona Decrease (mean (SD))	January - March	3.50 (7.91)
Change in Num Patients (%)	July September	12 4.0)
	October-December	182 (60.5)
	Other (please specify)	24 8.0)
	NA	2 0.7)
	April June	81 (26.9)
Change Sale Patients (%)	January - March	3 1.0)
	July September	193 (64.1)
	October-December	20 6.6)
	Other (please specify)	5 1.7)
	NA	80 (26.6)
Plan Increase Price (%)	<50 €	183 (60.8)
	€ 101-250	14 4.7)
	251-500	24 8.0)
	€ 51-100	80 (26.6)
Investment to promote Business	NA	137 (45.5)
	<50 €	141 (46.8)
	> 500 €	140 (46.5)
	€ 101-250	95 (31.6)
	€ 51-100	22 7.3)
	NA	59 (19.6)
	<50 €	58 (19.3)
	€ 101-250	17 (5.1%)

ANNEX XI – CUSTOMER EXPERIENCE AND MARKETING CHARACTERISTICS OF SURVEYED PRACTICES

Which marketing tools do you actively use?

Variables	Yes	No	Yes + own team	NA
Important First Visit	**199 (66.1)**	**20 6.6)**		**82 (27.2)**
Vaccination Reminders	81 (26.91)	59 (19.60)	75 (24.92)	83 (27.57)
Newsletter	8 (2.66)	188 (62.46)	7 (2.33)	98 (32.56)
Website	122 (40.53)	24 (7.97)	68 (22.59)	85 (28.24)
Presentations/Workshops	26 (8.64)	154 (51.16)	21 (6.98)	99 (32.89)
Blogs	12 (3.99)	181 (60.13)	8 (2.66)	100 (33.22)
Google Buisness	56 (18.60)	87 (28.90)	56 (18.60)	101 (33.55)
Google Ads	14 (4.65)	171 (56.81)	12 (3.99)	103 (34.22)
Google Alytics	20 (6.64)	170 (56.48)	7 (2.33)	103 (34.22)
Whatsapp	8 (2.66)	180 (59.80)	7 (2.33)	104 (34.55)
Facebook	48 (15.95)	98 (32.56)	57 (18.94)	95 (31.56)
Facebook Alytics	5 (1.66)	184 (61.13)	4 (1.33)	108 (35.88)
Instagram	15 (4.98)	163 (54.15)	21 (6.98)	102 (33.89)
Youtube	7 (2.33)	188 (62.46)	1 (0.33)	105 (34.88)
Tik Tok		193 (64.12)		108 (35.88)

What services do you offer?	
pharmacy	211 (70.1)
CT	23 7.6)
MRI	6 2.0)
Digital x-ray	181 (60.1)
Ultrasonic	185 (61.5)
laboratory	183 (60.8)
EKG	112 (37.2)
Dental station	178 (59.1)
acupuncture	40 (13.3)
Sale of animal feed	187 (62.1)
Home visits / driving experience	121 (40.2)
homeopathy	102 (33.9)
physical therapy	61 (20.3)
Animal care products	81 (26.9)
Inpatient stay	123 (40.9)
miscellaneous	29 (5.7)
Which organisations do you work with?	
Animal welfare organizations	134 (44.5)
Dog trainer	88 (29.2)
Animal physiotherapists, osteopaths	114 (37.9)
Nutritionist	45 (15.0)
Feed manufacturers	113 (37.5)
Pharmaceutical company	138 (45.8)
Pet shops	14 4.7)
Breeders' associations	39 (13.0)
Working dog kennels (police, emergency services, etc.)	32 (10.6)
miscellaneous	10 (3.0)

ANNEX XII – PERSPECTIVES ON FUTURE TRENDS OF SURVEYED PRACTICES

Questions	**Mean (SD)**
I think it is important to educate the customer in a professional manner	1.31 (0.73)
The location of the practice is of the utmost importance	2.60 (0.95)
My sales of veterinary services are significantly influenced by my competitors	3.42 (1.11)
I feel confident and competent in using my services	1.60 (0.76)
I maintain a good and professional exchange with my colleagues	2.06 (0.98)
I think communication with the customer is very important	1.31 (0.69)
I think it is particularly important to adequately inform the customer about the costs of the examinations and treatments	1.71 (0.81)
I have ample time to thoroughly examine each patient and advise the owner appropriately	1.98 (0.86)
I think sales can be increased significantly through improved management	2.24 (1.03)
I think that sales can be increased significantly through improved marketing	2.46 (1.03)
Active investments in the practice's marketing measures will be of crucial importance for the acquisition of new customers in the future	2.67 (1.02)
Telemedicine will play an important role in the future of veterinary medicine	2.64 (1.21)