GOALS OF ATLAS DENTAL

1. Sector overview & reference work
Our first GFDI study, the “Schedule for the European Dental Market”, marked IDS 2013 by collecting information relating to FIDE countries, illustrating the latest events on the European dental market and making a series of propositions regarding probable tendencies, and we would like to replicate this again with a contemporary overview of the sector.

2. Clear, compact depictions
The issues selected and the manner in which they are elaborated upon mean that this work far surpasses our 2013 study in many respects. It aims to help the reader identify items of relevance at, so to speak, a glance. The selection is accompanied by cartographic representations, with national or European maps being used to create a true ATLAS DENTAL. Individual countries are depicted in green or red, depending on whether an average value is exceeded or not. National and international differences are immediately identifiable. A uniform evaluation grid enables direct international comparisons.

3. Offering a basic analysis of the European situation
Drawing on a multitude of features which influence the dental market in a particular country, a comparative analysis is then conducted for ten selected countries. In addition, information relating to the health system and dental supply and demand structures is also illustrated for these countries.
4. Dental sector profiles

ATLAS DENTAL illustrates differences between countries through the aid of structural profiles that analyse relevant features, both in terms of supply and demand. This examination is complemented through the addition of recognised indices which compare countries in terms of competitiveness, innovativeness and digitisation. Structural profiles contribute to a rapid appreciation of conditions in different countries. Dental technology is an important and independent component of general medical engineering. The similarity of these sectors also means that we frequently make references to general medical technology.

5. Identifying potential and risks

One significant goal of a work of this nature is to sensitise readers to significant issues associated with the dental care available to Europe’s citizens. Simplified depictions also help “amateurs” form a picture of what is certainly a complex market situation. The potential which can be exploited in the different countries (and, in part, in their different regions) is illustrated and measures presented to obviate future risks.

6. Current market developments in the dental sector

This study illustrates contemporary market developments from the perspective of dentists/practices, dental labs and manufacturers/dealers. Furthermore, demand structures and information on the infrastructure of the respective country are also described at various points. Texts and graphic depictions are marked in colour to reflect different perspectives.
ANALYSING STRUCTURES
INTERNATIONAL PERSPECTIVE

Around € 80 billion is spent on dental treatment in the European Union. Given that there are 512.7 million EU citizens (as of 2018), this is equivalent to about € 156 per capita, and this figure continues to rise. The eurozone alone was home to around 341.5 million people in 2018. Public expenditure for dental treatment was between 3 and 8% of respective national health spending in individual European states. Demographic, economic and political factors ensure that the demand for dental services continues to rise. Health systems are being expanded, access to dental care improved, the population’s disposable income is rising (again), the baby boomer generation is getting older and providing for people in need of care is becoming a major challenge.

Patients in a majority of the countries examined need to cover a higher proportion of costs for dental services (particularly in the area of prosthetics) through private means (supplementary dental insurance or out-of-pocket) than for other outpatient or inpatient health care. The tendency in most countries in recent years has been for this proportion to rise.

The ATLAS DENTAL makes no claims with regard to completeness, as the data situation in a vast market such as Europe and an area as extensive as dental health is far too varied. There are around 340,000 practising dentists working in approximately 230,000 practices in the EU area alone. Approximately 210,000 dental technicians are employed in around 40,000 dental laboratories throughout Europe. Aside from this, approx. 25,000 medical engineering companies with about 650,000 employees are to be found in Europe. Half of these companies – with around 210,000 employees – are located in Germany. After the USA & China, Germany is the third largest producer of medical technology in the world. The United Kingdom, Italy, Switzerland, Spain and, also, France are further major producing countries. FIDE, the Federation of the European Dental Industry, represents the interests of over 550 dental manufacturers organised in nine national associations.

A Europe-wide consideration of selected demand and supply indicators is conducted initially in the first chapter. This data is prepared for a few selected countries, with double the number of pages dedicated to illustrating the German dental market, due to its importance. Significant challenges in the sector are present in the second chapter. The third chapter demonstrates how the target group under consideration here (consumers, dentists/practices, dental labs and manufacturers/dealers) can face these challenges in future.

There is an increasing focus on working with intelligent data in dental practices and dental laboratories, but in particular in the production of and trade with dental products. The range of products and services on offer should be customised to reflect the preferences of customers in as complete a manner as possible:

- Awareness of the demand behaviour of patients in a region (e.g. with regard to age, gender).
- One’s own patient file or the customer management system is the most important source for one’s own supply strategies. This information interacts with external data in an ideal case.
- The demand and supply situations for dental services should match each other.
- Further specialisation strategies first require an analysis of potential.
- Knowledge of demographic data is important, as this impacts on both the demand and supply structure.
- The secondary health market offers opportunities for growth, but it requires a detailed knowledge of the market.

The utilisation rate is of particular interest from the point of view of demand behaviour for dental services. It indicates what proportion of the population has contact at least once with a dentist within a year. Fig. 1 illustrates that high utilisation stretches like a green belt from the Nordic countries over the United Kingdom and through Central Europe. The Czech Republic, Slovakia and Austria form the eastern boundary lines of this green belt. The utilisation rate in Southern and Western Europe is considerably lower, and even Switzerland only manages to reach the EU average. Ireland exhibits a strikingly high utilisation rate.

Where these values are available in even greater detail, they are an indication of significant potential which is not only restricted to the dental practice (e.g. in different age groups, between women and men and between different regions). Utilisation rates for different dental services such as screening examinations/prophylaxis, fillings, X-ray services, endodontic treatment and dental prosthetics are available for a few countries.

The demand and supply situations for dental services should match each other

Regional analyses of this kind regularly show that significant differences still exist between demand and remuneration. Knowledge of age-specific characteristics among one’s own patients or, also, of the demographic structure of the region help one to adapt more effectively to special needs. The lock and key principle is also a guarantee for success here, because market players can only be successful if the products or services supplied to the dental practice or the dealer who supplies the dental practice also reflect the uniquely specific demand in the vicinity.
Fig. 1 /// Utilisation of dental services

Source: Eurostat, ZWP online /// Graphic: REBMANN RESEARCH /// As of: 2018

European Markets /// Structures, Challenges and Scenarios /// ATLAS DENTAL /// ANALYSING STRUCTURES
Further specialisation strategies first require an analysis of potential

Practice owners, dental laboratories, the dental industry and dental trade must be prepared to face the demographic development and the associated increase in chronic multiple illnesses, including appropriate care people in need of care and the elderly. This means that, through greater mobility and networking with other service providers, that the dentist too can also differentiate him or herself more markedly today. In addition, greater consideration of diseases which are associated with oral health could also close loophole in basic care.

Financing of dental services is heavily influenced by political/regulatory requirements. Two system variants are important when it comes to public health care in European countries: the Beveridge model and the Bismarck model: Beveridge systems are state systems, with a health care network of doctors’ practices and hospitals financed through taxes to which all inhabitants have access. Systems of this nature are to be found in the United Kingdom, the Scandinavian countries, Italy and Spain. Bismarck systems are social health insurance models financed through the social security contributions of insured persons and their employers. There are three variants of this system: standard regional or central insurance (France, Poland, Czech Republic), company/occupational and compulsory regional insurance (Belgium, Austria), systems with a free choice of insurer and competition between insurance providers (Germany, Netherlands, Switzerland).

Oral health

According to the WHO, there is a high prevalence of dental diseases in European countries. The main conditions affecting dental health are caries, dental (acid) erosion and periodontal diseases. Between 20 and 90 % of 6-year-old children suffer from caries while, on average, between 0.4 and 3.5 (depending on the country) of the remaining teeth are damaged in the case of 12-year-olds. In the case of adults aged 35 to 40, almost 100 % suffer from caries. Between 10 and 20 teeth are affected in this population group, depending on the country involved. Caries are the main reason for the total loss of teeth among senior citizens. Between 5 and 51 % of the 65 to 74 age group are affected by this, depending on the region. The main cause of caries and dental erosion is diet. Sugar consumption in particular encourages caries bacteria and the formation of acids that attack tooth enamel. Over 50 % of the European population suffers from a periodontal disease, with 10 % of these individuals suffering from a severe form. In the case of the 60 to 65-year-old population group, the proportion affected is as high as 70 to 85 %. The main factor contributing to the development of periodontal diseases which can also lead to tooth loss is poor oral hygiene. A further not insignificant factor is tobacco consumption. With regard to paediatric dental hygiene, 14 % of children worldwide exhibit a lack of mineralisation of enamel (MIH). Tooth substance is lost in 5 % of children, and they suffer from toothache as a result.

Socio-economic factors also heavily influence the prevalence of dental diseases. According to the WHO, underprivileged, disadvantaged population groups who, generally speaking, find it difficult to access dental care are disproportionately affected. Preventive measures are decisive when it comes to improving oral health. Consequently, the WHO recommends...
A drastic reduction in sugar consumption, accompanied by legislative measures such as the introduction of taxes on beverages and foodstuffs containing sugar or the introduction of mandatory labelling for the sugar content of products. Fluoride also plays a key role in reducing levels of caries. In order to reach the entire population, the WHO recommends fluoridation of drinking water, salt or milk and use of toothpaste containing fluoride.6

Fig. 2 indicates that north and south of Europe, which is well supplied in dental terms, are divided by a yellow and orange belt. The density of dentist in these countries (namely France, Switzerland, Austria and Hungary) is, if anything, average to low. With 0.39 dentists per 1,000 inhabitants, the Netherlands are the only “red blemish” on the European map (at least in terms of the countries examined) and, consequently, the worst performer in the comparison of countries. This shortage of practising dentists can be traced back to the high training figures in the 1980s and the subsequent closure of some dental faculties. In the United Kingdom, significantly more dentists are registered than are actually practising (registered dentists: 41,705; actually practising: 34,760). A growing problem with regard to recruitment and sharp fluctuations of personnel (30 %) among dentists mean that, far from the low dentist density improving here in future, it is more likely to worsen in the wake of Brexit. The number of foreign dentists practising in the United Kingdom how are leaving has already intensified.

In principle, per capita expenditure for dental treatment (Fig. 3) divides Europe into three zones. The western zone encompasses the United Kingdom and France with average to slightly below average per capita expenditure. The central “green” zone indicates high per capita expenditure in Sweden, Denmark, Germany, Austria and Switzerland. The eastern zone reflects the extremely low per capita expenditure in countries such as Finland, Estonia, Latvia, Lithuania, Poland, Slovakia, Slovenia, Hungary and Greece.

In the majority of European countries (with only a few exceptions, such as the United Kingdom or Spain, etc.) the provision of dental services is currently (still) characterised by conventional sole practices. 24 % of all dentist in the United Kingdom and 25 % in Spain are organised in chains (see Fig. 30, p. 51). The number of practising dentists in Europe has only risen marginally in recent years. Spain in particular has experienced a significant rise in the number of practising dentists (for the period 2010 – 2015: + 23 %). On the other hand, the number of dentists practising in Denmark and Lithuania is declining.
The remuneration of dental prostheses in Denmark, Germany, the Netherlands, Switzerland and Hungary was examined in greater detail in a comparison of countries by the Institute of German Dentists (IDZ, Cologne). Overall prices for prosthetic services (dental fee plus material and laboratory costs) in Germany are in the middle range and roughly comparable with Denmark and the Netherlands. However, if material and laboratory costs are considered on their own, these are the second highest in Germany, directly after Switzerland. With laboratory costs accounting for 61.3%, Germany is around 10% higher than the average of 50.7% for the countries examined.

Manufacturers/Trade

About 95% of all medtech companies, including those involved in dental medtech, are organised as small and medium-sized enterprises (SMEs). They are highly innovative and strong exporters. These companies generally employ fewer than 250 people. The most important dental market is North America, followed by Europe. Emerging Asian economies such as India, China, South Korea, Malaysia, Thailand and Singapore should offer a growing market due to their rising per capita income. Germany has by far the largest trading volume in Europe. The German market is regarded as the world’s leading market in the dental sector. Manufacturers expect sales to increase for 2018, especially in the area of materials. In the export business, manufacturers recorded an increase in sales, particularly in the target regions of Western Europe and the Far East.

According to a forecast of the US market research institute Renub Research, the global dental market (dental diagnostics and dental surgical equipment) will grow by more than USD 10 billion by the year 2022. Global sales of dental equipment amounted to USD 12.8 billion in 2016. This is expected to grow further to USD 17.8 billion by 2022.

Particularly healthy growth is also predicted for the implant market. This market reached a worldwide volume of more than USD 4.5 billion in 2016, and it is expected to grow to USD 8.4 billion by 2025. The reasons for this are a reflection of the situation in the overall dental market:

- An ageing population
- A trend towards group, multi-unit and corporate dental practices
- Technological advances in areas such as CAD/CAM systems, intraoral imaging, digital radiography, caries diagnosis and computer aided implantology.
- An increasing demand for particularly sophisticated aesthetic cosmetic dental treatments

With regard to concentration processes, the implant market has also become an example for mergers and acquisitions to position itself on markets worldwide. Simultaneously, individual medium-sized enterprises remain very competitive.

At 22%, the proportion of manufacturers supplying dentists or laboratories directly is highest in Germany. In many other European countries, especially the Netherlands, Switzerland and the Czech Republic, sales are conducted almost exclusively through dealers.

Fig. 4 Inhabitants per km²
Currently, increasingly protectionist tendencies in world trade, an imminent Brexit and trade conflicts, especially between the USA and China, are a cause of worry. China’s economic growth in the third quarter of 2018 has already fallen to its lowest level since 2009 (at only + 6.5% when compared to the same period the previous year). As a few US special duties on imports from China have only been in force since September 2018, their impact is expected to be considerably greater in 2019. According to the Federation of German Industries (BDI), these conflicts have not yet affected German exports. However, the BDI sees an urgent need for political action to avoid future negative consequences for international trade.

Massive effects on trade are also feared in the event of a hard Brexit.

**Infrastructure/young dentists**

This study illustrates some indices that endeavour to portray the infrastructural framework conditions of a country. These include the DESI Index which measures the level of digitisation of European countries. In addition, the GC Index reflecting competitiveness is shown, as is the GI Index for innovativeness. Figure 4 illustrates the population per km² as a key infrastructural feature. The larger an area is, the more difficult it is to ensure that dental care is provided on a widespread basis. The map shows green values for the densely populated United Kingdom and some countries in Central Europe. The further one moves away from the centre of Europe, the larger the area of countries such as Sweden and Finland, France and Spain, Romania, Bulgaria and Greece become and, generally speaking, the more difficult it is to provide care, especially far away from major cities.

Figure 5 shows the number of dental graduates per 100,000 inhabitants. Very high levels of up-and-coming talent (depicted in green) can be found in, for example, Romania. Many countries have significant entry barriers such as the numerus clausus or high tuition fees. Some Eastern European countries, such as Hungary, Bulgaria and, above all, Romania are producing astonishing numbers of graduates in dentistry. Spain and Portugal are also currently educating an above-average number of dentists. In Western Europe, where demographics seemingly have the strongest impact on the future, levels of up-and-coming talent are rather average (Germany) to critical (Italy, Netherlands). Today’s prospective dentist is likely to be more internationally oriented and location-independent.
Germany is Europe’s “Dentalland”, achieving peak values both in terms of consumers and suppliers. At 82%, utilisation of dental services is among the highest in Europe, since statutory and private health insurance funds cover about 70% of dental services. The population density of its almost 83 million inhabitants fluctuates strongly on a regional level. Around 75% of the population lives in towns and cities. German health expenditure totalled €374.2 billion in 2017. Its share of GDP has risen steadily in recent years to a current (2017) level of 11.3%. The healthcare market is therefore growing significantly faster (2017: +5%) than the economy as a whole (2017: +2.2%).

Around 7.4% of dental dealers (435:1) is above average. However, the dental trade, the ratio of dentists to each dental laboratory per 1,000 inhabitants. Most manufacturers offer their products through specialist dental dealers, but around a quarter also does business through direct sales. In the specialist dental dealers, but around a quarter also does business through direct sales. In the dental laboratories per 1,000 inhabitants. Most manufacturers offer their products through specialist dental dealers, but around a quarter also does business through direct sales. In the dental trade, the ratio of dentists to each dental dealer (435:1) is above average. However, the demographic situation in Germany, which has one of the highest median ages (46 years) in Europe, nevertheless raises many questions for the future. This applies in particular to the financing of an increasing demand for dental services and dental innovations. According to a study conducted by the Institute of German Dentists (IDZ), an increase in employment of around 20% is expected in the area of dental care by 2030. This means approximately 65,000 additional dental health and dental technology professionals and around 11,000 additional retailers of oral health products. Growth effects should be generated primarily through the privately financed, so-called “second health market”.

### Demand structures

In terms of caries experience, periodontitis and complete endentulism, Germany achieves top marks in oral health in an international comparison. Public social insurance exists which is mandatory up to an upper income limit (Bismarck model). The dual system of private (PHI) and statutory health insurance (SHI) is unique in Europe. Approx. 10.5% of the population is privately insured. SHI currently consists of about 109 individual funds. The state specifies the framework conditions, while local self-administration (everybody involved in care) is responsible for organising care. Health insurance contributions (which are split and borne equally by employees and employers) are paid into the health fund, from which insurers are allocated their funds through a risk structure compensation scheme adjusted to take morbidity into consideration. Insured persons can freely select their doctors (and dentists). Private households are the most important payers for dental care under the SHI system, with an average of 29.8% of dental costs being paid privately (supplementary dental insurance or out-of-pocket). Germany is, by European standards, the country with the highest share of public funding. Associations for panel doctors (and dentists) are responsible for ensuring outpatient care. Around 15.4 million people (16.6% of those with statutory health insurance) had supplementary dental insurance at the end of 2016 (a quadrupling of the figure since 2000). Statutory health insurance provides full coverage

- for prophylactic measures in the case of children and adolescents,
- for two prophylactic examinations per year,
- for necessary conservative and surgical treatments (including in the home environment and nursing homes if necessary) and
- necessary orthodontic treatments for adolescents up to 18 years of age.
In the case of costs for dental prostheses, the own contribution rate is 50% or higher (depending on the form of care selected). The fixed allowance increases by 20–30% in the case of regular visits to a dentist.\textsuperscript{15}

The average age of dentists involved in dental care has increased steadily in recent years, reaching 48.6 at the end of 2016, with female dentists on average younger (45.5) than their male counterparts (51.1).\textsuperscript{17}

In 2017, 3,819 orthodontists, 3,175 oral surgeons and 1,733 oral and maxillofacial surgeons were active in dental medicine.\textsuperscript{15} There are also many practices specialising in one area, or groups of practices offering services that focus on one or more specialties.

In contrast to some other European countries, the job of dental hygienist is not an independent profession in Germany, but a career advancement for qualified dental assistants (ZFA). Dental hygienists in Germany work under the supervision of a dentist. The focus of dental hygienists is oral prophylaxis as part of the pre- and follow-up treatment of periodontal disease. A bachelor’s degree in dental hygiene also exists since summer 2014, where a completed apprenticeship as a dental assistant (ZFA) is a prerequisite for admission to studies.

The number of people working in dental practices has increased over the past decade by around 53,000 to 365,000 (2017). However, despite an absolute increase in jobs, services offered in dental surgeries have been steadily declining since 2011 as a proportion of total health expenditure.

A total of 69,075 dental operations were performed in German hospitals in 2017. Most of the procedures involved tooth extractions (25,620 cases), followed by tooth removal through osteotomy (23,893 cases). In third place was gingival modelling (gingiva plasty: 11,533 cases) following extensive periodontal treatment or implantations.\textsuperscript{17}

(Public) expenditure for dentures only increased in five years by 5.8% (+ €179 million). By contrast, all other dental services clearly increased in the double-digit range. The largest
area of spending, namely conservative surgical treatment, also grew the strongest in absolute terms (+ €1,469 million or + 22.6%). With regard to absolute spending, this is followed by the “Other” category which, in percentage terms, increased most dramatically (+ €144 million and + 41.7%, respectively). The field of orthodontics grew by €125 million, or 12.8%. Spending on periodontal treatment increased by €67 million (+17.3%), while turnover from individual prophylaxis (IP) grew by €63 million (+13.3%). Overall, this review illustrates that the dental service spectrum is shifting due to improving oral health and increasing health awareness. The need for dental prostheses is increasingly shifting into advanced age.16

Dental laboratories

The German dental laboratory market is highly fragmented, with around 19,500 commercial dental laboratories and laboratories in practices active. Approximately 32% of all dental practices have their own laboratory (55% of them with dental technicians). Spending per member of the statutory health insurance was €249.81 in 2016 for treatment by dentists, including dental prostheses, and €190.75 for treatment without dentures.16

When one only considers those businesses subject to VAT and disregards micro-enterprises, the German dental laboratory market in 2016 consisted of 7,211 commercial dental laboratories, to which 11,290 practice laboratories with and without dental technicians can be added.16

70.1%, or 5,056 labs are among the small laboratories classified in the turnover tax bracket under €500,000. Their share of overall turnover was 26.0% in 2016. “Medium-sized laboratories” include 29.4% (2,117) of laboratories which are in the turnover tax class between €500,000 and €5 million. Only 0.53%, or 38 laboratories achieve a turnover exceeding €5 million. However, these laboratories have a total market share of 21.4%. The largest proportion of commercial laboratories (72%, or 5,195 laboratories) generates turnover of between €100,000 and €1 million. Operational figures have been steadily declining since 2012, with small businesses in particular being affected by this development. Of a total of around 64,700 dental technicians, around 49,500 were working as employees in 2017. Over 85% of dental technicians work in commercial dental laboratories.20

Total expenditure on dental prostheses in 2016 was €7.51 billion. This related to services provided by both commercial dental laboratories and practice laboratories.21 The turnover of commercial dental laboratories subject to VAT was around €5 billion in 2017. Turnover development in recent years was continually below GDP, with the turnover increase in 2017 being 1% when compared to the previous year. The volume of services is declining and, despite annual increases in remuneration, spending for dental prostheses has hardly grown in recent years. The
reason for the decline in the volume of services is primarily explained by the increased oral health of the population. The demand for dental services is shifting more and more towards restorative dentistry/prevention and (due to the growing importance of aesthetics) higher value care through which laboratories can compensate somewhat for the decrease in volume. On the other hand, baby boomers maturing into “best agers” and increasing cooperation with nursing facilities combined with better billing options for the dental care of nursing home residents are having a positive effect on future prosthetic needs. These developments are tempering the decline in the volume of dental prostheses which, nevertheless, will continue in future. The frequency of prosthetic care and restorations decreased by 9% in the period from 2006 to 2016, while single crowns (+10.8%), bridges (+8%) and telescopic prostheses (+18%) increased significantly.16

As well as being evidence of increased oral health, this also indicates a clear tendency away from removable to fixed prostheses. Conversely, the volume of services increased by 27.5% in the area of orthodontics from 2006 to 2016 and by as much as 86.5% in the area of mandibular fracture/temporomandibular joint disease, presumably due to the increased need for occlusal splints.16

Very little reliable market data has been available to date to indicate the degree to which the stagnating volume might be offset by offering higher-quality service. A study on the cost of dental prostheses indicated that 59% of patients pay over €1,000 for prostheses, with 19% paying more than €5,000.21 Many people simply cannot afford their own contribution towards dental prostheses. This was revealed in a household survey conducted by the Federal Statistical Office in 2016. 44.3% of respondents (48.2% of those at risk of poverty) decided against visiting a dentist for necessary treatment due to financial reasons.19 Dental prostheses from abroad exert additional competitive pressure on laboratories working in a conventional manner. Exact data on the market share of foreign prostheses is not available, with estimates differing widely between 10 and 30% (see also p. 55).23 More than half of dental prostheses manufactured abroad are produced in China, with Turkey and the Philippines being further important countries of origin.24 The increasing demand for high-quality, individual products and, also, the growth in CAD/CAM parts produced very cheaply and quickly in practices, dental laboratories and manufacturing centres put the importance of foreign prostheses into perspective.25

After the USA and China, Germany is the third-largest producer of medical technology in the world. Heavily characterised by small and medium-sized enterprises (approx. 11,000 micro-enterprises < 20 employees and around 1,300 companies > 20 employees), the medtech industry provides around 200,000 jobs. About 9% of turnover is invested in research and development each year.26

The German market is regarded as the world’s leading market in the dental sector. German dental companies are market leaders in numerous areas. The 200 mostly medium-sized enterprises which are members of the Association of German Dental Manufacturers (VDDI) represent 85 to 90% of the German dental market. According to the VDDI, the range of services offered by the German dental industry includes more than 60,000 products in the areas of equipment, devices, instruments and materials covering the entire spectrum of dentistry, from diagnosis and prevention to restoration/therapy. Solutions are also offered for the dental laboratory sector. VDDI members alone provide work for 20,700 employees. The numbers employed by VDDI member companies have risen by more than 22% since the year 2000. Typical characteristics of German dental companies are a high degree of specialisation, high development costs, an above-average patent quota and a high level of vertical integration. VDDI member companies achieved sales of around €5.3 billion in 2017, with exports accounting for 62%. Growth outside Germany was 5.9% higher in 2017 than domestically (+2.8%).27

In its Survey 2018, the Association of Dental Dealers in Europe (ADDE) lists 165 dental trade companies for Germany, of which 120 are so-called full-service providers whose market share amounts to around 52%. According to the ADDE, dental products marketed exclusively through distance selling (online, catalogues, etc.) only account for a market share of around 18% in Germany.
Belgium occupies a very central location in Europe and, with 11.4 million inhabitants, 65% of whom live in towns and cities, is one of the most densely populated countries (372 inhabitants/km²). In addition, a strongly technical infrastructure ensures that the country’s image appears above average in Europe in terms of innovation, digitisation and competitiveness. These factors are also the reasons why Belgium is forecasting relatively strong population growth until 2030. Overall, therefore, the country also offers first-class framework conditions for the dental market. This continues to lead to a rather average existence in Belgium, with per capita expenditure of €153 on dental care being just below the average for the countries examined here. The market volume is €1.75 billion. Utilisation of dental services and the density of dentists both fairly accurately reflect the average. What is noticeable is the relatively low private share of 48% which patients have to bear themselves for dental services. On the one hand, this makes the dental market less susceptible to cyclical fluctuations but, on the other, it also restricts the supply of innovative forms of treatment, as these would place too great a burden on the state system.

### Demand structures

In Belgium, 99% of the population is in a compulsory insurance system (Bismarck model). This consists of six private health insurance funds and one public health fund. Insurance contributions are income related, not risk related. Two insurance schemes exist:

- **Major risks**: hospital care, obstetrics, elective surgery, dialysis, rehabilitation, implantations and consultant care.
- **Minor risks**: medical consultations, dentist, minor surgery, home care, medication in the outpatient sector.

Self-employed persons previously only insured for major risks are obliged to pay insurance for both schemes since 2008. Private insurance providers only account for a small share of the market. A national health insurance institute administers the entire health system and distributes funding to health insurance providers. It also negotiates tariffs for a duration of two years at a national level with representatives of doctors (and dentists). This “convention” must be signed by the health minister. All individual doctors are then obliged to agree to this. Physicians are free to practice as “convention doctors” or to apply their own tariffs (which are remunerated lower). Individual contracts cannot be concluded between insurance firms and providers. Patients are free to choose their doctor, hospital and insurance.

Health expenditure in 2017 was €43.8 billion, with around 75% of this being covered by taxes and social security. 31% of all government spending on health care in Belgium is spent on dentistry.30 Despite the relatively good dental care cover provided by the compulsory insurance, utilisation of dental services is only average at around 60%. The more private medical system in the neighbouring Netherlands obviously offers more mobilisation incentives, and utilisation there is around 20 percentage points higher.

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**Dentists/Practices**

Belgium has some regions such as Brussels and Flemish Brabant which enjoy a high level of service. The density of dentists there is almost twice as high as in Hainaut or the province of Namur. Due to the relatively small area, it is assumed that even in less well-serviced regions, a large part of the population can reach a dentist by bus or car within 15 minutes. The approximately 8,300 dentists in Belgium work in around 4,050 practices. This means that, on average, there are 2.04 dentists to a practice, which overall is an above-average figure for the countries examined here. In the neighbouring Netherlands, this figure is just 1.25 dentists per practice. Numerous dentists restrict treatment exclusively to private patients. Following a five-year master’s degree, general dentists then complete their studies with a one-year internship. Having acquired their masters, they can specialise further as an orthodontist, implantologist or periodontist.31 Belgium also has a problem when it comes to up-and-coming talent, as the rate of dental graduation is significantly below average. Whereas a European comparison shows that 2.74 graduates are educated for every 100,000 inhabitants, the figure in Belgium is only 2.23. Although the problem regarding young talent is not as great as in the
Netherlands, supply constraints, especially in the already underserved regions, could soon emerge, given the steadily growing population.

**Dental laboratories**

Belgium has only half as many dental laboratories per 1,000 inhabitants as the 10 countries which are the focus of this study. With 0.15 dental technicians per dentist, only one third of the average value is achieved. Additionally, with 2.08 dental technicians, the dental laboratories are small to a below-average degree.

**Manufacturers/Trade**

The Belgian medtech market is forecast to grow by 23% in the period from 2016 to 2019 to attain a volume of €2.5 billion. Around 300 medical engineering companies are registered in the beMedTech association (formerly Unamec), with 250 of these involved in sales and only 40 enterprises producing themselves. The medical technology import rate is 80%. Clinic projects are opening up very good business opportunities.32

About one quarter of all dental instruments and X-ray appliances originates in Germany.33

The proportion purchased by dentists via the internet is significantly below average in Belgium. In the neighbouring Netherlands, this trend is three times as pronounced. At only 5%, the share of manufacturers involved in direct sales is also considerably below average in Belgium (see Fig. 9). The sale of dental consumer goods and consumables clearly takes place through dealers. Since there are relatively many dental dealers and, by comparison, only an average number of dentists, the number of dentists per dental dealer, namely 202, is also below the average of the 10 countries focused on here.

**Fig. 9 /// Structural profile – Belgium**

Source: Eurostat, OECD, European Commission, ADEME/IFOE, World Economic Forum, Cornell University, INSEAD, WIPO and others /// Graphic: REBMANN RESEARCH /// As of: 2018

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**Fig. 9 /// Structural profile – Belgium**

- **Very good population forecast until 2030**
- **Private contribution to dental services < 50 %**
- **Dental lab market below average small**
- **Relatively few dentists per dental dealer**
- **Very good infrastructure indicators**
FRANCE

France is a country with potential when it comes to oral health expenditure. Spending to date has been €11 billion, or €163.35 per capita. Of 67 million inhabitants, 1.7 million live overseas, with about 80% being urban dwellers. Demographic ageing is less serious in France than in Germany, and the birth rate is one of the highest in Europe. Utilisation of dental services is very low in some regions (e.g. overseas, Picardy and Normandy) and age groups (20 to 44-year-olds, but primarily those over 85). Even best agers (45 to 64-year-olds), who represent a lucrative clientele for dentists, harbour considerable mobilisation potential in France. With regard to the departments, the distribution of dental care is also extremely uneven, with a quarter of all dentists practising in Paris. However, the Provence-Alpes-Côte d’Azur and Alsace regions have an even higher density of dentists. Levels of care in the Picardy and Upper Normandy regions are a mere 50% of the supply rate, with even fewer dentists in overseas departments. Recent government prevention programmes have proven to be successful and could help (possibly in combination with supplementary coverage) to provide a higher level of French oral health in the under-utilised area of periodontics, implantology and endodontics.

Demand structures

The national health insurance (Régime général d’assurance maladie) is occupation-related, families are also insured and there is no exemption from the insurance obligation. Approx. 92% of the population has supplementary private insurance. The National Assembly stipulates an annual (virtual) upper limit for health insurance expenditure. Investments of €4.9 billion are planned for the healthcare system by 2021 (€3 billion for the renewal of infrastructure and technical equipment, around €1 billion for digitisation, €500 million for research, €400 million for group practices in underserved regions). The decision-making autonomy of communes is increasing. The regional health agencies (agence régionale de santé) are responsible for the care and budget of their populations beyond sector limits.

Whilst the own contribution rate in overall health expenditure is stated to be only 7.5%, the level for dental care is about 40%. 70% of dental care and prevention is covered by l’assurance maladie obligatoire (AMO). When it comes to children and adolescents, the M’T Dents programme provides more dental visits.

Services for treatment in periodontics, implantology and endodontics are not covered by statutory insurance. These are borne in part by supplementary insurance coverage.

Care for children and people with low income is covered. Only 33% of dental prosthetics and 10% of orthodontic care costs are covered by national health insurance. However, high private additional payments generate social disparities in care.

It is estimated that around 50% of the population has periodontitis, 75% of which is not treated because treatment costs cannot be covered. 75% of older people have unsatisfactory oral health. The situation is particularly serious in inpatient care facilities, where 56% of people have lost all their teeth. The figure is 34% in nursing homes for the elderly.

Dentists/Practices

Dentists are bound by the tariffs negotiated between representatives of the medical profession and insurance funds, unless they join the “second sector” where higher prices can be charged. Almost all oral surgeons work within the insurance fund convention. There

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are 42,589 dentists in total. 87.8% of dentists work as freelancers, and only 43.8% are women (but the number is rising sharply). 50% of dentists work in metropolitan areas with more than 200,000 inhabitants, with 18.8% in rural areas or communities with fewer than 10,000 inhabitants. €400 million is being invested in practices and greater resources for telemedicine to counter the loss of doctors in rural areas. 50.8% of dentists are older than 50, 7.1% are older than 65 and 10% are younger than 30. Most recently, 1,711 new enrolments were recorded in the universities. There are around 17,000 implantologists (prothésistes dentaires répartis) within the dental profession. In addition to dentists, there are also stomatologists who perform orthodontic operations.

Dental laboratories

There are 3,800 dental laboratories in which around 17,650 dental technicians are employed. Turnover is around €1.245 billion and most recently declined by 1–2% per annum. Many prostheses are now manufactured directly in the practice using new technology or imported from abroad.

Manufacturers/Trade

Turnover of the French medtech sector is estimated to be €28 billion, of which €8 billion is transacted abroad. The rate of change from 2016/17 is stated to be 8.9%, with growth forecast between 2% and 4.7% by 2021. French manufacturers of medical technology are primarily concentrated in the Île-de-France and Auvergne-Rhône-Alpes regions.40

The French dental industry and dental trading companies are organised in the COMIDENT association which, in turn, is a member of the Fédération Française de Industries de Santé (FEFIS) healthcare federation. Germany continues to be the leading import country for dental products (39.4% of all imports).40

The majority of dental trading companies are SMEs, and only 10% of companies generate sales in excess of €10 million. There are around 850 dental dealers and manufacturers in France with 6,600 employees and an annual turnover of €1.6 billion (which most recently rose by 3%).42 In its Survey 2018, the Association of Dental Dealers in Europe (ADDE) states that the number of French dental trading companies is 115. Promising market segments include consumables, dental implant systems and dental hygiene products.
ITALY

With a market volume of almost €11 billion, the Italian market for dental services is as big as that in France. Italy has 10% fewer inhabitants than France and, as a result, per capita dental expenses are considerably higher than there at €180. Dental care is also well above average with 0.82 dentists per 1,000 inhabitants. There are also plenty of dental laboratories, and dental dealers are also numerous. The dental industry is a significant economic factor in Italy. Many companies are very successful and renowned on an international level. Along with Germany, Italy is one of the few countries to have its own dedicated dental industry association (UNIDI). Life expectancy in Italy is one of the highest in Europe, and the trend is still rising. 24

However, forward-looking indicators do give cause for reflection. Compared to the population as a whole, the number of dental graduates is one of the lowest in Europe, and overall population growth is forecast to decline up to 2030. Italy has one of the lowest birth rates in the world. 25 All infrastructure-related indicators in the structural profile are below average. In terms of digitisation, competitiveness and innovation, Italy lags behind other major European countries. Added to this is second-highest national debt after Greece—a situation that leaves little room for manoeuvre, especially in a health care system financed through taxes. A survey from the year 2018 also indicates that a major chasm exists between the services offered by dentists and the level of satisfaction of the population. Only 34% of respondents said they had adequate dental care. The ages of those surveyed ranged from 16 to 64. 26

Demand structures

The National Health System (NHS) has existed since 1978, is accessible to every citizen and aims to guarantee the same services for all and also counterbalance regional differences. Providers of care are either employees of the NHS or work in private practices/clinics. 30% of Italian citizens have private health insurance, mainly in the form of supplementary insurance. Central government is responsible for the passage of the national health plan (every three years), allocation of funding and the definition of guidelines (clinical and for accreditation). The regions, on the other hand, are responsible for implementing the plan, quality control, planning and management of local health centres and both public and private clinics. In general, dental care is not covered and belongs to around a quarter of overall health expenditure which has to be paid for out of patients’ own pockets.

Dentists/Practices

Major differences exist in dental care, such as the fact that nearly 20% of dentists are practising in Lombardy. However, Liguria, the region of Abruzzo and Friuli-Venezia Giulia have an even greater density of dentists. Bolzano and the Aosta Valley, on the other hand, have an even lower density than Sicily. The total number of practising dentists is currently around 47,000. The Italian market is quite fragmented, with an average of only around 1.3 dentists per practice. Dentists work in about 34,200 private practices, 58% of which consist of small sole practices. In addition to smaller group practices (34.5%), specialised practices exist for surgical, periodontal and implantological therapies (12.5%). 5% of practices are organised in centrally held practice chains. 47 Jacobs Holding acquired a company in Italy with around forty locations (Odonto Salute). 48

Even if preventive services are increasingly offered in some regions again, the minimum dental care within the NHS means that the image of the state dental service is poor. There are also waiting lists to contend with. As patients therefore have to pay for practically every service themselves, economic difficulties saw the number of patients fall in recent years.

Dental laboratories

Italy is more than well supplied with dental laboratories. With 0.14 dental laboratories per 1,000 inhabitants, there are around 50% more than the average of the 10 countries surveyed here. At 0.51, the number of dental technicians per dentist is also higher than the average. Only the number of dental technicians per dental laboratory is less than the average at 2.94. The latter is again proof that the Italian dental market is quite fragmented in terms of structure.
The medical technology market as a whole had a volume of around € 11.4 billion in 2016, with annual growth of 3–4%. Up to 63% of local production was exported in 2016. This is equivalent to goods to the value of € 7.8 billion. Italy is an important import market for medical technology, and there is a strong dependence on foreign imports. About 60% of medical requirements were imported in 2016. Italy’s most important supplier of medtech products is Germany.

Dental care products from Italy are prized for their reliable and durable components, their innovative technological solutions and their aesthetically pleasing design. With a turnover of € 880 million in 2016, the Italian dental industry is considered the crown jewel of the Italian manufacturing industry and has a strong presence in almost every country in the world.

The number of dental dealers registered as full-service suppliers has been declining steadily since 2012 in Italy. Dental and medical practices are barely equipped with large medical appliances. These only possess a minimal inventory of appliances and rarely have X-ray equipment.

Italy shows little progress in implementing the electronic patient file (EPF). A comparison of countries was carried out with the aid of the scorecard developed by iNAV, and Italy was only ranked 18th here out of 20 countries surveyed. Progress in the areas of infrastructure requirements, utilisation properties and health literacy, political and legal frameworks, utilisation and implementation of the EPF and EPF content and functions is considered to be low.

Stagnating productivity levels and the lack of competitiveness of domestic industry in many places are considered the core problem of the Italian economy. This is why incentives for investment are in the foreground. Framework conditions are to be improved at a national level. A total of € 18 billion in public funding is earmarked for digitisation up until 2027. The national “Industria 4.0” plan aims to promote digitisation and trigger the significant increase in private investment hoped for by the government.

A whole series of reforms and innovations are currently being launched in Italy, and the effects of these are difficult to assess at the moment, as the laws required have not yet been fully implemented.
NETHERLANDS

17.1 million Dutch people inhabit a very confined country (population density: 506 inhabitants/km²) and, with a volume of € 3.3 billion and per capita dental expenditure of € 193, have an extremely compact dental market. In terms of overall health, too, the country repeatedly ranks first in the European comparison, and example being the EHCI (Euro Health Consumer Index 2017). Through progressive reforms, the Netherlands has succeeded in taking the lead in Europe in a number of healthcare areas. Our structural profile also indicates very significant values in terms of competitiveness, innovation and digitisation capabilities. With its excellent infrastructure, the Netherlands is in the process of becoming a European hub, and not only in the area of global medical technology. Given these structures, it is astonishing that, ironically, dental care is threatening to become a problem. The Netherlands has enjoyed an exceptionally efficient dental care system up until now. A relatively narrow supply ensures high utilisation rates and dental health levels among the population. However, there is now a threat of undersupply when it comes to dental care, as many dentists are retiring and there is hardly any up-and-coming talent to take their place.

Demand structures

The Ministry of Health, Welfare and Sport is responsible for health policy framework conditions. Private insurance has been brought into line with public health insurance since 2006. The reform means that there is no longer any difference between private and public insurance in terms of basic coverage. Insurance funds no longer have to contract with all service providers. They can conclude individual contracts and, consequently, influence the type and quality of the service. Every inhabitant is insured for a “basic package” in a public/private health insurance. The costs of the basic package are redefined annually by the legislature. The Dutch system consists of three pillars: nursing care insurance, basic coverage and private supplementary insurance. The latter plays an increasingly important role, as legislators have removed some of the benefits in basic coverage in recent years. In the meantime, around 95% of the Dutch have taken out private supplementary insurance (e.g. for dental treatment). Health insurance revenues are evenly divided between incomedependent contributions from insured persons and a fixed basic premium which insured persons pay directly to their insurance.

Private funding covers about 30% of health expenditure (primarily through fees and private supplementary insurance). The full cost of dental care, prophylaxis, sealant, max. two fluoride applications per year (from the age of 6) and surgical procedures is covered for children up to the age of 18. For adults, the basic insurance only covers special dental surgical procedures (such as full prosthetics). Further dental treatment for adults is covered by voluntary supplementary insurance. As a consequence, around 73% of expenditure for dental care is private. The system encourages a high level of use, as almost eight out of ten Dutch people visit the dentist at least once a year. 60 – 70% of children under 12 have flawless teeth.

There are only 8,500 dentists in the Netherlands who, with 1.25 dentists per practice, also work in very small structures. Conversely large practices are to be found in major hospitals with several dentists and assistants/qualified dental assistants. Even in outright metropolitan areas such as North Holland, a dental density of 0.79 dentists per inhabitant is barely achieved, values that are considerably lower than comparable regions in Europe. Even more striking, however, are the dental densities in regions such as Overijssel, Flevoland and Zeeland which, at 0.37 to 0.28, belong to the regions with the lowest values in Europe.

With 1.34 dental graduates per 100,000 inhabitants, the Netherlands currently has one of the lowest levels in Europe. About 250 dentists too few are trained each year. This deficiency is partly offset by foreign dentists. About one third of practising dentists come from abroad. The current shortage is the result of excessively high training figures in the 1980s and the subsequent closure of some dental faculties. Accordingly, a large proportion of Dutch dentists is currently nearing retirement and many practice owners are actively searching for a successor. Part of dental care is provided by...
dental hygienists (DH). Upgrading of the DH profession is an attempt to counteract the lack of dentists.59

Dental laboratories

With 0.05 per 1,000 inhabitants, there are also fewer laboratories in the Netherlands than in the other countries examined here (average: 0.09). 3.55 dental technicians per dental laboratory mean that these are of average size. With 0.46 dental technicians per dentist, the Netherlands achieves exactly the average score value.

Manufacturers/Trade

The Netherlands is one of the world’s most important distribution and logistical hubs for medical technology. Medtech products are predominantly exported (2016: € 13.1 billion). Most medical technology is supplied through imports (2016: € 13.4 billion). The strength of the medical technology industry lies in research and development which is promoted by the government. Dutch medtech companies are concentrated in the provinces of North Brabant, Overijssel, Gelderland, South Holland and Limburg, as the leading research centres are also located in these regions. Numerous clusters contribute to the networking of business and research. The FHI sector association supports a large number of clusters, including on a cross-border level.60

At 2 %, the proportion of dental manufacturers with direct sales is very low in the Netherlands. The number of dentists per dental dealer is below average at 220. In the Netherlands, the proportion of goods purchased by dentists via the internet is the highest in Europe at 68 %.

Infrastructure

In the area of eHealth, the “MedMij” project is being funded with € 105 million. This system provides patients with digital access to their medical records using blockchain technology which, in terms of data security and user recognition, is among the most advanced in Europe. The Dutch aim to take the lead in eHealth. 80 % of the chronically ill and at least 40 % of remaining inhabitants should have access to their medical data by 2019. One quarter of the chronically ill and the elderly should be capable of conducting examinations such as measuring blood pressure and cholesterol testing independently and then forwarding this data onwards in an appropriate manner. By 2019, patients should be able to access medical service providers at any time via their computer. In the care sector, e-Domotica devices will soon be used for home automation and control.55
AUSTRIA

In the area of dental practices, Austria has a market volume of around € 1.9 billion and dental per capita expenditure of € 213 (see Fig. 14 – Structural profile Austria). In a European comparison, expenditure for dental care is above average, and the utilisation rate for dental services is also high at 71.6%. In addition, there are positives forecasts regarding future population development with growth of around 10% predicted by 2030. Infrastructural assets in terms of digitisation, competitiveness and innovativeness are good when compared to other European countries. What causes particular problems for dental care is the topography, the in part sparsely populated regions associated with it and the sharply differing supply situation resulting from this. Vienna is the metropolis for dentists and the place where almost a third of the around 5,000 dentists in Austria are practising. With 0.77 dentists per 1,000 inhabitants, the density of care in Vienna is almost twice as high as in Burgenland, where the figure is 0.4. Lower Austria with 0.45 and Upper Austria with 0.46 are already significantly poorer provided for than the average in Europe (0.74). In addition, the dental graduation rate is currently very low at 1.53 per 100,000 inhabitants and well below the European average (2.74). Of a population of 8.8 million in Austria, approx. 60% lives in towns and cities. This percentage should rise to around 70% by 2050. According to forecasts, urbanisation in Austria is expected to be lower than the Western European average, where around 85% of the population will be living in towns and cities in 2050.62

Demand structures

Statutory accident and health insurance exists, and nearly 100% of the population is compulsorily insured. The insurer is determined by the place of employment or employer, and no choice is available. The 21 providers of statutory health insurance are organised in the Main Association of Austrian Social Security Institutions (Hauptverband der österreichischen Sozialversicherungsträger). Health insurance contributions are based on principles of solidarity. Contributions are income-related and borne almost equally by the employer and employee. No comprehensive private insurance exists parallel to statutory health insurance (as in Germany) in Austria. However, the insurance coverage offered by compulsory insurance can be individually enhanced through private supplementary insurance. Approximately one third of the population has additional private health insurance.63 Primary care includes a free choice of physician from panel doctors participating in the provision of care. Patients must have a referral to see a specialist. Social health insurance and taxes cover about 75% of total health expenditure of around € 39 billion, with private households contributing about 25%.

A fixed annual amount is incurred for dental care, and this covers basic dental treatment. This includes conservative, surgical and orthodontic treatments. For the latter, the deductible of the insured party or the relative amounts to between 25 and 50%. Essential dental prostheses are granted in accordance with the statutes of the health insurance while, in the case of removable prostheses, the deductible paid by the insured party and the relative is also between 25% and 50%.

There are allowances for periodontal treatment, with a subsidy of € 35 paid for oral hygiene (both are available a maximum of twice a calendar year).64 Since 1 July 2018, the oral hygiene of 10–18 year olds can be billed as an item covered by insurance once a year. Fixed dental prostheses (e.g. crowns, bridges and implants) are not covered by health insurers. Payment is realised in a fee-for-service system.

Free dental braces were introduced in 2015, with social security institutions being pushed to their limits in 2018 due to the enormous rush to avail of this. The guaranteed cost coverage cannot be realised in some cases. The annual budget of social security funds is € 80 million for the treatment of malocclusion or mandibular malposition. The greater the demand, the smaller the reimbursement for each applicant.65 The providers will evaluate the impact of free dental braces on dental health in 2020.64

Social insurance concludes contracts with individual doctors. Only approx. 47% of registered physicians and about 60% of dentists are bound by a contractual relationship with one or more health insurers.66 In principle, treatment by non-panel doctors (physicians of one’s own choice) is remunerated at 80% of the normal tariff. However, numerous exceptions mean that the actual reimbursement rate is often only 20 or 30% of the insurance fund rate. Around 82% of dentists work in individual practices. The employment of other dentists...
was prohibited to date. Since 1 July 2018, established dentists can now take on a dental graduate in their practice who has completed his or her studies within the last two years. The duration of the job sharing partner arrangement is limited to five years. Another 10% of the dentists or so work in group practices. According to the Law on Doctors (Ärztegesetz), the following group practice models are possible:

- Group practices with direct settlement (panel group practices)
- Group practices with reimbursement (elective group practices)
- Mixed group practices (doctors and dentists)

The group practice may only include physicians qualified to practice in the health sector on a self-employed basis as associates. Other doctors may not be hired. Every doctor working in the group practice must be an associate.

In a Doctors' Limited Liability Company (Ärzte-GmbH), a maximum of five full-time employees, but not more than 30 employees in total, may be employed per associate, whereby practice assistants are not disregarded (surgery assistants since 2013). Around 8% of the Austrian dental profession work in public outpatient clinics. In addition, there are two dental assistant professions: the dental assistant (Z-Ass) and prophylactic assistant (P-Ass). These have been legally anchored since 2013.

Dental laboratories

The federal dental technician association in Austria (österreichische Bundesinnung Zahn-techniker) has about 630 active members, mainly small businesses. The job profile and vocational school curriculum were adapted to new requirements on 1 June 2018 in order to qualify young dental technicians for Dentistry 4.0. Digital manufacturing technology and digital workflow are now an essential part of training.

Manufacturers/Trade

In 2015, Austria had a market volume for medtech of around € 1.8 billion. The industry is characterised by SMEs specialises in a variety of niches. Many foreign companies have subsidiaries Austria because they use it as a hub for Eastern European markets. Austria has high export quotas of up to 98%. Imports of dental instruments in 2015 amounted to € 64.1 million. Of this, € 28.3 million was imported from Germany. Wholesale prices for dental and laboratory supplies barely rose in 2017 by 0.8%. (In comparison: general wholesale prices in Austria rose by 4.6% in 2017 compared to the previous year.)

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**Fig. 14 /// Structural profile – Austria**

- **GDP per inhabitant**
- **Population**
- **Population development (growth) up to 2030**
- **Median age of population**
- **Utilisation of dental practices**
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- **Population**
- **Population development (growth) up to 2030**
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**Manufacturers/Trade**

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SWITZERLAND

Switzerland achieves peak figures in population development which will reach 12.5 % by 2030. Per capita expenditure on dental services of around € 440, which gives the country a dental turnover of € 3.73 billion, is also one of the world’s highest values. With 0.51 dentists, the density of dentists is about one-third lower than the European average. Provision of care across the whole of Switzerland is characterised by a very small fluctuation range between 0.47 (Central Plateau) and 0.64 (Ticino). “Dentist metropolises”, as are Berlin, Paris, Madrid or Vienna in other countries do not exist in Switzerland. Provision of care in Zurich (0.56) is only slightly above the domestic average. In Switzerland, the practice is still quite conventional in the individual practice. Larger structures are the exception. However, the level of dental graduates is also extremely low, whereby Switzerland can also recruit young dentists from immigrants if necessary. At best, the Netherlands can build on excellent infrastructure values that our structural profile shows for Switzerland. Competitiveness, innovative spirit and, also, digitisation options achieve best ratings in Switzerland.

**Demand structures**

There is a statutory basic insurance plan with contributions borne entirely by the insured person (no employer participation). A non-income-related premium is involved, the amount of which varies according to canton and fund. Every citizen, regardless of age or pre-existing conditions and without restrictions, must purchase insurance cover. Services are defined by the legislator and therefore identical. There is no free family insurance, and contributions must be paid for each family member, but reduced contribution rates apply to children and adolescents. Due to the relatively low per capita premium, patients also have to contribute to treatment costs. Around 80 % of the Swiss have private supplementary insurance. Dental treatment is only covered in exceptional cases by the basic insurance plan, 80 % of treatment is paid by private households and 14 % by private supplementary insurance. Prices in Switzerland are relatively high: The cost of a crown or implant in Switzerland is more than four times that in Germany, and a filling costs about three times the German rate. Patients in Switzerland also have to pay significantly more for professional teeth cleaning than in Germany (around 1.5 times). There are currently initiatives in Switzerland for compulsory dental insurance. The SSO (Swiss Dentists Society) rejects these efforts, arguing that costs would rise and the freedom to choose therapy would be limited. Compulsory dental insurance was rejected by a majority in two citizens’ votes which have already been held.73

The Swiss population enjoys good dental health. However, utilisation of dental services is only slightly above average in a European comparison. Patients are extremely sensitised to high-quality care. Most Swiss citizens opt for the ceramic version for an inlay or a crown. Dental implants became firmly established as part of a dental therapy. A significant improvement in oral health was determined, especially among the young and, also, in women. However, the oral status in nursing homes is in need of improvement. According to a survey conducted by the SSO, 22 % of Swiss people were treated in foreign dental practices, due to significantly lower treatment costs abroad. The favourite destination for treatment was Germany (22 %), followed by France (16 %), Hungary (9 %), Italy and Portugal (each 6 %).75

Only 1 % of dental turnover is generated in dental clinics, the rest in freelance practices.76 The number of dentists per 1,000 inhabitants has hardly increased since 1990. Dentists with an EU/EFTA member nationality and an appropriate degree can obtain a license to manage their own dental practice in Switzerland and practice here. Only 114 dental degrees were awarded by Swiss universities in Switzerland in 2017, but 400 foreign degrees were recognised. Liability insurers note an increase in claims for damages caused by dental treatment. This is also attributed to the lower standards of degrees acquired abroad. In Switzerland, basic dental training and education covers almost twice as many hours as in the EU/EFTA countries.77

Swiss dental laboratories (represented by their association VZLS) have a turnover of around € 300 million and around 4,000 employees.80 The quality of dental laboratory services is high. Local laboratories usually supply inlays,
crowns and implants. The majority of businesses are small and micro-enterprises (27% turnover < 250,000 CHF, 30% annual turnover between 250,000 and 500,000 CHF, 33% > 500,000 CHF; median: 350,000 CHF). There is a high qualification profile and a high degree of specialisation, especially in the field of orthodontics. The average age of laboratory managers is 49.3 years, and every seventh laboratory manager will reach the retirement age of 65 over the next five years. Between 20 and 50% of turnover is usually generated through top customers, and around a quarter of laboratories generate more than half of their turnover with this clientele. 14% of Swiss dental laboratories have fewer than five customers, 36% have between 5 and 9 customers, 27% between 10 and 19 customers, 23% 20 and more. Around 43% of laboratories procured materials/equipment from abroad in 2015. The most frequently imported materials are semi-finished products (import share: 24.2%). The most widely used digital technologies are scanners and CAD/CAM milling (28% of laboratories). Around 36% of laboratories have not yet or barely considered the possibilities of 3D printers, while around 32% are intensively involved with this technology.

Manufacturers/Trade

The Swiss medtech industry employed around 58,500 in 2017, 7.3% more than in 2015. Since capital goods are export-oriented (85%), almost all companies are exposed to the strong Swiss franc and associated price pressure. German medtech products achieved an import quota of around 27%.

90% of dental products manufactured in Switzerland are produced for export and stand for innovation, precision and quality. The 56 companies that are part of the Federation of Swiss Dental Industry Employers (ASDF) employ more than 8,000 people. 55.5% of the companies are active on a global scale. The average export share is 72.7%.
The trend in Spain is also towards shorter, less invasive and more precise forms of treatment using new technologies. Both long waiting times and emergency care are a problem in health centres. There are numerous private practices where remuneration is according to the fee-for-service model. Prices are much lower than, for example, similar practice models in the United Kingdom.

Overall, the Spanish dental profession is very young, as over 60% of dentists are younger than 45. This results in good innovation opportunities for both the technical and organisational equipment of practices.

Spain has a national health system in which almost the entire population is insured (approx. 95%). Around 71% of health expenditure (totalling €100 billion) is financed through taxes. At 7.3%, the percentage of expenditure for services in dental practices is one of the highest in the European comparison. Although the share of private supplementary insurances, many of which cover dental care, has grown significantly in recent years, only a fifth of the population has such protection.

- 17 autonomous regions are responsible for health care and compile a health plan.
- 3,050 regional health centres (ambulatorios o centros de salud), many with dentists plus 10,077 medical practices for primary care where patients have to register.

In Spain, the number of dentists increases by 3–4% per annum. There are now 1,850 graduates, which is one of the highest rates for young up-and-coming talent in Europe. Competition is growing rapidly, since licensing in Spain is not followed by a period as an assistant, and dentists are allowed to practice independently directly afterwards. There were already 36,863 registered dentists in 27,491 registered dental practices at the beginning of 2018. As a consequence, the overall market consists of very small practices. 39% of dental practices generated less than €0.25 million in sales in 2017, 37% between €0.25 and €0.5 million, 18% between €0.5 and €1 million, 4% more than €1 million and 2% more than €2 million.

The trend in Spain is also towards shorter, less invasive and more precise forms of treatment using new technologies. Both long waiting times and emergency care are a problem in health centres. There are numerous private practices where remuneration is according to the fee-for-service model. Prices are much lower than, for example, similar practice models in the United Kingdom.

Overall, the Spanish dental profession is very young, as over 60% of dentists are younger than 45. This results in good innovation opportunities for both the technical and organisational equipment of practices.
There is also a trend in Spain towards practice-owned dental laboratories. However, this is more of a creeping development as is evident from the still very inconspicuous key figures in the area of commercial dental laboratories.93 At 0.09, the number of dental laboratories per 1,000 inhabitants is exactly the average of the countries examined here. This also applies to the number of dental technicians per dentist, which is 0.4. Dental laboratories are also organised in smaller businesses in Spain with 3.26 dental technicians per dental laboratory. This is also typical for the entire industry in Europe.

On the one hand, the generally improving economic situation and, on the other, the existing investment backlog may be expected to increase the demand of medical practices for new equipment.96 Another major driver force on the market is the high number of graduates and the overall low average age of Spanish dentists. Although many of the young dentists prefer to work in an employee relationship, the young clientele are more willing to invest in innovative technologies and, above all, in the digitisation of practices.

In Spain, medical technology, with around 750 companies, represents a significant economic factor. In addition to representing manufacturers, the FENIN association also represents dealers, importers, etc. High levels of investment are taking place in R&D and, additionally, the government also promotes innovative programmes.97 The 10 largest product groups of Spanish medical technology exports include dentists’ chairs and other furniture and drills and other dental instruments.

The proportion of dental dealers in total (full-service providers, companies with direct sales and specialised dealers) is growing strongly in Spain. In a comparison of the countries examined, Spain has the highest number of dealers. Germany is the most important trading partner in most segments. Despite this, German companies failed to reach their record delivery levels from 2016 in 2017 again.98
CZECH REPUBLIC

For many companies, the Czech Republic is “the gateway to the East”. Location costs are still low when compared to other European countries, making it an attractive destination for foreign investment. Following a stagnation in population figures over nearly 20 years, significant growth has been evident since 2007, leading to the current figure of 10.6 million inhabitants. Added to this, the economy functions very well. At a mere 2.8%, the Czech Republic has the lowest unemployment rate for 20 to 64-year-olds in the EU 28 area. With a volume of €0.73 billion, the dental market is very small. This is due to the per capita spending on dental treatment of around €69. Location costs, which are very favourable when compared to Western Europe, become very noticeable in this context. Utilisation of dental services is one of the highest in Europe, and enormous attention is paid to young up-and-coming dental talent. The density of dentists in the 14 Czech Kraj (administrative regions) is at times extremely high when compared with other European countries. This is especially true of Prague which, with 1.39 dentists per 1,000 inhabitants, will soon be the “dental capital” of Europe and has one of the highest dental densities. Pilsen and the Olomouc region also have conspicuously high. significantly lower dental densities, however, are to be found in the Central Bohemian and Ústecký regions.

Demand structures

There is compulsory health insurance system with ten state-approved insurers that can be freely chosen by the citizens. Health insurers offer a standard health care package which is prescribed by law. In addition, citizens have a free choice of doctor and an unlimited choice of health care facility. €13.4 billion was spent on health care in 2016. This expenditure is low by European comparisons. €1.9 billion is provided through private supplementary payments, much of it for dental services. However, the Czech Republic enjoys a favourable economic situation, which means that more money is available to the country every year for medical care.

About 5% of the public health budget is spent on dentistry. Dental services such as prophylaxis, check-ups and fillings are covered by statutory health insurance. Patients are not required to make additional payments for standard services. Overall, the share of private contribution is comparatively low at 53%, and this is likely to be one of the reasons for the high utilisation of dental services by the population. The average citizen visits a dentist twice a year. The quality of oral health care is high. Comprehensive and advanced dental care is offered to citizens pursuant to EU standards. In addition, public and private clinics are increasingly investing in dental equipment.

Further data on the structure of practices

- Over half of active Czech dentists have their own practice (55.3%).
- 22.7% of dentists work as employees.
- Most active Czech dentists are between 60-64 years old. However, there are also many younger dentists in the age group between 24-29 years.
- More female than male dentists are active in the Czech Republic (male: 3,080; female: 5,160).
- 842 foreign dentists are active in the Czech Republic, 297 of which are EU citizens.
- Only a small proportion of Czech dentists is specialised (orthodontics: 314; oral and maxillofacial surgery: 88; clinical dental surgery: 41).

For the first time, the Czech Republic is seeking to counter the shortage of dentists in rural and remote regions and is offering funding. Up to 100 interested parties can be supported by this action until 2021. The Ministry of Health will finance more than €3.9 million from the state budget for this project. Grants amount to €9,350 for twelve months and €46,750 for 60 months, with the applicant’s participation amounting to at least 30% of the total budget. The applicant’s practice of the applicant must be open at least 35 hours a week, and proof of contracts with several public health insurance
companies must be provided. In addition, 10% of registered patients must be children or pensioners if the dentist is to avail of financial support.104

**Dental laboratories**

The Czech Republic has 0.09 dental laboratories per 1,000 inhabitants, which is on average with the countries examined here. Other indicators in this market are also “normal”. The Czech Republic has more than 0.46 dental technicians per dentist. With an average size of 3.7 dental technicians per dental laboratory, Czech laboratories are even somewhat larger than those in other countries.

**Manufacturers/Trade**

The Ministry of Industry and Trade registered about 2,500 manufacturers in the area of medical and dental instruments and accessories in 2016.102 Due to favourable location costs, many foreign companies have set up a production facility in the Czech Republic. Medtech products from the Czech Republic are mainly exported. Both the foreign trade in medical products and domestic demand are increasing. In 2016, production increased by about 6% compared to the previous year. Medical and dental instruments and accessories generate a foreign trade turnover of more than 27.0%.103 Czech companies have a major problem recruiting personnel. Capacities are exhausted, and bottlenecks in the labour market make it difficult to fill vacancies.106

Medical technology employed is largely imported. Imports have achieved an annual volume of more than € 1 billion – and continue to rise. The Czech Republic procures about one third of medtech imports from Germany. A little under half of the € 30 million imported dental instruments come from Germany (€ 13.5 million).107

The area of eHealth is currently not so well developed. Implementation of the electronic patient file (EPF) has so far failed, mainly due to data privacy concerns. According to the iNAV scorecard, the Czech Republic only ranks 17th here out of 20 countries surveyed. In the area of utilisation properties and health literacy, political and legal frameworks, utilisation and implementation of the EPF, development in the Czech Republic has been below average.108 Since January 2018, the issuing of electronic prescriptions is compulsory for the doctor.
The United Kingdom of Great Britain and Northern Ireland (UK) consists of four countries: England, Scotland, Wales (together known as Great Britain) and Northern Ireland. Approximately 81% of the around 66.2 million inhabitants are urban dwellers (as of: 2018). For such a large country, the market volume of € 8.6 billion in the dental sector is rather modest, and below-average per-capita expenditure of € 130 confirms the reticence of the British in this area. However, the country is still a focus of particular attention in the industry, because nowhere else in Europe is it easier to observe how structural disruptions in the supply sector can change the market. With an average of around four dentists per practice, the individual practice is practically a thing of the past here. 24% of dentists are organised in chains. In addition to the concentration among dentists, a concentration can also be observed in trade, because the UK is the absolute front runner with most 600 dentists per dental dealer. Consequence of structural change: In 2017, 68% of UK dental practices had problems filling vacant dental jobs. 

This, as well as the already below-average care provided in many regions when compared to Europe, means that many UK citizens are no longer able to find an NHS dentist. In addition, there is enormous dissatisfaction in the dental profession. Of the relatively few dental graduates, 53% plan to leave the NHS in the next five years.

In terms of dental care, reducing sugar intake would significantly relieve the financially burden on the NHS. The number of dental extractions performed in hospital on children under the age of 18 has been growing steadily since 2012/2013. Since April 6, 2018, therefore, a tax on sweetened beverages applies in the United Kingdom. The sugar tax lowered the sugar content in beverages by 2.3 g/100 ml to 4.6 g/100 ml. The tax applies to drinks with a sugar content of 5 g/100 ml.

Most dentists are self-employed and treat patients both within and outside the NHS. In the case of 63% of dentists, their work is composed of both private and NHS services. 20% work exclusively for the NHS, and 18% exclusively in the private sector. Dentists, like GP’s, are primary care professionals whose services are provided through local trusts, although private care is also possible here. In addition to this, specialised care is provided in clinics. Community dentists are employees and responsible for care. Once treatment is required, three standard rates of NHS excess coverage apply: £ 19.80, £ 53.90 or £ 233.70. Around 60% of dental services are provided privately. The number of practising dentists is declining. The density of the dentists is 0.52 per 1,000 inhabitants. In addition to registered dentists, 74,468 dental care professionals (DCPs) were registered in 2017 in the UK (e.g. helpers, hygienists and dental technicians, dental therapists, orthodontic therapists). In order to increase the profitability of practices, more and more practice chains are forming. The corporate landscape has changed significantly since 2016 through a series of mergers and acquisitions affecting some of the largest providers. Oasis, the UK’s second largest provider of dental services, has been sold to Bupa, an international healthcare group. Bupa increased the number of dental practices belonging to the group to more than 400 as a result of the acquisition. Further acquisitions of this group included Avsan Holding (a group of 16 practices in England and Scotland) and
Metrodental (with two main practices in London), Southern Dental, the UK’s fourth largest dental practice with 79 practices, was acquired by Jacobs Holding. MyDentist is Europe’s largest dental care provider with a network of over 600 practices in the UK. MyDentist has announced the acquisition of further practices, but also has difficulty filling vacant dental positions in medical practices.110

- Dentists in private practices generated a net income of £139,454. Net profit increased by 4.3%. Net profit in NHS practices, on the other hand, only increased by 3.2% to £136,270 (figures as of 2016/2017).117
- Since 1997, dental qualifications from Commonwealth states are no longer recognised in the United Kingdom. This represents an additional barrier to the recruitment of dentists.
- 17% of UK dentists are recruited from the EU, so Brexit is likely to make it more difficult to find staff.118

Dental laboratories

The number of independent dental laboratories is only a third of the figure in the other countries surveyed here. Many large-scale practices may have expanded their added value in this respect. There are only 0.19 dental technicians to every dentist in the UK. However, the number of dental technicians in these few dental laboratories is comparatively high at 3.5.

Manufacturers/Trade

In 2016, domestic manufacturers produced €4.1 billion in medical technology and consumables. Domestic production of dental products in 2016 amounted to €367.8 million. Of special note is the fact that, in the event of a “hard” Brexit, many notified bodies in the United Kingdom (approximately 33% of all existing certificates) will abruptly lose their validity, with the result that these products will no longer be able to be placed on the market. A presumably weaker British currency will also be result in products traded in Euro become more expensive for the UK.119

The United Kingdom imports almost 70% of the domestic demand for medtech products, and imports in 2016 amounted to approximately €6.4 billion. Dental instruments valued at €1.15 million were imported into the United Kingdom in 2016. This was equivalent to an increase of 3.6% over the previous year. The import share of dental instruments from Germany amounted to €52 million.119

Inhabitants per km²

<table>
<thead>
<tr>
<th>Population</th>
<th>GDP per inhabitant</th>
<th>Per capita expenditure for dental services</th>
<th>Degree of digitisation (DESI Index)</th>
<th>Innovativeness (GI Index)</th>
<th>Competitiveness (GC Index)</th>
<th>Dentists per 1,000 inhabitants</th>
<th>Dental technicians per dentist</th>
<th>Goods procured by dentists via the internet (%)</th>
<th>Number of dentists per dental care provider</th>
<th>Goods procured by dentists via the internet (%)</th>
<th>Number of dentists per dental care provider</th>
</tr>
</thead>
<tbody>
<tr>
<td>66,238,007</td>
<td>€35,090</td>
<td>€129,83</td>
<td>61.19</td>
<td>72.9</td>
<td>90</td>
<td>0.74</td>
<td>0.46</td>
<td>60.0%</td>
<td>230.08</td>
<td>34.0%</td>
<td>133.71</td>
</tr>
</tbody>
</table>

Source: Eurostat, OECD, European Commission, ADDE/FIDE, World Economic Forum, Cornell University, INSEAD, WIPO and others. /// Graphic: REBMANN RESEARCH /// As of: 2018

Fig. 19 /// Structural profile – United Kingdom
MASTERING CHALLENGES
DEMOGRAPHIC CHANGE

The proportion of older people is rising rapidly in all industrialised countries, a development which is explained by the declining birth rate and higher life expectancy. The median age (see Fig. 20) in Europe now averages 43.1. With 46, Germany leads the field in this respect. Ireland has the lowest median age (37.5). In Europe, the “60 and older” age group makes up just under 25% of the population as a whole. The proportion of the population of working age is shrinking, while that of older people in the population as a whole will continue to rise sharply in future as the baby boomers of the post-war years increasingly reach retirement age. By 2030, the 60+ age group is expected to be around 28% of the European population.120

With 27.6% of the population over 60 years of age, Germany is currently well above the European average. At 28.4%, Italy is the only country with a noticeably higher figure (see Fig. 22). More than 30% of the population in Germany will be 60 years and older in 2030. According to a forecast by the German Federal Statistical Office (Statistisches Bundesamt), this proportion is expected to rise to between 38.2% (in the event of stronger immigration) and 39.4% (for weaker immigration) by 2060.121

Future population development of individual European states will differ greatly, depending mainly on the birth rate and migration. The future population size and distribution resulting from this will also have an impact on the future development of market volumes, including in the area of prosthetics/prostheses. Demand in the United Kingdom, for example, will in future increase much more strongly than in Italy.

“Best agers”, younger seniors

Baby boomers are currently reaching the age of 50+, thus strengthening the “best ager” group. This consumer group typically lives in economically secure conditions and is still physically and mentally fit and active. The “best agers” are active participants in the internet (95% of this age group use the internet) 122, health conscious and well informed. This buyer type also exhibits a high degree of readiness to invest in their (oral) health and appearance, including through self-pay services.123

The significant improvement in oral health among the young seniors group is evidence of increased health consciousness. For example, only one in eight 65 to 74-year-olds is edentulous (in 1997 it was one in four). Retaining an increasing number of own teeth means the...
The prevalence of caries and periodontal diseases is shifting more and more into old age. The number of periodontal (65% of 65 to 74-year-olds affected) and caries diseases is declining, both in terms of the number and severity of these conditions. The improvement in oral health is equally pronounced in all social classes.

The highest fee revenues are currently achieved in Germany (and presumably also in the other countries examined) through the 45 to 70-year-old patient group. In addition to the increased demand from the age of 65 for caries and periodontal treatments, the willingness to pay for high-quality dental prostheses (e.g. implant-supported dental prostheses) and prophylactic dental treatments (e.g. professional dental cleaning) is increasing with growing health awareness. The demand for cosmetic dental treatments (e.g. bleaching) is also growing. As Figure 21 illustrates, these and other target groups can be accurately localised using suitable analytical tools.

The increasing need for dental care among older senior citizens and people in need of long-term care has led to a growth in dental implants and oral surgery. The fact that baby boomers are joining the “best agers” group is currently having a positive effect on future prosthetic requirements, lessening the decline in volume caused by increasing oral health. However this will continue in the long term.

Older seniors/People in need of care

The oral health of older seniors (> 75) today corresponds to that of younger seniors 10 years ago. Overall, this development means greater oral health over more years of life. However, despite this improvement, it can be assumed that caries and periodontal diseases will increase in absolute figures due to the increasing proportion of older people and the decreasing proportion of edentulous individuals, and that the need for treatment will therefore predictively increase. This development is evident in all European countries. The burden of disease only increase...
at an advanced age. This so-called morbidity compression applies to both caries and periodontal diseases. Almost every elderly senior (90%) suffers from moderate or severe periodontitis. The consequence is a growing need for treatment among older senior citizens, especially those in need of long-term nursing care, as the latter have significantly poorer oral health when compared to those of the same age who are not in need of long-term nursing care. This manifests itself in higher instances of caries experience and fewer teeth of their own (see Fig. 23). The dental care of people in need of nursing care is often inadequate, and access to dental care is difficult. For example, only 17.5% of people in Germany in need of dental care can currently be treated without restriction. Despite this fact, expenditure on dental care can currently be treated without restriction.124 Despite this fact, expenditure on dental treatment is at a lower level in all phases of life (including old age and end of life) than the rest of health care expenditure.125

Those with responsibility in politics and society have agreed to improve dental care for those in need of long-term nursing care and adequately remunerate services which need to be performed in this context, both for dental practices and nursing staff. The possibility of concluding cooperation agreements with nursing facilities offers security for both sides. There are already 3,700 of these cooperation agreements in Germany, which is equivalent to 27% of nursing facilities. In principle, the provision of services by a dentist in a practice is today still more economical and ergonomic than visiting seniors in need of care in nursing facilities. However, since July 2018, dentists in Germany have been able to invoice more than before for the treatment of elderly people requiring nursing care for a home visit, treatment in an institution or even in their own practice, due to additional billable surcharge items.

Since demographic developments will increase the need for dental care among older senior citizens and, especially, those in need of long-term care, it makes sense to focus more on geriatric dentistry in the future. This development is supported by the trend towards multi-treatment practices that can, for example, schedule a fixed morning each week for outpatient treatment.129

Increasing multimorbidity, especially in older patients, should be taken into account in oral surgical interventions (especially in light of the different medications used in treatment).

Appropriate therapy planning, implementation and post-therapeutic care are required here. In general, the correlation between dental findings and diseases of the entire organism is becoming increasingly apparent, and research results are making it ever clearer. With regard to demographic development, model calculations made by the KV Nordrhein association for panel doctors predict a change in the prevalence of certain chronic diseases, including a significant increase in dementia, heart failure, Parkinson’s disease, kidney failure, stroke and ischaemic heart disease. Typical for these diseases is their coincidental occurrence in a patient. General illnesses of this nature are increasingly associated with dental diseases. Consequently, interdisciplinary cooperation between dentists and general practitioners, specialists and nutritionists is becoming increasingly necessary. The awareness that good oral health also has a positive effect on the maintenance of general health is increasing.124

Fig. 24 /// Population development (growth) until 2030

![Population development graph]

Source: Eurostat128 /// Graphic: REBMANN RESEARCH /// As of: 2018
With an increasing average age and decreasing proportion of employed people in the overall population, demographic change not only changes the demand for dental services, but also affects service providers. It is leading to an ageing workforce and an increasing shortage of skilled workers in dental practices.

**Age structure of specialists and dentists**

According to a study conducted by the Institute of German Dentists (IDZ), an increase in employment of around 20% is expected in the area of dental care by 2030. This means an additional need for approx. 65,000 employees in the dental care and dental technology sector and approx. 11,000 in the retail trade for oral health products (see also p. 12).130

On the other hand, the average age of the population – and skilled workers – is rising. A glance at the figures for dental care shows a clear development. 35% of dentists in Germany were aged 55 and over in 2016, compared with 27% in 2009. In 2016, the average age of all dentists in Germany was 48.6 years (2009: 47.1).15

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**Lack of skilled personnel in case of dental technicians**

The age structure of German dental technicians subject to social insurance contributions highlights the extent of the shortage of skilled workers even more. In 2000, approx. 45% were under 35, but the proportion of employees in this age group was only 24% in 2016. Whereas only every ninth employee was older than 50 in 2000, 38% belonged to this age group in 2016. Based on these developments, it can be assumed that closures of small businesses will increasing in the coming years or that some owners of dental laboratories will switch to an employment relationship.124

Direct sales of cosmetic dental and oral care products via online portals is increasing, as increasing numbers of elderly people have access to the internet and the necessary skills to purchase online. The tendency to procure and apply the necessary products oneself leads to innovations.

Demographic change is also putting pressure on the skilled labour market for manufacturers and distributors of dental products. Career prospects for professionals in the medtech industry are therefore excellent. 84% of companies have vacancies, especially in sales, and 79% have problems filling these.132

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**Dental laboratories**

The demographic development will be accompanied by an increasing but also changing demand for dental products and dental technology. For example, the growing proportion of older people and increasing awareness of oral health are contributing to the growth of the dental equipment market. As a consequence, dental practices are faced with the task of adapting their practice organisation and equipment to this group of patients (e.g. by purchasing a mobile unit for treatment in a nursing home). Many dental problems suffered by seniors result from limitation of their motor skills, making oral hygiene more difficult.

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**Manufacturers/Trade**

The demographic development will be accompanied by an increasing but also changing demand for dental products and dental technology. For example, the growing proportion of older people and increasing awareness of oral health are contributing to the growth of the dental equipment market. As a consequence, dental practices are faced with the...
The use of digital technologies continues to proceed unabated, and the degree of networking of digital devices is also increasing. Digitisation enables completely new procedures and methods in dentistry, resulting in changes in the interaction between patients and all involved in dental care. The impetus for future developments in the field of digitisation comes from digital virtual assistants which are there to aid the user when he or she has no hands free. In addition, the so-called Internet of Things (IoT), increasing use of intelligent software right up to AI (artificial intelligence) and improvement of the digital infrastructure are also significant drivers in health care. The exponential increase in data-collecting devices (which provides a continually growing volume of analysable data) in conjunction with AI-based analysis algorithms will also open up completely new opportunities in the future for players on the dental market. Assuming a suitable degree of openness and willingness to adapt, new, constantly progressing digital technologies will also open up new opportunities for the dental industry with, on the one hand, enormous potential for ever improving patient care and, on the other, interesting new business models.

Specialist personnel are a decisive factor in the successful transition to and use of digital technologies. There will be strong demand for IT and electronics professionals in the future. Digital dentistry and other areas of digitisation such as IoT or Industry 4.0 require new digital job profiles, the design of which actively challenges the dental industry.

However, not only digitisation is continuing to advance. Technological development as a whole is progressing. New materials and technologies are opening up innovative, more gentle and more efficient treatment options for dentistry and, also, transforming options and workflows in the restorative area.

The new e-patient

Digital technologies, in particular the internet, also have a major impact on patients. Constantly increasing health awareness and new digital options are helping to shape a patient who is better informed, compares things and does not leave decisions up to the practitioner alone. A study conducted by the Bertelsmann Foundation found that 58% google information on symptoms and diseases before visiting a doctor, with 62% doing this after a visit. Patients use doctor search and evaluation portals, exchange information in patient communities, inform themselves in the internet about treatment procedures on health websites and through YouTube videos, obtain health data themselves through smart devices, wearables and apps and, in future, will manage their own electronic health records. Consequently, this new “e-patient” is gaining more and more market power. Far more serious, however, are the effects on how patients experience healthcare, how patient data is managed and how communication will occur in future.

Digitisation continues to gain momentum across Europe, but some countries still have a lot of catching up to do. This is also evident from the DESI Report 2018.
**DESI Index**

The Digital Economy and Society Index (DESI) is published annually by the EU Commission and documents the progress of digitisation in member states. The criteria examined are connectivity, human capital, internet use, integration of digital technologies and digital public services (e-government).

The Scandinavian countries and Switzerland lead the field in terms of digitisation, followed by the Netherlands, Ireland, the United Kingdom, Belgium and Estonia. Germany and France are only middle-range performers, with Italy, Bulgaria, Greece and Romania bringing up the rear. Germany performs particularly poorly in the area of digital public services/e-government and ranks 21st out of 28 in an EU-wide comparison. The low level of digital interaction between authorities and citizens is also reflected in the use of health services. This is at present still negligible in Germany. Only seven percent of internet users access electronic health services, whereas a European comparison indicates almost a quarter of users avail of this option. On the one hand, the extremely low take-up of electronic health services in Germany is due to the still limited range available and, on the other hand, to a continuing lack of acceptance on the part of doctors and hospitals. Even though reservations and obstacles still exist, 2018 has seen a significant increase in digital health services. In particular, the electronic health records of various health insurance funds deserve mention here, but developments also include providers of video consultations and the integration of online appointments. It can be assumed that the establishment of the telecommunications infrastructure will give a further boost to digitisation in the health care system, promoting development of further digital services. In principle, the implementation of e-health goals does not depend, as is often assumed, on the size or organisation of the healthcare system, but rather on political will and a carefully considered e-health concept which are decisive for successful digitisation in the healthcare system. Countries like Finland, Denmark and Estonia have led the way in this respect.

**Estonia, Finland, Denmark: Role models in implementing a digital public (health) infrastructure**

Estonia is considered a pioneer in e-government. Free internet for citizens and almost 100% digitisation of the 2,400 state services are the basis for a high level of acceptance among the population. The core element of Estonian digitisation is the identity card which serves as a storage medium and for identification. Important personal information (e.g. tax returns, the electronic medication plan or voting in elections) can be stored on the integrated chip. E-prescriptions can also be redeemed by patient identifying themselves or logging in at the pharmacy using their identity card. Those who do not wish to have their health data stored digitally must actively object to this in Estonia (opt-out procedure).

Estonia was the first country in the world to introduce the electronic health record, thus enabling documentation and administration of all health-relevant patient data (medical findings, vaccination certificate, diagnoses, X-rays) from birth to death. Both doctors and other medical service providers are obliged to update data to ensure that the health records are always up to date. In addition to data entered by service providers, citizens have also been able to store their own health information from, for example, apps or wearables since 2017. The transmission and storage of data occurs via the so-called X-Road which is based on blockchain technology.

In addition to Estonia, Finland has also been using the X-Road since 2017, technology which enables a cross-border exchange of data. A development partnership for X-Road and the Nordic Institute for Interoperability Solutions (NIIS) which was founded for this purpose demonstrate the will to develop new digital and interoperable solutions jointly.

The electronic health card is also an integral part of the health system in Finland. 90% of the information exchange between general practitioners, specialists and hospitals occurs digitally via this platform. Citizens have access to their own health data via “Kans Ta”, the national health archive, which is accessible to every citizen. As in Estonia, e-prescriptions, which have been required by law since 2017, are stored on identity cards. In contrast to Estonian data management, the Finns must consciously agree (opt in) in advance to data access.

In Denmark, too, patients’ health data is stored and managed in an appropriate file where it is made available to the various players. A large part of communication between doctors and hospitals can be realised paperless as a result. Similar to in Finland, the patient can access stored health data via the “Sundhed.dk” portal using their individual citizen number. In addition to managing data, patients can also arrange appointments with their family doctor via the portal or order follow-up prescriptions.

Contrary to the Scandinavian countries, digitisation in the health service is still very new in Germany. The so-called E-Health Act from 2016 (E-Health-Gesetz) for secure digital communication and application in the health sector has created the framework conditions for targeted promotion of digital progress in the health sector. The aim is to network various service providers (doctors, dentists, hospitals, psychotherapists), thus ensuring an efficient and secure data exchange (see Fig. 26). At the same time, patients’ self-determination and health care should be strengthened sustainably through the digital infrastructure. The central element here is the electronic health card (eGK) which serves as a storage medium for electronic applications and is used for verification purposes. In addition to the comparison of the insured person master data (VSDM), the documentation of medication (eMedication plan), the storage of emergency data or the electronic patient file will also represent added value for patients and practitioners in future. According to the legislator, connection of doctor and psychotherapist practices to the telecommunications infrastructure (TI) must be completed by June 2019.
European eHealth Network

In order to establish political guidelines for developments in the area of e-health in Europe, the EU member states unanimously decided on an appropriate initiative in 2009 which was scaled with the establishment of the eHealth Network. The objectives of the eHealth Network are to improve medical (cross-border) care, strengthen trust and safety and to ensure high-quality care based on prescribed security standards. In addition to data protection, the focus of the European eHealth Network is in particular on the development and definition of technical and semantic standards that enable cross-border electronic exchange of health data. This is all the more important, as various European member states are developing or already making available their own health or patient files for their citizens. In addition to an option for European data exchange being beneficial for citizens (e.g. commuters), research can also profit from it.

Germany has made little progress in introducing the electronic patient file (ePa) in the last two years and, in a comparison between 20 European countries, fell back 2 rankings from the last comparison in 2016 to 13th place. There is a lack of clear political guidelines, and broadband expansion is also very sluggish. Implementation of the electronic patient file is also led by the Scandinavian countries (with Denmark ranked in 1st place). Hospitals here already use the electronic patient file on a nationwide basis, as do a large proportion of general practitioners and specialists. It is common practice here to issue e-prescriptions, and all patients have full access to their e-patient file. In Estonia and Spain, almost all general practitioners now use the electronic patient file (50% of them for prescriptions), while the level among specialists is 70%. The United Kingdom also belongs to the group where the introduction/use of the electronic patient file is already well advanced. The country has a good internet infrastructure and many young doctors with e-competence. In addition, the electronic patient file is already accessible to patients themselves. France is already using

the electronic patient file across the board, at least in hospitals. Austria, which like Germany has made little progress since the last survey, has now introduced measures (ELGA electronic health record). Italy, the Czech Republic, Slovenia and Ireland are lagging behind in the introduction of the electronic patient file.

At present, progress in the implementation of an electronic patient file is also evident in Germany. In a letter of intent, the German National Association of Statutory Health Insurance Dentists (Kassenzahnärztliche Bundesvereinigung – KZBV), the Federal Association of Statutory Health Insurance Physicians (Kassenärztliche Bundesvereinigung – KBV) and the National Association of Statutory Health Insurance Funds (Spitzenverband Bund der Krankenkassen – GKV-SV) have agreed on uniform standards and a distribution of tasks for implementation of the electronic patient file. The basis for this is the model of the Society for Telematic Application of the Health Card (Gesellschaft für Telematikanwendungen der Gesundheitskarte - gematik). Provisions are made for three areas:

- A standard area for the identical filing of medical information from providers
- A health insurance area for information provided by health insurance companies for insured persons
- An insured person area for data provided by insured persons themselves

According to the German Appointment Service and Supply Act (Terminservice- und Versorgungsgesetz – TSVG), German statutory health insurance funds are obliged to provide persons insured with them with an electronic patient file approved by gematik by 1 January 2021 at the latest. The electronic patient file will be stored on the electronic health card in future to centralise all important data such as treatment processes, findings, laboratory values or medication plans. As an alternative to the highly secure method via the electronic health card and electronic health professional card, insured persons will in future also be able to access data on their electronic patient file via a smartphone or tablet. Health insurance funds must inform their policy holders how the electronic patient file works, the type of data processing involved and about access rights. The procedure for granting consent to the insured person to use medical applications should also be simplified.

The electronic patient file is currently still in the development phase. The situation is different with regard to electronic health records (eGA). These were launched on the market in 2018 by health insurers and other providers independently of the requirements of the E-Health Act. In contrast to the electronic patient file, the electronic health record is not subject to the strict security requirements of gematik and the German Federal Office for Information Security (BSI), but only to current data protection regulations.
Data protection – risks

Data protection is a top priority, especially in the healthcare sector, as it involves the administration and processing of highly sensitive data. The legislator has defined concrete IT requirements for this purpose (EU GDPR and ITSiG) which are intended to prevent disruptions in the system and unauthorised accessing. In addition to observing the legal framework, sensitivity in dealing with IT systems in the dental practice is particularly important. Every dental practice employee should have basic knowledge of the system security. For example, careless use of external USB sticks should be avoided to prevent the introduction of viruses and Trojans. Equally important is the use of contemporary antivirus software and regular updates for computers and medical devices. In addition, the practice is required to keep the hardware and associated operating and software systems up to date. There is a risk to data security and system availability if older systems which have not been updated are combined in a network with other dental digital systems. Technical and organisational measures are particularly difficult to implement in facilities where administrative and clinical IT have grown together without clear divisions. New IT networks, such as blockchain technology, can increase data security and ensure protection against improper access from outside and inside through their decentralised structure.

Dentist/Practices

What does the e-patient expect from the dental practice?

Patients expect their dentist to be more involved in treatment and to provide information about it. Dentists should expect that patients will increasingly seek counteroffers for self-pay services and for treatment and cost plans. This will also impact on prices. This new self-understanding is accompanied by a parallel diminishing in acceptance of certain things which were previously taken as a matter of course (e.g. the dentist having exclusive decision-making authority regarding treatment). Customer orientation and transparency are increasingly becoming success factors. A study by the Deutsche Apotheker- und Ärztebank (ApoBank, German bank for pharmacists and physicians) indicated that around one in three uses the internet to select a doctor. In the case of Generation Y (18-39 years), around 43% have chosen their dentist or doctor on the basis of online evaluation portals. According to this

Electronic health record (eGA) in Germany

§ 68 SGB V – Voluntary benefits provided by health insurance funds for their insured persons

Different health records:
- Vivy (Vivy GmbH): statutory and private health insurance funds: Allianz SE (up to 70 % participation in Vivy GmbH), DAK, Bahn BKK, IKK, Classic, Barmenia, Gothaer and Süddeutsche Krankenversicherung
- TK Safe: Technician health insurance fund in cooperation with IBM
- Gesundheitsnetzwerk HaffNet: AOK Nordost, AMEOS Klinika Ueckermünde and Anklam, KV Mecklenburg-Vorpommern
- My Health: AXA in cooperation with IBM
Blockchain is the digital implementation of a trade repository in which data record blocks are mathematically confirmed and inseparably linked to the previous transaction. The blocks are not stored in central data centres, but decentralised. The platform regulates and controls itself in this respect (algorithms), thus dispensing with authorities. This and decentralised, frequently replicated data make the process less susceptible to manipulation and cyber crime. Blockchain technology is always interesting when several parties work together and contribute data.

Application options in the healthcare sector: Administration of sensitive patient data, billing of services, logistics in the health care/pharmaceutical industry

Application options in industry: Due to the subsequent immutability of transactions, blockchain is highly suitable for immutable storage of production data, measured values and machine characteristics. Processes can be traced in a counterfeith-proof manner. The process is therefore also suitable for tracing the supply chain and validation processes such as those required for CE certification pursuant to the MDR. Blockchain also enables an enormous increase in process efficiency with regard to the Internet of Things.

Manufacturers and retailers must adapt to the changing purchasing behaviour and changing information channels of patients

Altered purchasing behaviour (which also generates potential in logistics)

Increasing digitisation in practices and laboratories is accompanied by a strong increase in use of the internet. This is also impacting procurement channels for dental products. The dental trade is increasingly facing competition from purely internet traders, foreign manufacturers, players from outside the industry (e.g. Amazon) and manufacturers selling directly via the internet. Retail is also migrating to online business. When supported by digital tools, full-service providers with a comprehensive product range and complete service/consulting programme have the best market opportunities. However, this also requires qualified specialists who can handle this variety and, in particular, the digital tools employed and integrate them effectively into the overall sales process. On the other hand, continuous digitisation in ordering and logistics/shipping also enables a significant improvement in efficiency and quality. Digitisation not only leads to growth in the equipment market for digital dentistry. The growing volume of digital data and increasing networking also lead to market growth in computer systems and software (including data security) and, also, cloud providers and cloud applications. Digitisation transforms dentistry through, for example, AI-supported big data analyses and robots and procurement and production processes (the key phrase being Industry 4.0).

Dental laboratories

Laboratories must also adapt to this shift in market power from dentists and health insurers as payers to patients. Modern digital technologies make it possible to impress and convince patients of the positive end result of a prosthetic restoration as early as the planning phase. For dental laboratories, digitisation means not only the digital CAD/CAM production of dental technical products, but also the digitisation of communication and data exchange with their dental customers and suppliers.

Manufacturers/Trade

The new e-patient means the following to manufacturers:

- An increasing desire for individualised products
Artificial Intelligence (AI)

AI exploits artificial neural networks. As in the human brain, these are linked to each other via neuron nodes. Typical applications are speech recognition, image recognition, pattern recognition, control of complex processes, early warning routines and analyses of time series.

Machine learning (ML) is an area of AI for processing big data. ML is used to predict events based on the evaluation of available data. One example of this is Netflix. Netflix collects user data (who’s watching what, and when? When do viewers interrupt a series? etc.). This data collection is used to recommend series to users, but also for the development of new series. The algorithms used are divided into two categories:

1. Supervised algorithms: A human being is responsible for the input, the desired output and also feedback about the accuracy of predictions during training. After completion of training, what has been learned can be applied to data and also new data.

2. Unsupervised algorithms: These do not need be trained with desired output. Deep learning (also known as deep neural learning/ deep neural network) is employed here. Data is checked to draw conclusions.

ML is used for personalised marketing in the area of internet commerce. Sales recommendations are compiled in conjunction with purchases already made and internet usage (search). Further application areas for ML are fraud detection, detection of network security threats, the creation of news feeds and, also, predictive maintenance. This will also play an increasingly important role in the dental sector in connection with the Internet of Things (IoT) for equipment in dental practices and dental labs and in production/Industry 4.0.

US and Chinese companies currently lead the field in AI. The US companies Alphabet (Google), Apple and Facebook are investing in AI, as are the Chinese technology giants Alibaba and Tencent. The state in China is also investing large sums in AI with the aim of becoming the world market leader in this area by 2030.

Use of AI in dentistry

As initial projects in medicine have met with a positive response, the dental industry is also striving to improve efficiency with the help of artificial intelligence.

The aim is to use algorithms to evaluate X-ray and CT images of patients which will help doctors during diagnosis. Artificial intelligence can represent the most effective treatment methods with the aid of data evaluation, thus enabling the physician to develop improved treatment plans. Overall, diagnostics employing AI can be more efficient and precise. In addition, AI can also support appointment and financial planning for dentists.

The advantage here is that AI learns automatically. Newly recorded data ensures that algorithms are expanded and, as a result, the application is constantly improved through new knowledge.

Example: Caries detection algorithm prototype

This algorithm is already used by dentists and can be installed as software. It performs caries diagnosis by comparing X-ray images of patients with a large volume of data on X-ray images of patients affected by caries.
Interesting, future-oriented fields of innovation in dentistry are highlighted below, without any claims to completeness and without setting priorities or a fixed framework: The use of digital technologies (digital imaging, CAD/CAM production, 3D printing, etc.) is currently at the forefront of technological developments. Depending on the specific clinical situation or indication, they can enable the achievement of qualitative improvements in treatment and diagnosis in detail. Above all, they enhance comfort and efficiency. In particular, CAD/CAM enables rapid, high-quality production of dental technical objects, makes it possible to process new materials during this. Changed workflows in the laboratory and practice also contribute to a different cooperation within the industry. In addition, there are many other innovative developments, especially with regard to materials and procedures.

Dental restoration is one of the most common dental procedures. Mixing nanoparticles such as silica and zirconium oxide (also known as nanocomposite resin) allows dentists to fill cavities and reduce bacterial infections. It also aids reconstruction of dental enamel. PEEK is a high-performance plastic already in use for implants in medical technology. Its advantages: metal-free and thus permeable to X-rays, high biocompatibility, bone-like elasticity, hardly any signs of material fatigue. PEEK can be processed with CAD/CAM support. The material is approved for removable and conditionally removable prostheses. It can therefore be used for model casting prostheses, abutments, overdentures for combined prostheses, implant-supported full crowns in the posterior region and conditionally removable screw-retained bridges. The material is also approved for use in bruxism patients due to attenuating effect it has on chewing force. Although the material does not offer transparency, it can be shaded pursuant to the shade scales and would therefore be suitable for full crowns, including in terms of aesthetic properties. PEEK is an ideal as a metal-free and biocompatible alternative to gold, due to its material properties.

Nitrous oxide sedation also offers potential for growth. It reduces anxiety and pain, reduces choking and swallowing reflexes, is very low in risk and has no after-effects. It is already widely used in the United States and UK, but very little in Germany (estimated proportion of practices using laughing gas: 10%).

Development is also progressing in the field of dental lasers, both technologically and in terms of applications in dental practices. Dental laser treatment is becoming increasingly gentle. In addition to applications in surgical procedures, implantology, endodontology and periodontitis treatment (including peri-implantitis therapy), lasers will probably be used in the future to prevent caries formation. A research team at UC San Francisco has found that the high temperature of the laser renders the uppermost layer of enamel more acid-resistant and less vulnerable. A single combination treatment with fluoride varnishes and CO₂ lasers could replace repeated fluoride treatments in future.
better evaluation of image material, due to their magnification and colour rendering options and, in particular, filter functions and software-supported evaluation. DVT (Digital Volume Tomography) images, in particular cone beam computed tomography (CBCT), open up new diagnostic and therapeutic possibilities for the dentist with three-dimensional images and radiation exposure of only 3 – 20% of a conventional CT image. While enable good assessment of existing bone volume with a small space requirement and comparatively low acquisition costs, CBCT also provide a good image of the alveolar nerve and maxillary sinus. Better knowledge of the spatial situation allows for more precise and, consequently, more gentle interventions. Classic "X-ray chemicals" are dispensed with when digital X-ray systems are used. In addition to the above-mentioned advantages, this also relieves the burden on the environment, and the dental team need not place any repeat orders.

Digital impressions as basis for completely digitised workflow

In prosthetics, a digital workflow can mean fewer consultations for the patient and an increase in comfort and quality. Digital impression taking means that bite into the impression casting material that some patients do not like is no longer necessary. Depending on the clinical situation and the equipment available, restoration can be realised directly in the practice in the case of crowns and up to three-unit bridges (in the sense of "one-stop dentistry"). In general, however, the much greater part of digital (partial) workflows takes place in the laboratory - usually in the following manner: The dental technician either works on the basis of a digital data set (intraoral scan), or he develops a conventional plaster model and digitises it in an extraoral scanner. CAD/CAM production follows in each case. Approximately 75% of laboratories already use an extraoral scanner, while impressions are taken on patients in most practices using conventional methods. In Germany, only 15 – 20% of dentists use intraoral scanners, but their use is on the rise.

The trend is increasingly towards a completely digitised, networked workflow. Its implementation means the development of extensive time and cost saving potential. In addition, continuously digitised processes harbour fewer sources of error and, consequently, also the potential for a qualitative improvement in precision. CAD/CAM technology will therefore continue to make inroads in dental practices. As these systems are not yet in use in many practices, there are good opportunities to be exploited here for the dental industry. The example of a region in Germany illustrated in Figure 29 shows that there are also large regional differences in the use of CAD/CAM systems.

Intraoral scanners are easy to operate, and development is moving more and more towards handier, more cost-effective systems with a growing scope of services. Systems operate increasingly as a wireless solution, powder-free, in true colour and offering open data exchange. In practice, use of this technology means that costs for impression material and a significant amount of time are saved (see info box). Data obtained can be forwarded directly to the industrial or lab partner or prepared in practice for chairside production. Archived data records are immediately available again if necessary, whereas conventional plaster models take up space. The digital impression

![Fig. 29](density of CAD/CAM systems)

This map shows the density of dental practices with CAD/CAM systems in Saxony (Germany). The fewer CAD/CAM systems calculated per inhabitant, the less the competition, hence the green colouration.

Source: www.ATLAS-MEDICUS.de /// As of: 2018

**Time-saving digital impressions using an intraoral scanner versus conventional method with impression tray**

<table>
<thead>
<tr>
<th>Conventional impression taking</th>
</tr>
</thead>
<tbody>
<tr>
<td>The material must harden in the mouth for at least 5 minutes for each impression.</td>
</tr>
</tbody>
</table>

**Impression taken by digital scan**

1.5 min. for fully dentulous jaws

In addition, subsequent work steps for impression taking using intraoral scanners are dispensed with:

- Preparation of impression tray
- Model casting
- Cleaning and disinfection of impression tray
- Demoulding and trimming of model

→ Time saving per impression: 0.5 h
→ During scanning, data can be transferred from the dental assistant to the dental technician shortly after the scan.
The invention of surgical robots allows physicians more precise control over surgery. In dentistry, robots are already used as navigation systems for the pre- and intra-operative phases of implantology. Robot systems are already available for 3D CAD and CBCT guided drilling of dental implant sites, with surgical planning software, real-time 3D graphics and physical navigation through a robot arm that is permanently guided by the dentist and performs minimal automatic angle improvements.150

An intraoperative impression, which can be useful for immediate implant placement, is hardly possible without an intraoral scanner, due to the risk of contamination of the tissue with impression materials. In addition, the digital workflow enables simulation of the subgingival situation following scanning of the healed situation before prosthetic restoration by matching the implant data set. This makes the tissue-damaging insertion of sutures to show the preparation margin superfluous. Intraoral scanners also enable rapid and accurate bite position determination. For example, the latest generations of scanners also allow one to record and display the real dynamic articulation of the patient. Further application options are to be found in patient education (e.g. documentation of the progression of periodontal diseases). The efficiency of intraoral scanner use can be further enhanced through delegation (e.g. scans for situation models, splints). Many practice laboratories which are mainly used for model production can be dispensed with through the use of an intraoral scanner, and staff involved in these tasks can be deployed elsewhere. Due to its outstanding advantages, digital impression will gradually replace the conventional method in many places.151

For dental laboratories, increasing CAD/CAM production means they need to redefine themselves and their role in the manufacturing process, especially as the “bread-and-butter” business involving crowns and bridges is likely to decline. The old “all-round supplier” for the entire range of dental prostheses from a single source will increasingly lose importance. Outsourcing of sub-processes is enhancing the importance of manufacturing centres, and dental technical services in the low-budget segment are increasingly being provided by foreign laboratories. However, the advantage of usually lower (personnel) costs for laboratory work abroad will presumably play an ever smaller role in the future. The main reason for this is that the growing volume of parts manufactured by CAD/CAM is increasingly replacing the time-consuming manual work involved in traditional manufacturing methods (which is cheaper abroad). For example, the production of a crown using a CAD/CAM milling machine takes 15 – 20 minutes, plus 30 minutes of sintering in a sintering furnace. Added to this are falling prices and improved quality in additive manufacturing processes (3D printing). These are becoming increasingly affordable, even for small laboratories, enabling them to produce dental products such as crowns/bridges, splints, models, impression trays, etc. quickly, inexpensively and in a material-saving manner. Ongoing training of dental technicians and continuous software updating are decisive for the successful implementation of digital technologies. Laboratory owners should take these aspects into consideration at the time of purchase.

Changes through use of additive manufacturing (3D printing)154

If the acquisition costs of CAM systems are too high, it can make sense to invest in CAD technology only, especially for smaller labs, and to outsource CAM production to milling centres. Each laboratory should check for itself whether it is economically advisable to give preference to in-house or external production. The situation is different when using additive manufacturing processes (3D printing). 3D printing of drilling templates is already widespread in both commercial dental laboratories and practice labs, as is the production of aligners in orthodontics. For example, 3D printers replace the labour-intensive model casting process in laboratories. Other applications include anti-grinding and occlusal splints and impression trays. Simple and rapid production of long-term temporaries and implants will also be possible in future using 3D printing. In the orthodontic sector, dental arches for deep drawing aligners or transfer trays for indirect bonding are already being manufactured using 3D printers. A wide range of materials can now be processed using various additive manufacturing processes via CAD/CAM (metals, plastics and even ceramics).152

Prices of 3D printers are falling, and they are now even affordable for small labs. The price development means that use of 3D printers is also becoming increasingly profitable for dentists in private practice. The advantages of 3D printing are considerable time savings when compared to conventional manufacturing processes, high quality and low material consumption.

The use of CAD/CAM can already reduce unit costs in part when compared to conventional manufacturing processes. Compared to subtractive CAD/CAM processes, 3D printing achieves a further significant reduction in unit costs. An empirical survey conducted by the Meisterschule für Zahntechnik, Handwerkskammer Köln (the school of dentistry for master craftsmen/women of the Chamber of Crafts, Cologne) and two dental laboratories resulted in a 45% reduction in unit costs for digital production using 3D printers when...
3D printing is now practical for the production of drilling templates for dental implants, physical models for prosthetics, transparent aligners for orthodontics and individual parts for dental/implant restoration. 3D printing can also be used to produce inexpensive gingival masks, cast designs, individual impression trays, splints (e.g. orthodontic occlusal splints), transfer keys, long-term temporaries, crown and bridge frameworks, bars and prosthetic bases. 3-D printers are already frequently used in larger dental practices with a focus on implantology.

Current developments already enable the complete manufacture of certain types of dental prostheses in just 20 minutes using additive procedures, thus reducing the cost of a prosthesis by more than 50% when compared to conventional processes. Nevertheless, widespread use of, for example, temporary restorations realised through additive manufacturing will probably take some time. 3D printing is also likely to occur initially mainly in the laboratory, with chairside printing developing where appropriate in the medium to long term. In the meantime, 3D printers exist that combine several materials in a single printing process, thus generating a very wide spectrum of colour tones, and progressively smaller structures can also be produced. New developments that combine the use of additive and subtractive processes in a single device or 3D printers that can process different materials simultaneously are also very interesting. Research is currently also being conducted into the printing of tissue and bone material using bioprinting.

Compared to conventional printers, the production time using 3D printing was only around a quarter and, for tray production, only about a sixth of that usually with a conventionally produced part. Calculations indicate that the purchase of a 3D printer often pays for itself after just a few months. If, for example, the 3D printer is only used to print splints, the acquisition pays off from as few as 11 splints a month. Cost-effectiveness increases parallel to capacity utilisation.

In CAD/CAM production, additive processes (3D printing) are increasingly competing with milling machines. A current analysis forecasts an increase in the market volume for 3D products in medical technology from € 0.26 billion (2015) to € 5.59 billion in 2030. The dental sector is playing a pioneering role in this. Laser-assisted printing of frameworks and 3D printing of plastic models are already established areas. Market researchers see the greatest growth opportunities in orthodontic appliances, prostheses, crowns, bridges, aligners and models. Customers are predominantly dental laboratories and, increasingly, also large dental practices, especially with a focus on implantology, and orthodontic and maxillofacial practices.

3D bioprinting, for example, is used in the field of maxillofacial surgery for cleft lip and cleft palate closure. For this purpose, some jaw bone material is removed from the patient during the first surgical step (closure of the lip). The cells contained therein (vascular cells, bone cells, stem cells) are separated, multiplied by cell cultures and then cryopreserved. A three-dimensional image of the cleft jaw is then created as the basis for the creation of the “living” bone implant. This is created using 3D printing from bone cement, hydrogel and the cryopreserved living cells. This so-called bioprinting procedure is much more gentle on the patient, as it eliminates the need for (painful) removal and transplantation of bone from the pelvis to close the cleft jaw.

Low level laser therapy (LLLT) replaces, among other things, painkillers that can trigger intolerances or allergies during orthodontic treatments. In particular, pain that occurs during fixed brace treatment due to a change of archwire or combined oral surgery and orthodontic treatment can be alleviated.

With genetic personification in dentistry, dentists can determine the risk of patients contracting oral diseases such as periodontitis and other inflammatory diseases. Telemedical support for analysis of the connection between dental diseases and other chronic diseases (e.g. diabetes or coronary heart disease) is also interesting. A smartphone app can provide the patient with information on his or her state of health and oral health in this context. The data collection is used to analyse the relationship between dental and chronic systemic diseases.

The aim is to set up an electronic decision support system for dentists and other specialists.

The Mercateo Study 2017 which, in cooperation with the Leipzig University of Applied Sciences (HTWK Leipzig), examined procurement processes with the aim of identifying hidden potentials, produced the following results: The establishment of digital procurement processes in purchasing reduces process costs by around 40%. A digitally supported procurement process takes 1.5 instead of 3 hours (only about half as long). Conclusion of the Mercateo Study 2017: “The courage to digitise is rewarded with a strategic advantage”. However, around 70% of companies feel unprepared for the challenges of digitisation. This primarily applies to small and medium-sized enterprises, as the larger the company, the more likely it is to rely on digitally supported processes.
MARKET CONSOLIDATION

The trend towards consolidation of the dental market is evident throughout Europe, both in the area of dental care and among manufacturers, laboratories and retailers. This is also associated with increasing interest on the part of (non-specialist) capital investors in the dental market, especially in the area of dental services. The reasons for this are manifold. On the one hand, the dental market is highly regulated and reacts to changes in the legal framework and, on the other, these developments can also be attributed to technological change, in particular increasing digitisation, networking and current financial market developments, but also the changing working behaviour of skilled personnel.

How this development towards larger structures and cooperation among individual players in the dental market manifests itself is illustrated below. We not only examine current developments in this respect, but also their causes. The focus is on the German market as the leading dental market in Europe.

Drivers of large clinic structures

- Changes to legal framework conditions
- Changed working behaviour of upcoming generation of skilled personnel
- High-income regions/ conurbations
- Increasing investment volumes for the establishment of (especially medtech equipment)
- Market entry of investors unrelated to sector
- Increasing service diversity due to progress in medical technology

Changes to legal framework conditions

With a share of just under 82% (2016), individual practices continue to dominate the market in Germany. A recent study by the Institute of German Dentists (IDZ) based on a thirty-year study period concludes that, far from being in decline in Germany, this form of practice will in all likelihood continue to play an important role in the future market. Nevertheless, a consolidation can be perceived, fed by two different developments which were only made possible by a change in the legal framework:

1. Increasing size of individual practices: With the entry into force of the German Panel Doctors’ Rights Amendment Act (VÄndG) in 2007, expanded options for the recruitment of salaried dentists were created. Since then, a trend can be observed away from “lone wolves” towards larger individual practice structures which, according to the IDZ, leads to “the differences between practice forms (...) becoming increasingly blurred”. The larger practice structures are also reflected in the number of employees. The average number of employees per dental practice (not including health care centres) increased from 4.89 in 2000 to 6.08 in 2015. The average number of employed dentists and assistant dentists per dental practice rose from 0.14 to 0.29 during the same period.

2. Increasing number of dental health centres and dental health centre chains: Since the introduction of the option for establishing medical health centres involving the same specialist group through the German Statutory Health Insurance Care Provision Strengthening Act (GKV-Versorgungsstärkungsgesetz – GKV-VSG) in 2015, the development of purely dental health centres (zMVZ) has been extremely dynamic. Already more than 600 dental health centres existed at the beginning of December 2018. Furthermore, an increase in the establishment of dental health centre chains can be observed.

Given that larger practice structures are attracted primarily to locations with a high demand and purchasing power and, therefore, are encountered in large cities, conurbations or structurally strong rural areas, and given that many dentists will be giving up their practices for reasons of age in the coming years, it will become increasingly urgent to secure rural care. Although not yet very pronounced in Germany, it can be assumed that typical small practices, which average 1.74 dentists in Europe, will increasingly decline.

Changed working behaviour of upcoming generation of dentists

According to recent studies by the American Dental Association (ADA), a trend can currently be observed in many countries where younger dentists are increasingly opting to practice their profession in a cooperation. The change in values of the younger generation of dentists, which has a direct influence on working behaviour, is therefore regarded as an important driver for the creation of larger practice structures. The young generation attaches increasing importance to regular working hours and a harmonious work-life balance. Favoured by the increasing proportion of women among dentists, these developments are leading to employment relationships and part-time work becoming preferred forms of work. Large practice structures offer almost optimum conditions for such aspirations. In addition, dentists close to retirement age are willing to give up their own practice and choose a more flexible working time model in a joint practice or medical health centre instead of self-employment.

Rising investment volumes

Another reason for the trend towards larger practice structures lies in increasing investments in medtech equipment, digital practice management and networking and ever more diverse dental diagnosis and treatment procedures. In addition, as a result of medtech progress, innovation cycles are becoming ever shorter and the range of treatment options increasing, requiring equipment investments at
ever shorter intervals. This development puts small individual practices under pressure – not only to raise the appropriate investment sums, but also to master new equipment and technologies for which staff with appropriate training must be available.

Increased investment volumes are also reflected in the German market for practice takeovers. According to the current business start-up analysis of the Institute of German Dentists (IDZ) and the Deutsche Apotheker- und Ärztebank (ApoBank, German bank for pharmacists and physicians), the proportion of individual practice takeovers in which the total investment (price for practice takeover plus further investments, excluding operating loan) exceeded the € 500,000 threshold, rising from 5 to 10% between 2015 and 2017. The average financing volume for the establishment of a new individual practice in 2017 was already € 441,000 (excluding operating loan). For the takeover of an individual practice – the most frequently chosen form of business start-up at 64% – an average of € 309,000 was incurred (of which € 125,000 was for modernisation and equipment). Consequently, only a few dental start-ups dare to set up an individual practice – (the figure in 2017 in Germany was only 7%).

**Market entry of investors from outside the industry**

The low interest rate that has persisted for years now makes classic forms of investment unattractive. In the search for alternatives, investors are increasingly focusing on the healthcare market. The dental care market is interesting, not only because of the high market volume, but also because of the stable demand which is largely independent of economic fluctuations. The possibility of achieving economies of scale means that private equity investors see particular potential in the formation of large practice chains. This has led to the development of dental chains throughout Europe in recent years. Among other things, large pan-European dental chains can be observed with locations in several EU states, some of which pursue a very expansive policy.

Overall, shares of practice chains in the dental market are (still) relatively small in most European countries. The trend towards consolidation is currently most pronounced in Finland, where dental practice chains have a market share of 35%. Apart from this, only the United Kingdom and Spain have a significant share of practice chains (see Fig. 30). Chain formation is increasingly occurring in countries with predictable market conditions. Price increases generally do not influence investment decisions, as they only, if at all, have a temporary impact on demand.

According to KZBV, there were at least 93 chains with 296 medical health centre locations in Germany at the end of 2018. Of these, at least 75 dental health centres were in the hands of private investors. Around 12.9% of all dental health centre locations belonged to chains with at least five locations. According to the professional association, the twelve largest dental health centre chains have 98 locations with a total of 30 panel dentists and 289 salaried dentists. The trend continues to rise (especially with regard to the number of salaried dentists).

Opinions differ widely on the evaluation of the activities of external investors. Critics fear a “commercialisation” and “monopolisation” of dental services with correspondingly negative consequences for freedom of choice, patients’ access close to home and the quality of services. Advocates, on the other hand, see dental health centres and chains as a suitable instrument for ensuring care in view of the increasing ageing of dentists – including in rural regions – and to offer sufficient jobs to the next generation of dentists.

Apart from practice chains (which are growing more or less strongly, depending on the country), the consolidation process in Europe is not yet very pronounced, which is why markets are still characterised by a high degree of fragmentation.
In addition to doctors and dentists, institutional investors have been increasingly acting as founders and investors in Germany for about a year now. This development is more advanced in other European countries. Some large European dental chains are already in the hands of private investors, and further takeovers are constantly taking place.

The largest European practice chains currently exist in the United Kingdom, namely “My Dentist” (450 locations) and the state chain “Oasis” (300 locations). The “Dent-Connect” chain, which belongs to the Swedish EQT Group and cares for around one million patients in five countries, operates 220 practices with around 850 dentists in the Netherlands alone. EQT also acquired the Dutch dental chain Tandvitala about a year ago.

The Jacobs family is currently investing in the development of a pan-European dental chain through a Swiss holding company called Colosseum Dental Group. This chain operates more than 150 major high-turnover practices in Scandinavia, the United Kingdom, Italy and Switzerland. The total sales volume of the Colosseum Dental Group amounts to around € 300 million. Colosseum Dental, the Swedish investment fund company Altior Equity Partners and the Swedish financial investor EQT are currently also investing in the German market. Investcorp, the Bahrain-based investor, has acquired the Schloss Schellenstein private dental clinic in Olisberg, Sauerland, and the Acura clinics in Albstadt.

**Drivers of large laboratory structures**

- Investments in equipment and software required for conversion to CAD/CAM manufacturing
- Increasing digitisation (including electronic transmission of CAD data) means that spatial location near the client plays an increasingly minor role
- Dedicated practice or dental health centre labs compete with commercial laboratories
- Growing number of dental health centres leads to demand aggregation

Analogous to the market for dental services, the current low-interest phase is one of the reasons for increasing investor interest in the laboratory sector. The trend towards larger structures can, however, be attributed above all to increasing investments in equipment (e.g. 3D printers, CAD/CAM milling and software). Larger laboratories usually have better financial resources or better access to financing and, thanks to larger production volumes and better equipment utilisation, achieve a faster amortisation of investments. In addition, large laboratories benefit in particular from the exchange and close cooperation with internationally active experts and colleagues. This gain in experience is much more valuable than the mere purchasing advantages of large laboratory groups.

**Sales share of laboratory chains**

Laboratory chains already account for a significant proportion of sales. Although small companies are typical for the sector in Germany, in 2016 alone 38 large laboratories in the > € 5 million turnover class generated around 26% of the sector’s turnover. In particular, large dental laboratories with a turnover of at least € 1 million are increasingly the subject of interest of financial investors. Dynamic growth can also be observed in laboratory chains (due to start-ups and takeovers). In addition to this, internal takeover activities in the industry are leading to a further concentration.

**Shortage of skilled workers**

In Germany, large practices and medical health centres active in dentistry mostly operate their own practice laboratories which are run as profit centres within dental health centres and compete with commercial dental laboratories. Since dental health centres recruit their laboratory staff from the commercial dental laboratory sector, competition for scarce skilled personnel exists. Well-known laboratory or practice chains generally have greater potential when it comes to attracting and retaining qualified specialists. Another reason for the increasing shortage of skilled workers is the age structure development among employees and owners. Many owners are currently reaching retirement age, which is why problems arise in the search for company successors. With regard to employees, the recruitment of skilled workers and trainees (the number of trainees has fallen by about one third compared to the year 2000) is also causing difficulties for the dental technology trade.

According to the Federal Statistical Office’s Crafts Census, dental technician comes fifth in the area of practices.
in the negative ranking of all professions in German skilled trades, with a share of 17.3% of marginally remunerated employees.\textsuperscript{373} The evaluations of the wage survey conducted by the Association of German Dental Technicians’ Guilds (VDZI) show that the average monthly gross income of a dental technician in 2016 was around 28% below the average income in the skilled trades. Compared to the gross monthly earnings of all employees in Germany, this difference was even greater at almost 58%. According to the VDZI, however, the prerequisite for competitive wages is a correspondingly good earnings situation. However, commercial laboratories see themselves at a disadvantage here as a result of statutory price interventions and competitors.\textsuperscript{374}

Further problems arise from the age structure of existing skilled workers.\textsuperscript{375} If the shortage of skilled workers worsens in the future, this could have a negative impact on the existence of small businesses. In order to ensure the continued existence of specialised dental master craftsmen, the VDZI advocates abolishing the option to operating practice labs belonging to craftsmen, the VDZI advocates abolishing the option to operating practice labs belonging to craftsmen, the VDZI advocates abolishing the option to operating practice labs belonging to craftsmen, the VDZI advocates abolishing the option to operating practice labs belonging to craftsmen, the VDZI advocates abolishing the option to operating practice labs belonging to craftsmen, the VDZI advocates abolishing the option to operating practice labs belonging to craftsmen, the VDZI advocates abolishing the option to operating practice labs belonging to craftsmen, the VDZI advocates abolishing the option to operating practice labs belonging to craftsmen, the VDZI advocates abolishing the option to operating practice labs belonging to craftsmen. The aim of mergers and acquisitions is to save costs, gain access to the distribution networks of other companies and purchase innovative technologies. Transactions are increasingly occurring in adjacent areas such as artificial intelligence or wearables. A digital orientation is indispensable in this respect for the long-term success of new business models.\textsuperscript{178}

In the European dental industry (including trade), M&A transactions developed very dynamically between 2016 and 2017, increasing more than threefold (cf. Fig. 31). The medtech industry is influenced by the high speed and variety of technological developments, leading as they do to ever shorter innovation cycles. According to the German Medical Technology Association (BVMed), one third of sales is already generated with products that are three years old or less. Simultaneously, regulatory requirements are growing, an example being as a result of the EU Medical Device Regulation (MDR). The comprehensive requirements which this gives rise to pose a major challenge, especially for small and medium-sized enterprises when it comes to staffing and financial resources.\textsuperscript{179} Experts assume that the MDR (especially in the niche area) can lead to market consolidation.\textsuperscript{180} In a similar way, digitisation is also seen as a reason for the market exit of smaller businesses that cannot or do not want to deal with the corresponding technological challenges.\textsuperscript{181} In addition, small businesses increasingly under pressure from standardised purchasing processes (e.g. purchasing associations, purchasing companies of large hospital chains).

It is difficult to assess the further development of the medtech industry, due to the significant heterogeneity of its participants. Despite predicted further consolidation, small and medium-sized enterprises that make a decisive contribution to the innovative capability of the industry, especially as international niche players, still have opportunities which they can avail of.\textsuperscript{181}
Increasing protectionist tendencies in world trade, an imminent Brexit and trade conflicts, especially between the USA and China, are also having an impact on the global healthcare industry. Economic growth in China is already significantly affected. The German economy will also have to adjust to negative consequences if no political measures are taken.

Innovations in digital telecommunications are an important driver of globalisation. Digital developments not only enable closer international cooperation, but also new business concepts. New players, some from outside the sector, are transforming the dental market and changing existing dental trade structures.

Intensification of international competition is primarily putting pressure on the many small and medium-sized dental businesses that are exposed to global competition.182

A trend is currently evident that increasingly restricts liberalised trade relations through protectionist measures. China’s economic growth already slowed in the third quarter of 2018 (see p. 11). In order to strengthen its supply position, production relocations from China to third countries or even the USA cannot be ruled out. Punitive tariffs imposed by the USA and China on each other are responsible for this development. The Iran sanctions and the Italian budgetary policy are also contributing to uncertainty among businesses.

According to the Federation of German Industries (BDI), these conflicts are not yet affecting German exports, but the BDI sees an urgent need for political action to avoid future negative consequences for world trade.184 With regard to EU goods, the US government has refrained from imposing punitive tariffs on the entire medical technology sector. VDDI member companies achieved an export share of 62% in 2017.185 Manufacturers expect sales to expand in 2018, especially in the area of consumables. In the export business, manufacturers recorded an increase in sales, particularly in the target regions of Western Europe and the Far East.

As the world’s largest market for medical technology, the USA accounts for over 30% of global sales. The total volume of medical technology imports into the USA in 2017 amounted to US$ 53 billion. Ireland and Germany rank third and fourth among the countries of origin with medical technology imported into the USA. The total value of German shipments, including a large proportion of dental instruments and equipment, amounted to US$ 5.4 billion.186

### GC Index

The Global Competitiveness Index (GCI) is produced by the World Economic Forum and published as part of the Global Competitiveness Report. It provides information on the competitiveness of individual countries surveyed and shows the extent to which a
country is able to generate wealth on the basis of a value from 0 to 100. The GCI is made up of four sub-indexes: Basic requirements and needs (enabling environment), efficiency-enhancing factors (markets), innovation factors, sophistication factors (innovation ecosystem) and human capital, which are again subdivided into several pillars. In order to determine the exact value for individual countries, sub-indexes are weighted according to the gross domestic product per capita (GDPPC) of the population of the country in question. In 2018, the European states are still led by Germany with a value of 82.8. It is followed by Switzerland, the Netherlands and the United Kingdom. The bottom ratings are occupied by Bulgaria, Romania and Greece.

Dentists/Practices

Dental practices themselves are only marginally affected by globalisation (e.g., through issues such as freely available do-it-yourself kits, foreign providers of dental technology/dental services and globally active internet providers in the dental field). With the exception of foreign dental prostheses, however, these factors do not currently represent a phenomenon that affects all practices on a broad scale. The situation is somewhat different for international practice chains and private equity investor activities in dental practices, which are described in the chapter on market consolidation and which lead to structural changes in some European countries. As in most of the other countries examined, dental tourism in Germany is usually only a marginal phenomenon. The reason for this is the close relationship of trust between dentist and patient and the scepticism with regard to receiving equivalent treatment abroad. High standards in Germany mean that offers in the dental tourism industry are therefore somewhat unattractive. In Switzerland, however, the situation is different due to the price differential and the short distance to cheaper neighbouring countries.

Brexit

- The British will leave the European Union on 29.03.2019.
- A possible transition phase can ensure that the British remain in the European Single Market until 31.12.2020.
- Preparations for withdrawal are progressing sluggishly (lagging far behind the original timetables).

Consequences:

- The movement of goods in complex cross-border supply chains:
  - Customs barriers
  - Deviating national specifications for ingredients, packaging and labels
  - After Brexit, the weak pound sterling will tend to favour British exports. However, the British currency has a weak external value, which is why inflation in the United Kingdom will presumably continue to rise after leaving the EU (Peak inflation: November 2017 at 3.1%. Consequence: falling real wages)

Duties mean the exports of European companies to the United Kingdom after Brexit are also in danger of collapse. An average of 4.3% is anticipated for German exports to the UK. The EU could levy an average of 2.8% on British exports. London could levy 3.6% on EU goods. Trade between the UK and the EU is expected to collapse by up to 50%. German exports to the island, which reached €89 billion in 2015, could fall by up to 57%.

Trade between the UK and the EU is expected to collapse by up to 50%. German exports to the island, which reached €89 billion in 2015, could fall by up to 57%.

The EU and the UK fear major difficulties with massive trade implications:

- Attracting skilled workers will be more difficult, especially in the UK
- Lack of planning and legal certainty for companies

The EU and the UK need a trade agreement to avoid a sharp decline in trade:

- Waiving of duties
- Quotas on imports from the respective partner area

Dental laboratories

Foreign prostheses are of much greater relevance than dental tourism. Dental prostheses manufactured abroad impact dental laboratories, especially in the very large German market. Experts estimate that, up to 30% of dental prostheses in Germany come from abroad. The majority of foreign dental prostheses are produced by smaller commercial and practice laboratories, while only one fifth are manufactured by the top 10 providers of foreign dental prostheses. Foreign dental laboratories are not only in competition with dental laboratories, but also open up new possibilities for small laboratories in particular through outsourcing which ensure their profitability and, consequently, competitiveness. Major laboratories with manufacturing subsidiaries or supplier relationships abroad benefit from the exchange and close cooperation with internationally active experts and colleagues and, in particular, from the experience gained. Global cooperation in the context of increasing globalisation improves treatment options and the introduction of new products and technologies.
Global networking in the context of globalisation has led to greater price transparency and, as a consequence, prices are falling in some product areas. Digitisation and increasing cost pressure are resulting in the formation of larger structures in some countries in the medical practice and laboratory sectors. For manufacturers, this means greater bargaining power on the part of customers. Smaller/specialised manufacturers increasingly see themselves competing with large dental groups which represent all product areas and address practices directly. Increasing price awareness among the dental target group is leading to increased competition for customers.

In the dental trade, digitisation is bringing in new providers from outside the industry and digital platforms with large data volumes and marketing power. Increasing networking of devices and platforms in conjunction with data analytics algorithms/AI software will benefit these new market participants by helping them to offer and sell products in a more targeted manner. As a result, the dental trade is supposedly losing market shares to these new internet platforms and, also, manufacturers involved in direct sales. Online retailers who are able to link their collected data appropriately and have a successful logistics infrastructure have a clear advantage here.

New purchasing behaviour of the up-and-coming generations Y (born 1980 to early 2001) and Z (succeeding generation) also influences the procurement of information by dentists and laboratory operators. Analogous to other industries, prices can be compared worldwide on digital marketplaces, and the internet can also be used by dentists and laboratory operators as a comprehensive source of information. One of the consequences of this is that these material orders are also placed via the internet. Online marketplaces for dental equipment and materials are in vogue. They offer advantages such as transparency, in part more favourable prices and a shortening and simplification of the purchasing process.

Large online mail order companies are constantly diversifying their range of products and services and extending it to the B2B sector (e.g. Amazon). In addition, there are manufacturers (e.g. from Asia) who sell their products via the internet and try to attract European customers by offering lower prices. In standard segments in particularly, competitive pressure here is increasing for established businesses as a result of products that are also improving in terms of quality. The development and marketing of own brands by wholesalers is further increasing competitive pressure on manufacturers. These suppliers rely on integrated process solutions (IT workflow integration) and offer dentists and laboratories expanded consulting services. The major challenge for manufacturers will be to strike a balance between dependence on dealers and clear product and service differentiation.

New players on the dental market

The online trading group Amazon expanded its sphere of influence on the healthcare market with the launch of Amazon Business in 2015. Amazon Business is an online marketplace to which only licensed business customers have access. The marketplace currently offers a selection of products from around 85,000 providers, business prices and volume discounts especially for companies, free and fast delivery, payment on account and, also, analyses.

On the dental market, Amazon Business offers around 40,000 Class I and Class II products (no large-scale equipment such as CAD/CAM) for dentists, dental technicians, dental hygienists and central manufacturers. Half of these products are offered directly by manufacturers, while the other half are supplied by third party providers. Amazon Business has already garnered more than 1 million customers in the United States. According to a survey, 34% of practising doctors in the US use it to purchase medical and dental products. The platform currently has 150,000 customers in Germany, but Amazon Business is not yet active on the dental market. However, it can be assumed that this will change. This will undoubtedly entail consequences for the European dental trade. In the United States, Amazon’s entry into the dental B2B market has already brought about a significant change in dental trade structures. Price levels have fallen as a consequence of greater price transparency.

Experts predict a growing dependence on the market giant Amazon, particularly among small and medium-sized enterprises. However, as a purely trading company, Amazon also depends on cooperation with manufacturers. Manufacturers could possibly benefit from this trend by negotiating attractive conditions with Amazon, thus expanding their market position.

In addition to Amazon, Apple, Google and IBM are also investing in the healthcare sector. This is extremely promising development for this sector, as public and private healthcare providers are under increasing pressure to innovate due to an ageing population, rising patient demands, a growth in lifestyle diseases and budgetary limitations. The aim is to improve the quality of care and reduce costs. However, the technology giants are facing strong competition from established technology providers in the healthcare industry. For this reason, organic sales growth must be maintained and market orientation intensified.

Dental price comparison platforms and online marketplaces are also increasingly conquering the European dental market. For practices and dental laboratories, the use of these online platforms means more price transparency and significantly less time spent comparing offers, as they find products from many dealers bundled in a single location on the platforms and are offered a large selection. Since purchases made via online platforms do not require a field sales force, products can be offered at a
lower price. Nevertheless, technical support is just as possible as through classic sales channels, because the platforms are only intermediaries. The providers are the manufacturers and dealers active on the platform, and they also provide services if required. Offer portals help when it comes to comparing offers. These industry-specific platforms can score points with expert knowledge in the dental field and provide qualified answers to product questions which could potentially arise.

Some of these dental marketplaces and also some active online dental depots offer additional services online such as practical and product advice, including through live chat. In addition, an online marketplace offers its customers a fully-fledged merchandise management system in which minimum stocks are defined, own suppliers and individual special conditions are saved and from which orders can be placed directly.

European dental trading companies are well advised to deal with the new possibilities trading via platforms offers. Registering as a dealer with a highly frequented platform offers many advantages, especially for smaller businesses that can increase market awareness and success through their presence on the platform. One possible strategy for dental dealers is to position themselves on platforms to further expand their customer base. At the same time, it can make sense to maintain your own web shop/online channel aimed primarily at existing customers and to offer added value such as forums, user videos or studies. Expanded consulting services (e.g. practical business analysis, business start-up consulting, etc.) or news on new legal regulations (telematics, GDPR, ...) could also represent attractive added value for users. With appropriate and carefully considered value-added offers that combine digital and personal customer care, dental retail companies can also differentiate themselves from large cross-industry trading platforms such as Amazon. The enormous strength of traditional distribution structures is to be found in their local proximity to customers and direct access. In addition, many investment-relevant decisions in dental practices are a complex process in which experts from different areas (technology, trade, medicine, finance, law) work together, making it difficult for new non-industry providers such as Amazon, Google and Co. to capture this market.
OUTSOURCING

Increasing competition at all stages of the value chain, growing costs (including those associated with regulations) and a higher workload and complexity of tasks/processes (e.g. due to global networking) increase pressure to outsource tasks and processes that are not directly related to a company’s core business. This is realised by outsourcing to external companies or internally to specialised departments, subsidiaries or joint ventures. Increasing digitisation is also a driver for the outsourcing measures described below.

However, outsourcing also increases the dependency on the service provider. Risks include quality deficiencies, delays in the provision of services and network/IT failures at the service provider. For outsourcing to be successful, it is therefore important to have precise contractual agreements, a careful selection of service provider (in which not only cost aspects may be taken into consideration) and the implementation of control mechanisms.

Delegation

The dentist works hand in hand with trained specialists, prophylaxis assistants or even dental hygienists, since the activities involved cannot be mastered alone. German law stipulates that dental services must be provided by the dentist him or herself, but since the personnel costs of employees are a cheaper alternative to the dentist’s fee, delegation should occur here where it is allowed. In addition, the growing complexity of regulations to be observed in the areas of administration/invoicing, safety, hygiene and the specialist knowledge needed during operation of equipment and software require an increasing division of labour. Practices increasingly need well qualified personnel whose expertise and skills are constantly updated through further training. Practice operators should take this aspect into consideration when making purchasing decisions regarding equipment or software, and then include training requirements relating to this equipment and associated services of the dealers/manufacturers in their decision. Delegation options also exist in the area of practice management. Employees can be trained to become practice managers. Participants in training learn how to take on management tasks, design efficient workflows and optimise processes.196

Production of dental prostheses

In principle, dentists are entitled to make dental prostheses and orthodontic aids on the basis of their training. Despite this, commercial dental laboratories are generally commissioned to realise these tasks. However, commercial dental laboratories are subject to some laws regarding craftsmanship which represent a considerable cost factor (e.g. the permanent presence of a master craftsman).197 If a dentist uses the services of a commercial laboratory, such requirements are also reflected in the price. As a consequence, some dentists do not require such a service because they are also able to operate their own dental laboratory in the context of their practice and, also, are ultimately responsible towards their patients for the treatment provided – including the technical dental service. The decision about in-house or external production is therefore made by the dentist, taking both economic and quality aspects into consideration. A dental practice laboratory operated by a dentist is not subject to the regulations of the German Crafts Code and also enjoys tax advantages up to a certain scale. This unequal treatment harbours potential for conflict between dental and commercial laboratories. Dentists and dental practices join forces and form practice laboratory groups in order to further exploit the efficient operation and capacities of an internally operated laboratory. This not only reduces costs for premises for individual participants, but also encourages the purchase of equipment and its utilisation.198 Joint purchasing of materials within the practice laboratory group can also be made more advantageous for the participants.
Digital dentistry also opens up new possibilities for practices. By transmitting digital data records, they can also involve large laboratories, foreign laboratories or industrial production centres in the manufacturing process.

**Miscellaneous**

Outsourcing can also be useful when making appointments and in the areas of IT and hygiene/disinfection. Each dental practice should check individually whether it is economically appropriate to give preference to in-house or external production. Many technical, economic, legal and fiscal questions that appear to make the involvement of appropriate experts advisable should be considered in this respect.

**Dental laboratories**

### Outsourcing of partial work/external procurement

The improvement of efficiency is also an important aspect of dental laboratories, especially as the market becomes more transparent and globalisation and digitisation mean that dental products are generally no longer procured from a local laboratory. Laboratories look for ways to reduce their costs to remain competitive on the market. The question of competitive prices arises above all in countries where dental care is predominantly privately remunerated and in countries with an above-average share of material laboratory costs, as is the case with Switzerland and Germany.

CAD/CAM production opens up new possibilities for laboratories to outsource manufacturing processes.

Outsourcing of partial work to industrial manufacturing centres and large laboratories/laboratories abroad also gives small laboratories access to modern technologies and allows them to remain competitive without the need for major investments. If partial work is outsourced, the purchase of CAD software and a scanner is sufficient in many cases. This also has a positive impact on the liquidity and creditworthiness of the businesses.

Outsourcing is already very common in Anglo-Saxon dental laboratories. Concerns about the outsourcing of technical dental work mainly relate to material safety/quality, especially in sourcing countries outside the EU.²³³

### Administration

Relief from “unproductive” administrative tasks frees scope that can be used for further strategic development, marketing/acquisition of new customers and for further training. There are now many factoring companies that specialise in dental laboratories. Dental customers often work together with factoring companies and appreciate the professional handling and, also, services offered by factoring companies such as granting a longer payment period in return for a fee.

### Manufacturers/Trade

Outsourcing is also an interesting option for manufacturers and is already common in many company areas and activities (e.g. building cleaning or in the area of accounting/payroll accounting). The involvement of temporary employment agencies provides flexibility, for example in the case of fluctuating workloads. Another advantage is that idle times do not need to be paid. The integration of services in personnel recruitment is also widespread. Expensive IT processes can also be reduced by renting software (SaaS, Software as a Service), not only in terms of running costs, but also development and design.

Knowledge process outsourcing comes into its own when complex tasks suddenly need to be mastered (e.g. implementation of regulatory requirements such as the GDPR or MDR). Outsourcing is also useful here, due to the complexity involved and expertise required. A specialised service provider may be able to perform such tasks more efficiently and with the same high level of quality.

Digitisation and increased networking of devices create new options for the integration of manufacturers in servicing/maintenance (remote maintenance). In addition, digitisation also enables the complete outsourcing of entire business processes (business process outsourcing), examples being ordering or billing processes.

Globalisation and digitisation enable the outsourcing of entire manufacturing processes to domestic or foreign companies. Cost aspects are usually decisive when it comes to such outsourcing. However, factors such as quality, the supply of skilled workers and trade restrictions/regulation must also be taken into account.

In the case of larger company structures, outsourcing can also take place within the company (e.g. by founding a subsidiary that assumes certain tasks as a service provider for the entire company).
Despite efforts to create uniform international standards, regulatory requirements in the dental field have also increased dramatically in recent years. Reasons for this are as follows:

- Growing markets/increasing demand
- Increase in international supply relationships/increasing export shares
- Shorter product lifecycles with a simultaneous increase in the number of dental medical products and increasing technological diversity
- Growing (different) safety and environmental requirements
- Some countries use regulatory requirements specifically to make market access more difficult for foreign products

In addition to new national regulations, the implementation of some European regulations in particular is currently causing uncertainty in the dental industry and tying up capacities during implementation.

**European General Data Protection Regulation (EU GDPR)**

Since 25 May 2018, after a two-year transitional period, the EU General Data Protection Regulation (EU GDPR) with which the data protection of consumers has been standardised and strengthened has been in force.

According to the GDPR, the processing of personal data is only permitted if a contract has been signed or if the data subjects have given their consent to the processing. Even then, however, data may only be processed for a specific purpose. Personal data is not only patient data, but also employee data and data from business partners such as customers or suppliers. If third parties such as IT or accounting service providers have access to such data, an order processing contract must be concluded with them.

The GDPR also prescribes a directory for each data processing procedure in which processing activities are described in more detail. The operator of a website must also revise this site in accordance with the new data protection provisions (legal notice, disclaimer, data protection declaration). Also new is the so-called data protection impact assessment, a risk assessment.

Non-implementation of technical and organisational measures can be punished through a substantial fine.

The biggest regulatory challenge for companies in 2018 will be the implementation of the new data protection rules pursuant to the EU General Data Protection Regulation. This applies to practices, laboratories, manufacturers and retailers and costs companies a lot of time and money. Nine out of ten companies have taken advantage of external legal advice during implementation.
The majority of B2B companies have dealt with the GDPR within six months prior to its coming into force, while a quarter have addressed the issue a year or longer beforehand. Around 30% of companies expanded their existing data protection team or created new jobs. However, a survey conducted by the digital association Bitkom found the following: Four months after the end of the transitional period, only a quarter of companies had fully implemented the new regulation. Two thirds of companies interviewed complained about a complication of their business processes. However, 46% of companies do see the GDPR as strengthening the competitive advantage of European companies.202

In addition to the GDPR, companies will soon have to implement another European set of data protection rules: the ePrivacy Regulation. This will have a major influence on internet-based business models.

### The ePrivacy Regulation (ePR)

- **The ePR supplements the GDPR with regard to electronic communication and is intended to replace the old regulation from 2002 (expanded to include regulations on cookies in 2009). It was made necessary by new economic and technological developments.**
- **In contrast to the GDPR, the ePR also refers to exchanged data without personal reference**
- **In the case of personal data, the ePR relies even more than the GDPR on the user’s consent to data processing.**
- **It is relevant for every commercial enterprise, as any form of electronic communication is covered by this regulation (traditional communication services such as telephone, web or email services and the new Internet of Things (IoT) or Industry 4.0 services).**

### From when and to whom does this apply?

- **The ePR is expected to come into force in the course of 2019. Originally, the ePR was supposed to come into force together with the GDPR, but it is still in the legislative process.**
- **There will be a 24-month transitional period after its entry into force.**

### Some consequences for businesses

- Telephone advertising with cold calls and unsolicited advertising emails remain prohibited (as is already the case in Germany)
- Communication providers may only collect the data they need to handle the communications of their users
- Meta data may not be used to create profiles for marketing purposes and online advertising, unless the user agrees to this.
- The user must be explicitly asked whether tracking cookies may be used
- If users do not agree, only simple static advertising banners are permitted (without personal reference, as in printed newspapers)
- Databases must be created in such a way that individual entries can be removed in a targeted manner
- Users should be able to revoke their consent every six months
- Applications such as browsers or email programs must revise their privacy settings – external access must not be possible

**Failure to do so could result in a fine of up to € 20 million or four per cent of annual turnover.**

To date, around three quarters of companies have already addressed the ePrivacy Regulation. Opinions are divided on the benefits of the new regulation. 79% of companies see the regulation as a standardisation of competitive conditions, but 40% fear a collapse of the advertising market and see a threat to new internet-based business models. This is especially so in the area of artificial intelligence (AI) or the Internet of Things (IoT), but also software updates and advertising-based websites.203 Consequently, the digital economy in particular fears that the new regulation may represent a potential innovation barrier for Europe as a technology location. It seems clear, however, that once it has entered into force, companies will have little time to implement it and will have to deal quickly with the new regulation.

### Global Innovation Index (GII)

Together with the elite Cornell (USA) and Insead (France) universities, the World Intellectual Property Organisation (WIPO) in Geneva compiles rankings annually for 126 countries. The list is made up of 80 indicators, including the number of patent applications, educational expenditure and scientific publications. The list is headed by Switzerland, with Germany once again taking ninth place worldwide (7th place in a European country comparison) and top places in the criteria of logistics, R&D investment and patent applications. Germany’s rating for the criterion of business start-ups is rather weak. In the global GII comparison, the USA ranked 6th and China improved from 22nd to 17th place.

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**Dentists/Practices**

Employees of German dental practices have 55% of their working time at their disposal for patient care, the remaining 45% being required for completion of bureaucratic tasks.204 In addition to tasks in the area of practice organisation, this also includes the implementation of regulatory requirements. For example, legal requirements in the areas of quality assurance or safety require time-consuming documentation work. The introduction of new regulations is an additional burden. In addition to implementation of the telematics infrastructure in the health care system (which is currently being accelerated in the EU member states) and implementation of a number of other national and European regulations (e.g. on the handling of amalgam), the practices in 2018 were mainly concerned with the implementation of the EU GDPR.
What practices need to consider when implementing the GDPR

For each data processing operation, the EU GDPR requires a directory describing processing activities in greater detail be kept. In the dental practice, the following are considered to be procedures:

- Electronic patient file
- Dentist information system
- Electronic dictation and speech recognition programs
- Accounting software
- Email (administration) software
- Address databases
- Appointment management software
- Electronic personnel management

The creation of these directories is complex. They must contain the name and contact details of the practice (and, if applicable, of the data protection officer), the purpose of data processing, the type of persons involved (patients, employees, etc.) whose data is processed, the type of data processed, its possible recipients and measures taken to ensure data security. If data is transferred abroad outside the EU (e.g. due to the use of cloud services or webmail services), this must be expressly stated. It should also be noted that programs on mobile devices such as smartphones or tablets are also regarded as data processing procedures and that directories must be created for them when they are used. In addition, a so-called gap analysis must be conducted for each directory of processing activities in order to uncover possible weak points. This analysis must then result in an action plan if necessary. In the case of order data processing by external service providers, a contract document must be available for this. If a practice website exists, it must also be revised in accordance with the new data protection regulations (above all the legal notice, disclaimer, data protection declaration).

**Dental laboratories**

In dental laboratories, too, the observance/implementation of legal requirements requires ever greater administrative efforts and makes cooperation with dentists more difficult.

**What laboratories have to consider when implementing the GDPR**

Dental laboratories may process patient data for the purpose of fulfilling the contract for work and services with the dentist, but not beyond that (e.g. for marketing purposes). If the dental laboratory operates a website, this must also be revised in accordance with the new data protection regulations. Around 70% of the master laboratories do not need to appoint a data protection officer, as they employ a maximum of nine people.

Associations and guilds in particular are required to support their member companies during implementation and to ensure clarity in controversial regulations (e.g. if order processing of personal data occurs the dentist and a commercial dental laboratory). Should this be the case, a processing contract would need to be concluded between the two parties. In Germany, there are still different opinions among the associations involved, and the problem has not yet been conclusively settled. However, the Association of German Dental Technicians' Guilds (VDZI), as the trade umbrella organisation, and the relevant data protection authorities have, in the meantime agreed that, in relation to dentists, dental laboratories are not contract data processors pursuant to Art. 28 GDPR.

**What must dental laboratories observe in connection with the MDR?**

The new European Medical Device Regulation (EU MDR) (see Manufacturers/Trade below) applies not only to series production, but also to customised products (i.e. it also affects dental laboratories). According to the MDR, dental technicians are obliged to introduce a risk management system which involves systematic assessment and minimisation of risks relating to the medical device. The dental technician therefore has duties with regard to documentation, labelling and verification/product monitoring. Laboratories that are already certified according to DIN EN ISO 13485:2016 and have a corresponding QM system have an advantage here.

**Manufacturers/Trade**

The majority of products in the dental industry are medical devices whose market access is specially regulated. A large proportion of these medical devices is intended for export. In order to market these products in respective target countries, special country-specific requirements and national standards must be observed, some of which require different (additional) testing/certification procedures than in the country of manufacture.

Following the amendment of ISO 13485 in 2016, it is primarily the implementation of the new European Medical Device Regulation (EU MDR) that is currently occupying dental businesses.

In Europe, ever stricter regulatory requirements and cost-intensive recognition procedures are hampering market access for medical devices and are mainly responsible for the fact that it takes longer and longer for medical progress to reach the patient.

**Medical devices for the European market** are certified according to the standards of the European Medical Device Regulation → CE conformity marking. The United States Food and Drug Administration (FDA) is responsible for approving products for the North American market.
Implementation of the new MDR is complex and time-consuming. Accordingly, dental manufacturers see this as their biggest regulatory obstacle. The associations consider its timely implementation to be unfeasible (see Fig. 34).

**Bottleneck at notified bodies**

A bottleneck in the number of notified bodies is to be expected from 2020, as it is not yet clear how many of the 50 current notified bodies will apply for accreditation and for which product group205 (note: there were 90 notified bodies in Europe just a few years ago). By December 2018, only 33 of the European notified bodies had applied for re-accreditation under the MDR, five of them from the United Kingdom. How these will continue after Brexit is still unclear. However, four notified bodies from the United Kingdom are already intensely involved in preparations for the possible post-Brexit period and are currently opening offices in EU-27 states. This bottleneck is leading to delays in approval times. The problem of the lack of notified bodies is further exacerbated by the fact that more manufacturers are seeking a notified body for the first time as a result of higher classifications. It is also problematic that in some European countries, as things currently stand, there are no notified bodies at all, and these countries are therefore at a clear disadvantage as a result of their location, as they are forced to contact a notified body abroad. Both notified bodies and manufacturers also lack sufficiently qualified personnel.

**Important regulations and clarifications are still missing at present**

The MDR is a basic legal act which is clarified by further legal acts and guidelines. However, important accompanying legal regulations such as the Eudamed database (European Database for Medical Devices) have not yet been implemented. For example, there are still no concrete requirements for product labelling. A further problem in implementation of the MDR is the clinical evaluation of medical devices, where specifications of the MDR are not sufficiently precise.

**Consequences for dental manufacturers**

As fewer notified bodies have to test a higher number of products, a bottleneck in approvals is anticipated. This is to be expected:

- that the commitment of personnel capacities for the regulatory system will have a negative effect on innovative strength.
- that many established products that are important for care will have to be withdrawn from the market for economic reasons, as the time and financial effort required for certification does not pay off. This becomes problematic for patients when these are medical devices that are important for niche applications and certain patient (marginal) groups.
- that by 25 May 2020 many medical devices will not yet be recertified and will therefore not be available for patient care.
- that a significant market consolidation is taking place in the area of dental product suppliers, due to the MDR and increased demands on supplier management, as small dental manufacturers and suppliers in particular cannot cope with the effort (without help) and/or cannot find appropriately qualified personnel.
- that new product developments are likely to slow down and potential founders will be deterred because administrative expenses and costs will increase and there will also be a lack of advice centres for companies (notified bodies are banned from giving advice).

Possible consequence for the European dental market: The first market for new dental products (and also research and production) could shift from Europe to the USA – if politicians do not counteract this.

BVMed’s 2018 autumn survey indicated the following: 68% of companies fear that products will be taken off the market or not launched on the market for economic reasons. Nearly two-thirds of companies expect that the costs and, consequently, prices of medical devices will
rise as a result of MDR consequences. According to 56% of respondents, pressure will increase, especially on small and medium-sized enterprises (SMEs). Almost half of companies (47%) expect that patient care will suffer in the future as a result of MDR consequences.

The complex requirements relating to certification according to the new EU MDR are a major challenge and burden, especially for smaller companies. It is also difficult for them to persuade clinics, doctors and patients to participate in clinical trials, with special providers (compared to mass providers) being at a particular disadvantage due to the comparatively high cost of collecting clinical data for small numbers of cases.

Another survey confirms some of the consequences predicted above for manufacturers: Around 70% of the companies surveyed see the new MDR as having a negative impact on their research and development capabilities. Many companies are currently relinquishing R&D resources in favour of the regulation. More than half of respondents want to rethink their product portfolio and possibly discontinue products because of certification requirements. However, this primarily affects products whose market potential is considered to be low, and only 6% of companies plan to delete previous core products.207

Support and cooperation on the part of the state and through associations and clusters

In view of the problems encountered in implementing the MDR, the industry is pressing for improvements, in particular in the re-accreditation of notified bodies and the definition of clear guidelines. For automated processes to be possible, the basic UDI in particular and the required Eudamed specifications must be clearly defined. In addition, common specifications, harmonised standards and implemented legal acts are lacking after the introduction.

The new Medical Device Regulation (MDR) came into force in May 2017. It replaces Directive 93/42/EEC on medical devices (Medical Device Directive, MDD) and Directive 90/385/EEC on active implantable medical devices (AIMD). After a transitional period of three years, the new regulations must be applied from 26.5.2020. The MDR brings significant changes:

- Extended scope (now also applies to non-medical products)
- Higher requirements for documentation and proof in clinical evaluation and testing
- Stricter monitoring of products after they have been placed on the market: Notified bodies’ powers extended (unannounced audits, sampling and product testing)
- Introduction of system of unique product numbers (UDI = Unique Device Identification) \( \Rightarrow \) simplifies traceability and enables fast, efficient recall where necessary
- Companies must review the current classification of their products in the risk classes; there is a risk of upgrading, particularly with regard to rules 6 (reusable surgical instruments), 11 (software), 19 (nanomaterials) and 21 (material medical devices).208

All currently approved medical devices must also be re-certified according to the new requirements, but they can be placed on the market until the certificate expires, at the most until May 2024.

The conformity assessment procedure for medical devices is realised by so-called notified bodies.

Increased regulatory requirements are currently also leading to greater cooperation among manufacturers. Many associations and clusters help their members with practical implementation of the MDR – in the form of documents, but also through joint projects (e.g. on the issue of “clinical evaluation”). In addition, various institutes are in the process of setting up electronic platforms to enable the exchange or purchase of data for conformity assessments between companies. It might make economic sense (especially for smaller companies) not to create documents themselves, but rather to buy them from other companies. For start-ups, institutions such as the MedTech Startup School also offer mentoring programmes in relation to the MDR. The German Federal Ministry of Education and Research has reacted by offering funding for SMEs for projects in which medical technology innovations are expected to lead to significant improvements in patient care.

Software helps with implementation

To ensure compliance with the complex regulations governing the manufacture and placing on the market of medical devices with shorter product lifecycles, a growing number of companies are using end-to-end software-supported processes from the development phase to manufacture and shipping. The use of modern ERP (Enterprise Resource Planning) or PLM (Product Lifecycle Management) software not only positively influences compliance, but also efficiency. Modern complete systems cover all processes, ranging from finances and human resources, research and development, purchasing and logistics to project management, production and quality management, sales, export, customs and service management. They create a central database which, in addition to enabling data consistency, also ensure compliance with validation guidelines (such as UDI labelling in which the ERP system generates the required labels and barcodes and...
automatically logs the labels issued). The use of ERP software enables the market launch of new medical products with 50 to 80% less validation effort. The use of such systems is also interesting for small businesses, and software providers offer these special ERP solutions with pre-defined settings. Companies then have to adapt their processes to the ERP solution.

The MDR also affects the retail trade

The specialist retail trade must also adapt to the new MDR, as it is included in the system for monitoring after medical devices have been placed on the market. The dental trade may continue to market medical devices that were first placed on the market before 26 May 2020 in accordance with the old EU directive until 27 May 2025 at the latest (this only applies to new products). Like manufacturers, trading companies must also name a responsible person in the company who ensures that the traded products are MDR-compliant, that technical documentation and the EU Declaration of Conformity are up to date and that the obligations for monitoring after placing on the market and reporting obligations are fulfilled. The obligations for trade resulting from the MDR differ if the dealer (trader) is also an importer. The importer is the person who places a medical device from a third country on the EU market. The contact details of the importer must also be indicated on an imported medical device in addition to the manufacturer's details. The dealer must ensure that the manufacturer's or importer's label has been provided, that labelling and instructions for use in German are available and that the UDI code is indicated. In addition, the dealer must forward complaints from users to the manufacturers. In the absence of an approval, or if a suspicion of risk exists, the dealer must stop selling the product and inform the responsible authorities. Anyone who sells a medical device without a CE mark is liable to a fine or even a prison sentence of up to one year and, in the case of medical devices subject to the Radiation Protection or X-Ray Ordinance, even up to three years. Anyone who places a medical device on the market despite safety or health concerns is liable to a prison sentence of up to three years, along with penalties for placing the device on the market after its expiry date, lack of a declaration of compatibility, the submission of a custom-made product that does not meet the basic requirements, the lack of information (instructions for use, safety information, etc. must be available in the national language), activity as a medical device consultant without a corresponding qualification, or who as a medical device consultant does not meet his or her collection, recording or reporting obligations.
Digital virtual assistance and artificial intelligence (AI) already provide support at home.
Software arranges a dental appointment if necessary.
The EPF is now an important communication medium.
The patient enjoys all-round care, including from other health care professions.
A visit to the dentist is transformed into an event.

At home:
- The future of dental care will see contact with the patient already begin at home. Digital-based technologies contribute to prevention, with proactive intervention to ensure that patients with dental problems seek out a practice at an early stage. As a consequence, dental problems can be identified and treated at an early stage.
- The patient describes his or her dental problems to a digital virtual assistant who, through targeted inquiries, analyses these and initiates further steps where necessary. Mouth rinse or a painkiller can be ordered or, at the push of a button, an appointment can be arranged immediately at a practice or the patient’s own dentist.
- Alternatively, the patient’s smart toothbrush can inform him or her of any potential oral problems. Intelligent toothbrushes already exist which, in conjunction with an app, detect and optimise cleaning behaviour. Patients can see their own image and, additionally, the areas that require cleaning on their tablets, smartphones or, possibly, through future Bluetooth transmission to a smart bathroom mirror. AI algorithms identify dental problems such as plaque or calculus, inflammations or cavities through oral scanning. Additionally, sensors can identify particular substances (pH value, alcohol, glucose, …) that indicate nutritional or lifestyle habits that contribute to oral health problems.
- If necessary, the app linked to the smart toothbrush can suggest a visit to the dentist directly or, conversely, the dentist can (subject to agreement with the patient) receive patient data automatically and, for example, examine the progress of orthodontic treatment. The advantage here is that the patient can be scheduled for treatment at the exact time this is necessary. If, for example, the patient receives orthodontic treatment through aligners, these could be created (either industrially or through 3D printing) in the dental practice on the basis of the data scanned at home, then delivered directly to the patient at home or, alternatively, collected at the next dental appointment.
- Patients themselves can add data they have collected to their EPF and, consequently, make it available to other parties involved in medical care.

In the practice:
- In the practice, patient data is scanned from their health card (or, alternatively, the identity card chip, AppleWatch, …) and transmitted to the treatment unit which imports this data (projecting it through augmented reality onto the dentist’s glasses) and positions the dental chair appropriately.
- The body’s temperature and pulse are measured, while software identifies the stress level and reacts through music/a relaxing integrated massage function/lighting adjustment/recommendations for the dentist (e.g. nitrous oxide sedation).
- Digital virtual assistants aid the dentist by enabling the display of information.
- Virtual reality glasses (with intuitive control) counter anxiety and boredom. They provide entertainment and enable the patient to communicate through questions with the dentist. A visit to the dentist is transformed into an event.
- The patient’s oral situation is scanned (through an intraoral scanner and CBCT: 3D imaging of hard and soft tissue and a facial scan of the patient).
- CAD design of the required restoration
- The patient can view the completed results immediately
- A drilling template
Digital virtual assistance and artificial intelligence (AI) already provide support at home.
Software arranges a dental appointment if necessary.

The EPF is now an important communication medium.

The patient enjoys all-round care, including from other health care professions.

A visit to the dentist is transformed into an event.

for implantation is printed or digital data is sent to a lab or production centre. Soft tissue is scanned following implant placement/the healing period \( \rightarrow \) CAD abutment/crown planning \( \rightarrow \) In-house production through CAD/CAM (milling or 3D printer) or digitally again to a lab/production centre. The crown is fitted.

The dentist avails of audio and video support where appropriate.

Detrimental X-rays are replaced by scans/MRI.

AI-based analytical programs support the dentist during analysis of X-ray and other diagnostic image files.

In addition to growing digital administration of patient data, the exchange of information with colleagues through video surgeries (telemedicine/teleconsultations) will be an everyday part of work in future.

Knowledge databases (big data) assist the dentist in therapeutic choices and decisions.

Exploitation of the qualified electronic signature (QES) which is equivalent to a handwritten signature. The signing of electronic documents (e.g. findings, emergency data records) is therefore legally watertight. Secure communication for service providers (KOM-LE) means that the dentist can safely send encrypted emails to a recipient, and the exchange of medical data or electronic doctor’s letters is speedy and uncomplicated as a result.

In the case of self-pay services, credit rating queries can be made directly from practice software.

A timely signal indicates that material for the 3D printer is expended, and new material can be reordered with ease at the push of a button or automatically through the printer itself.

Prescriptions or referrals are issued digitally and transmitted directly, or patients can redeem a prescription totally paperless at their pharmacy through electronic identification (health card, …).

Despite the overall good level of dental care in Europe, areas still exist in dentistry which, from the patient’s point of view, still harbour development potential (e.g. geriatric dental care or periodontal therapy). There is even room for improvement when it comes to consideration of correlations between general and dental illnesses. The interaction with general practitioners and specialists can be particularly significant for the dentist. It is estimated that around 50 million EU citizens suffer from periodontal disease. This disease in particular is associated with general medical conditions such as type 2 diabetes, coronary and vascular disease and other chronic illnesses. An improvement in periodontal health would have a positive effect on associated general illnesses. Service catalogues of health insurers are currently inadequate in most cases when it comes to enabling those therapy measures necessary for the care of periodontitis. Patient representatives advocate the inclusion here of medical consultation, re-evaluation and structured aftercare in the form of supportive periodontal therapy in healthcare coverage.
TOMORROW’S DENTAL PRACTICE

More digital, more networked, smarter
More personal, increasing patient autonomy
Well-being grows in importance, with a greater focus on the patient
Further treatment is minimally invasive
A holistic consideration of the patient, not solely the oral area
Increased networking with other medical technology disciplines
More efficient, service-oriented practice organisation

CURRENT

Focus on treatment
Focus on prevention and prophylaxis
Practices concentrate solely on oral health
Correlation with other diseases and lifestyle is perceived
Small practice structures dominate
Trend towards larger practice structures, particularly in urban areas. Large practices exert pressure in negotiations through higher purchasing volumes
Treatment generally takes place in the practice
Outreach treatment, remote treatment, do-it-yourself kits are increasing
Diagnosis in the dental practice
Diagnosis using smart devices starts in the patient’s home, and prophylaxis is supported through smart devices/apps
Digitisation restricted to individual areas (primarily practice administration, digital radiography)
Digitisation increasingly encompasses all practice areas and involves more networking with other stakeholders
Practices are run by dentists
The influence of investors is growing
Public funding
Increasing proportion of self-pay services, the patient is a customer and his or her needs are paramount
One practice does everything
Increasing range of technologies/treatments
Classic workflow demands numerous patient consultations
Patients are taken care of on a single day; fixed immediate restoration of the entire jaw with implant-borne prostheses is growing in importance
Any work arising is realised by the dentist and practice staff
Focus on patient treatment, other tasks are outsourced
Invoicing by practice admin staff/dental assistants
Invoicing is outsourced
Ordering of dental products from regional laboratory partners
Digital workflow broadens procurement options for dental products
Purchasing from reps/dental depot
Ordering through online providers, from online dealers and platforms directly at the manufacturers; automated material orders directly through IoT devices

ZUKUNFT

Demographic change

- Stronger consideration of the needs of the elderly (e.g. with regard to treatment duration, patient positioning)
- Holistic treatment, closer cooperation with other health service providers (e.g. general practitioners, orthopaedists, ENT, nutritionists)
- Dentists educate themselves further to offer treatment options to patients suffering from conditions such as sleep apnoea and orofacial pain which are associated with oral health
- Expanded services with spa treatment such as massage chairs

Digital patient

- Implementation of a telematics infrastructure to enable electronic master data management of the insured and EPF
- Enabling online appointment booking
- Digital orientation of marketing, presentation of the practice in patient portals, combination of content marketing and search engine optimising (SEO)
- Inclusion of telemedical services, with a video surgery allowing dentists to advise patients regardless of the time or location
A combination of the latest technology and service is a significant competitive factor during patient acquisition.

**Technological developments**
- Software and imaging systems enable the review of final results before actual treatment commences.
- Procurement of centralised practice management software for all activities (new digital applications need to be integrated in the practice organisation and require specialised training of employees).
- Digital imaging, particularly digital impressions (intraoral scanners), is a prerequisite for a completely digitised workflow.
- Use of advanced cone beam technology reduces exposure to radiation.
- Examination of 3D printer purchasing (to eliminate classic model casting and manufacture less expensive dental splints and even prostheses).
- Purchasing of equipment for less painful treatment ➔ Injection; nitrous oxide sedation; innovative low-level laser therapy (LLLT) replace painkillers in the context of orthodontic treatment.
- Modern dental lasers facilitate a growing spectrum of applications.
- Classic areas of use for cone beam computed tomography in surgery planning and dental traumatology are expanded through the addition of applications involving endodontics, periodontology and mandibular diseases.
- Gentle tooth extraction using ultrasonic technology can, in an ideal case, enable the extraction of a tooth and implant placement in a single session.

**Market consolidation**
- Organisational positioning (e.g. as a referral, primary care, specialist or central practice) and professional prioritisation (implantology, geriatric dental care, periodontology, paediatric dentistry ….)
- Employment of dentists (leveraging employment limits).
- Dental cooperatives as a new cooperation model for the assurance of dental care in rural areas and to maintain self-employment.
- Merging of smaller individual practices to form larger care units with and without sub-specialisation.

**Globalisation**
- Availing of attractive prices through comparison of different providers, offer and price comparison portals.

**Outsourcing**
- Exploiting delegation frameworks.
- Outsourcing the implementation of regulatory requirements.
- Outsourcing of administrative tasks.
- For joint practices: Centralising of administrative activities.
- Examining options for a joint laboratory with other practices.
- Examining the use of disposable instruments.

**Regulatory requirements**
- Timely compilation of a plan of action and qualification of personnel.
- Involvement of service/system providers in implementation.
TOMORROW’S DENTAL LABORATORIES

➡️ Larger structures are created (lab mergers, lab chains)
➡️ Stronger focus on sales/service
➡️ The patient as a customer is increasingly important
➡️ The variety of materials and technologies is growing
➡️ Digital technologies and networking are increasing
➡️ The skills shortage is becoming problematic

CURRENT

Dentist primarily procures dental products from his or her lab partner. Regional laboratories are in competition with dental practice labs, major labs, foreign labs and industrial production centres. Patients are involved in the decision on which lab should manufacturer their prostheses (possibly obtaining counteroffers to their dentist’s treatment plan and cost projection through an online calculator for prostheses)

Small laboratory structures, primarily individual owner-operated labs. Trend towards larger lab structures and lab chains ➔ Investors from outside the sector are gaining in importance

Digitisation only evident in individual areas. Digitisation increasingly encompassing all areas (overall workflow, all administrative processes…)

Manual production. CAD/CAM production, particularly 3D printing requires new know-how/training

Dental prosthetics. Dental preservation is increasingly important

Removable or partial prostheses. Implant-borne restorations

Classic dental braces. Aligners from the 3D printer

Range of standard materials and standard technologies. Variety of materials and technologies continually growing

Financing of dental services determined to a significant degree by regulatory requirements. Growing proportion of self-payers also increasing price flexibility/pressure

Recruitment of skilled workers is not easy (due to low pay level for dental technicians). Problem exacerbated still further due to demographic change, increased competition for skilled labour

Orientation of products and sales/marketing towards dental and laboratory customers

➡️ Demographic change

➡️ Digital patient

➡️ Technological developments

➡️ Strengthen focus on so-called “best agers” and geriatric dentistry
➡️ Ensuring timely and active business succession (or possibly sale) for a laboratory

➡️ Improvement of communication/marketing with regard to the dentist as a customer (including modern communication media, social media)
➡️ Stronger marketing orientation towards the patient as a customer

➡️ Use of digital technologies. A solution is: CAD software + scanners + 3D printers + purchase of CAD/CAM-production parts from major labs/production centres
➡️ Uniform file formats ensure smooth communication processes between the dental lab and dentist
➡️ Backward planning in the implantology area ➔ Close cooperation with dental practice
➡️ Exploiting digital business data for benchmarking/strategic business development
Personnel qualification (digitisation still plays a very limited role in training)

- Use of proven materials
  ➔ Caution during material change (risk of quality problems)

New therapeutic set-ups: The dental technician is, for example, involved at the very beginning of treatment for fixed prostheses

- Differentiation strategy: Conclusion of reliable collaborations (e.g. through purchasing or equipment sharing groups)
- Growth through acquisition of smaller labs
- Mergers with other laboratories, lab partnerships to enable support of large practices (with regard to capacity and range of services)
- The exchange and market knowledge which membership of an international laboratory chain brings can be advantageous for speedier market penetration of new products and technologies; dental customers and patients profit from this

**Globalisation**

- A unique profile to stand out from competitors, examples being a choice of specific patient groups and service partnerships, the manner of service provision (technology, craftsmanship/know-how)
- Active sales (customer acquisition and existing customers) in larger laboratories, possibly with sales representatives, regular development/strategy meetings with dental customers, documentation of knowledge gained, setting of sales targets
- A modern website is indispensable for sales; targeted attraction of a younger clientele through social media such as Facebook and Instagram
- Organisation of customer events/laboratory open days (which also facilitates an exchange among dentists)
- Larger laboratories may have the option of exporting dental work (to other European countries with lower dental technician densities)
- Online dealers offer alternative purchase prices, price comparison platforms enhance transparency

**Outsourcing**

- Outsourcing of manufacturing steps to industrial production centres (particularly for small dental labs)
- Outsourcing of administrative tasks, particularly invoicing
- Outsourcing of GDPR implementation and other special projects relating to the introduction of regulatory requirements
- Purchasing groups enable the achievement of more favourable conditions

**Regulatory requirements**

- MDR also applies to labs ➔ Introduction of risk management system, documentation, labelling (laboratories certified pursuant to DIN EN ISO 13485:2016 which have an appropriate QM system are at an advantage)
- Exchange/cooperation with other laboratories (e.g. purchase of templates)
- Taking advantage of training measures provided by associations
- Integration of consultants, potentially together with other labs
- GDPR-compliant website design/adaptation

- Larger structures are created (lab mergers, lab chains)
- Stronger focus on sales/service
- The patient as a customer is increasingly important
- The variety of materials and technologies is growing
- Digital technologies and networking are increasing
- The skills shortage is becoming problematic
TOMORROW’S MANUFACTURERS AND TRADE

Internet-based business models and internal business processes benefit from universal digitisation/networking (Industry 4.0)

CAD/CAM equipment manufacturers operate own production centres for protheses

Parts of value chains migrate to other providers

Social selling and personalised advertising using AI-based big data analyses are growing

Regulatory requirements are increasing and tie up capacities

CURRENT

Focus as product supplier Solution/service provider (products + consulting, training, financing…)

Classic sales via depot trade Growing competitive pressure for trade through online depots, direct sales by manufacturers, internet traders online market platforms from outside sector (e.g. Amazon)

Prices only available on request Increasing transparency, comparison portals, increased competition Customer orientation is becoming more important

Manageable choice of devices, technologies, materials Ever expanding variety of products, materials and technologies, increasingly shorter innovation and product lifecycles

Orientation towards dental and laboratory customers Strong orientation towards patients

Digitisation in individual corporate areas Increasing universal digitisation/networking of all business processes

Arduous analog processes between manufacturers and suppliers/partners Continuous digital communication, ordering and logistical processes bring time and cost advantages and increase quality

Demand also exists for unskilled workers Growing demand for highly qualified skilled workers, particularly in the IT and electronics area and also in sales; increasingly fewer unskilled workers are required

Clear competition Digitisation is changing existing market rules: Innovative startups with digital products and service ideas are appearing on the market

Corporate consolidations in manufacturer area Takeover activities to exploit new technologies, rounding off expansion of product/service range, pooling of resources, access to sales network; goal: full-service provider; increasing number of transactions in the areas of AI, wearables, IoT

Stable raw material prices due to international trade relations Trade conflicts/restrictions lead to greater uncertainty and rising raw material prices

High degree of investment in R&D by manufacturers An increasing share of the budget required for regulatory issues (primarily MDR) and marketing/sales

FUTURE

Demographic change

Growing market in geriatric dentistry, mobile devices (for outreach care)

Stronger focus on restorative dentistry

Self-payers/aesthetics increasing in importance (“best ager” consumer group)

Digital patient

Introduction of online portals (direct customer contact, direct provision of information for patients)

Influencers are increasingly important (patients obtain information on the internet, view YouTube videos)

Patients are offered digital services or via apps on the smartphones

Social selling is increasingly important, adaptation of payment methods to customer wishes in respective countries, use of mobile payment systems, target groups are addressed on the internet through personalised advertising

Technological developments

Internet-based business models

Internal business processes benefit from universal digitisation/networking (Industry 4.0)
CAD/CAM technology allows other providers to open their own prosthesis production centres.

- Vulnerability to espionage/sabotage increases with the growth in networking.
  - Data security is increasingly important.

- Equipment market continues to grow, best market opportunities for 3D printing, diagnostic imaging, software, IoT, AI-based technologies.

- Software projects can be considerably accelerated through the use of cloud technology (increasing SaaS acceptance/cloud usage).

- Funding programmes help launch new, innovative products and technologies on the market.

- Networking/data analysis options should be taken into consideration when manufacturing equipment (IoT, predictive maintenance); equipment of this kind also helps to minimise downtimes during production.

- Use of PLM software is increasingly important for manufacturers at all phases of product development (lifecycle management) and facilitates traceability, guarantee/observance of requirements.

- Innovative technologies, such as advanced robotics or AI, offer advantages with regard to efficiency, time needed, quality, compliance (MDR).

### Market consolidation

- Exploitation of suppliers as strategic partners. Formation of system partnerships (supply partners, innovations, efficiency reserves).

- Partnerships, cooperations and, also, corporate mergers can improve market access, cover a broader portfolio, optimise processes, promote innovations and aid implementation of regulatory requirements in this respect.

### Globalisation

- Development of product suppliers into service companies and solution providers (including in areas such as consulting and financing).

- Introduction of direct sales structures (online trade).

- Cooperation with start-ups can harbour advantages for the company during development of new (digital) solutions.

- Direct sales to dentists and laboratories.

- Positioning on platforms/e-commerce.

### Outsourcing

- Examination of outsourcing options for services.

- Purchasing can be less expensive than in-house production.

### Regulatory requirements

- Temporary employment agencies ensure flexibility during demand fluctuations.

- Sales partnerships open up new customer groups.

- Outsourcing of complex implementation tasks (e.g. in the area of regulations, software/IT).

- IoT equipment/machinery enables integration of manufacturers/service partners in maintenance/servicing.

- Outsourcing of entire business processes (e.g. ordering or invoicing processes) requires precisely defined interfaces and control mechanisms.

### Promotions

- Promotion of MDR introduction, particularly recertification of old products.

- Timely location of a notified body and clinics, physicians, patients for any clinical studies which may prove necessary.

- Examination in each case of whether recertification of old products is worth it.

- Use of ERP systems (reduces validation effort by up to 80%).

- Implementation assistance is available from state bodies, funding programmes, consultants, associations, regional clusters.

- Acquisition of templates, clinical studies.
IDS AS PART OF THE MARKETING MIX

"IDS is the leading global trade fair for the dental community, ensuring sustainable success as a platform for innovation and market trends." (IDS brand essence positioning)

The International Dental Show (IDS) in Cologne is the world’s largest sector get-together for dentists, dental technicians, specialist dental dealers and industrial enterprises involved in the dental community. The IDS is organised by the GFDI (Gesellschaft zur Förderung der Dental-Industrie mbH), the commercial enterprise of the VDDI (the Association of German Dental Manufacturers) and staged by Koelnmesse GmbH. As the leading global trade fair for the dental community, it provides a platform for the sector and an important impetus for innovation and market trends. As a brand, IDS mirrors the excellence of the German dental industry and the VDDI association and regards itself as one large community in which personal contacts and relationships can be fostered and new business contacts established. The fair aims to offer everyone involved the very best of conditions to achieve their technical and business goals.

Held every 2 years in Cologne, the IDS is a top event with a tradition extending back more than 90 years. 2017 saw the staging of the 37th IDS. With 2,305 exhibitors participating, the 155,000 visitors to the fair had ample opportunity to explore the full extent of what the dental market has to offer, draw inspiration from new developments and obtain information on the latest trends.

The IDS has become an indispensable communication platform for manufacturers and dealers, providing an excellent venue in which to kindle and develop long-term business relationships. Targeted use of the event for marketing measures is therefore possible, and a visit to the IDS is in itself a real event for all involved. Product presentations by specialists and developers and demonstrations by internationally renowned dentistry and dental technology operators are of extreme interest to customers, share experience and leave impressions that still inspire after the event.

Steady growth of the International Dental Show

The number of visitors to the fair rose two-and-a-half times in the years from 2003 to 2017. The increasing number of international visitors and exhibitors bears testimony to the leading role played by the IDS. At the 37th IDS in 2017, 60 % of visitors were from abroad, with the proportion of exhibitors being even greater at 72 %.
Get the most out of the IDS and other trade fairs – motivation aimed at small enterprises and first-time visitors.

Direct contact with customers and business partners is paramount for most exhibitors, and sales professionals use this opportunity to establish new contacts and deepen existing relationships. Trade visitors learn of the latest innovations first hand and obtain information that aids their own business development. Apart from direct encounters at the event, trade fairs, and the IDS in particular, offer a variety of attractive options for reaching out to potential customers – welcome opportunities in an increasingly borderless and digitised age.

In addition to the actual planning and realisation of the fair, there are a few other to-do’s which could be of interest to exhibiting companies and ensure a successful trade fair appearance in terms of public relations, advertising and promoting customer loyalty.

Communication

Trade fair communication is best defined in a single motto. Both before and during the event, a well thought out slogan can attract attention to the exhibitor, and the company can even use it successfully after the trade fair. In the majority of cases, it pays to invest an appropriate amount of time in brainstorming and, also, implementation, and communications experts should be involved where necessary.

The sales department should be able to coordinate meetings with interested parties in advance of the fair via the company’s website, an option which can be exploited through an additional page – the trade fair landing page. If this page is optimised for search engines, the company may be discovered by visitors who are researching the trade fair in advance of the event. The company could also refer to the trade fair landing page on social media (e.g. Facebook, Xing etc.) or in press releases.

Public relations

It pays for the company to provide editors with appropriately informative material to ensure that the trade press and, later, the respective target group learns of new innovations presented at the trade fair. An option is available at the IDS to publish all relevant information in the online press box six weeks before the trade fair commences. This data can be accessed up to 12 weeks after this, and exhibitors have the chance during this time to supplement and update content. In addition, it is recommended that printed press kits also be deposited in the trade fair press centre.

Funding

Numerous forms of funding are available to small and medium-sized enterprises that wish to exhibit at international trade fairs, both domestically and abroad. Detailed information in this respect is available at www.auma.de, the website of AUMA (the Association of the German Trade Fair Industry).

Further information and the official trade fair app can be obtained at: www.ids-cologne.de

You can also use our matchmaking function on the website to prepare your perfect trade fair visit.