



**NEW BUSINESS OPPORTUNITIES:  
Disruption in the Food Supplement  
Industry? - Gummies as a Driver of  
Market Transformation and Consumer  
Behaviour Change**

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## **Abstract**

With functional gummies, a new category of products has emerged in the context of the growing global interest in nutrition and health products. These predominantly act as a challenger for traditional capsule and tablet products.

According to innovation theory, there is a significant risk in failing to distinguish between different types of innovation and therewith fail to adapt to market developments sufficiently in time. A clear distinction is crucial to understand and strategically utilise market dynamics to ensure long-term market participation and potentially generate competitive advantages. The purpose of this paper is to help categorise the innovation and therefore anticipate its potential behaviour and impact on the German market.

This was answered based on interviews with industry experts and analysis of survey data. In this regard, several key factors influencing the adoption of functional gummies were identified. The importance of hedonic values for the consumption of functional gummies is a key finding of this paper. The "fun component" and flavour enhances the consumption experience and contribute significantly to consumers' positive attitude towards functional gummies. This clearly distinguishes functional gummies from traditional food supplements such as capsules and tablets, which tend to centre on utilitarian values.

Furthermore, this paper examines market diffusion and consumer behaviour using the theory of planned behaviour. In this context, social norms, intention and attitudes prove to be significant influencing factors for the consumption of functional gummies. In addition, the findings emphasise the importance of trust, knowledge transfer and the perception of product quality for market penetration.

**Keywords:** Functional Gummies, Theory of Planned Behaviour, Innovation Theory, Dietary Supplements, Food Supplements, Germany, Europe

**Title:** NEW BUSINESS OPPORTUNITIES: Disruption in the Food supplement Industry? Gummies as a Driver of Market Transformation and Consumer Behaviour Change

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## **Resumo**

Com as gomas funcionais, surgiu uma nova categoria de produtos no contexto do crescente interesse global por produtos de nutrição e saúde. Estas gomas desafiam predominantemente os produtos tradicionais em cápsulas e comprimidos. De acordo com a teoria da inovação, existe um risco significativo de não se conseguir distinguir entre os diferentes tipos de inovação e, conseqüentemente, de não se conseguir adaptar atempadamente à evolução do mercado. Uma distinção clara é crucial para compreender e utilizar estrategicamente a dinâmica do mercado, garantindo uma participação a longo prazo e potencialmente gerando vantagens competitivas. O objetivo deste documento é ajudar a categorizar a inovação e, por conseguinte, antecipar o seu potencial comportamento e impacto no mercado alemão.

Esta análise baseia-se em entrevistas com peritos do setor e na análise de dados de inquéritos. Foram identificados vários fatores-chave que influenciam a adoção de gomas funcionais. A importância dos valores hedónicos para o consumo de gomas funcionais é uma das principais conclusões deste estudo. A "componente divertida" e o sabor melhoram a experiência de consumo e contribuem significativamente para a atitude positiva dos consumidores em relação às gomas funcionais. Este facto distingue claramente as gomas funcionais dos suplementos alimentares tradicionais, como cápsulas e comprimidos, que tendem a centrar-se em valores utilitários.

Além disso, este documento examina a difusão do mercado e o comportamento dos consumidores utilizando a teoria do comportamento planeado. Neste contexto, as normas sociais, a intenção e as atitudes revelam-se fatores que influenciam significativamente o consumo de gomas funcionais.

**Palavras-chave:** Gomas funcionais, Teoria do comportamento planeado, Teoria da inovação, Suplementos dietéticos, Suplementos alimentares, Alemanha, Europa

**Título:** NOVAS OPORTUNIDADES DE NEGÓCIO: A disrupção na indústria dos suplementos alimentares? As gomas como motor da transformação do mercado e da mudança de comportamento dos consumidores

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## List of Abbreviations

CAGR	Compound Annual Growth Rate
FGs	Functional Gummies
FFs	Functional Foods
FPs	Functional Products
OTC	Over the Counter
EFSA	European Food Safety Authority
TPB	Theory of Planned Behaviour

## 1. Introduction

In 2021 around 32% of deaths worldwide (17.9 million) were caused by cardiovascular diseases. Those diseases could be often prevented through a healthy diet and lifestyle habits (World Health Organisation, 2021). The foundation of awareness surrounding a balanced diet and its impact on the body, particularly concerning athletic performance, encompasses various layers. While the integration of health concepts into social consciousness may seem like a recent trend, its roots trace back to ancient times. Historical records, such as accounts of athletes at the Olympic Games, reveal the utilization of diverse nutritional strategies, including the consumption of meat, bread, dried fruits, honey, mushrooms, and herbs, all aimed at enhancing athletic prowess (Swaddling, 1984). The same fundamental consideration and awareness of exercise and health has been increasingly evident and expanding its reach on a global scale, entailing the goal of improving general health, physical performance and correcting inappropriate lifestyle habits (Del Balzo et al., 2014). This has led to a Compound Annual Growth Rate (CAGR) of 6.2% in the vitamins and minerals category since 2016 (Euromonitor, 2022). The developed countries are currently leaders in this market, having introduced and developed sports nutrition at an early stage. In this context the trend is now also increasing significantly in Europe, following on footsteps from the USA and Asia. The continuous improvement and convenience of sports nutrition, including food supplements, have led to an increase in its consumption and increased market demand (Cui et al., 2022). Furthermore, their relevance is linked to rising healthcare costs, steadily increasing life expectancy and the willingness of elderly people to optimise their quality of life, as they become older (Bigliardi & Galati, 2013). Therefore, the already large (sports) nutrition industry has an opportunity for further massive expansion (Cui et al., 2022; Arenas-Jal et al., 2019). Consequently, the demand for sports nutrition products and their sales are steadily rising, resulting in an estimated CAGR of 4.8% until 2028 (Euromonitor International, 2022; Wang, 2023a; Statista, 2023). This trend is also observable in the Functional Foods (FFs) sector, resulting in an estimated, global CAGR of 6.8% until 2026 (Markets and Markets, 2021).

In the food supplement category, capsules and tablets have proven themselves on the market for a considerable time and have therewith been established as the predominant form of consumption (Markets and Markets, n.d.). However, as posited by Schumpeter (1934), it is the relentless pursuit of innovation that stands as the cornerstone of enduring corporate success. In this context and within the framework of new product innovation, the landscape of the industry has evolved rapidly in recent years with the introduction of functional gummies (FGs) – a

category of gummies that provide additional (health) benefits beyond basic nutrition intake. When analysing the market, a demand for gummies as an alternative to capsules and tablets is recording a significant increase. This popularity in the market can be explained primarily by the ease of swallowing, appealing appearance, and flavour aspect, in particular for elderly adults and children (Markets and Markets, n.d.; Yan et al., 2021).

Given the potential transformative nature of FG and similar products in the food supplement industry, it is relevant to classify the fundamental capabilities of the development, also in the context of disruptive theory (Christensen, 1997). In this regard, it is critical to assess whether this emerging trend meets the criteria to be categorized as a disruptive innovation. According to Christensen et al. (2002) disruptive innovation can be seen as the catalyst for success stories and the significant growth in almost every industry. If this trend is advanced enough and contains the parameters that are relevant to classify it as a disruptive innovation, understanding its impact is essential for industry players, including manufacturers, retailers, regulators and consumers. By critically assessing the disruptive potential of FGs and its impact on market dynamics and consumer behaviour, this study aims to provide valuable insights into the future direction of the industry and the opportunities for innovation and growth.

Within the framework of this research objective, the initial focus will be at the relevant literature in the areas of disruption and innovation theory. In addition, this research endeavours to scrutinize the alignment between the consumption of FGs and its fundamental “functional terminology,” exploring the decision factors and whether such consumption is indeed driven by utilitarian motivations, values, and goals, as the literature would suggest. This paper is therefore analysing the gap, stated by Siro et al. (2008), by reducing the scope to one product category.

This paper aims to classify the product and market potential. Herby, the following research questions are answered:

**Q1:** Do FGs follow the characteristics of disruptive innovation theory?

**Q2:** How do consumer perceptions and attitudes towards FGs differ from those towards traditional food supplements, and what implications does this have for market dynamics and consumer behaviour?

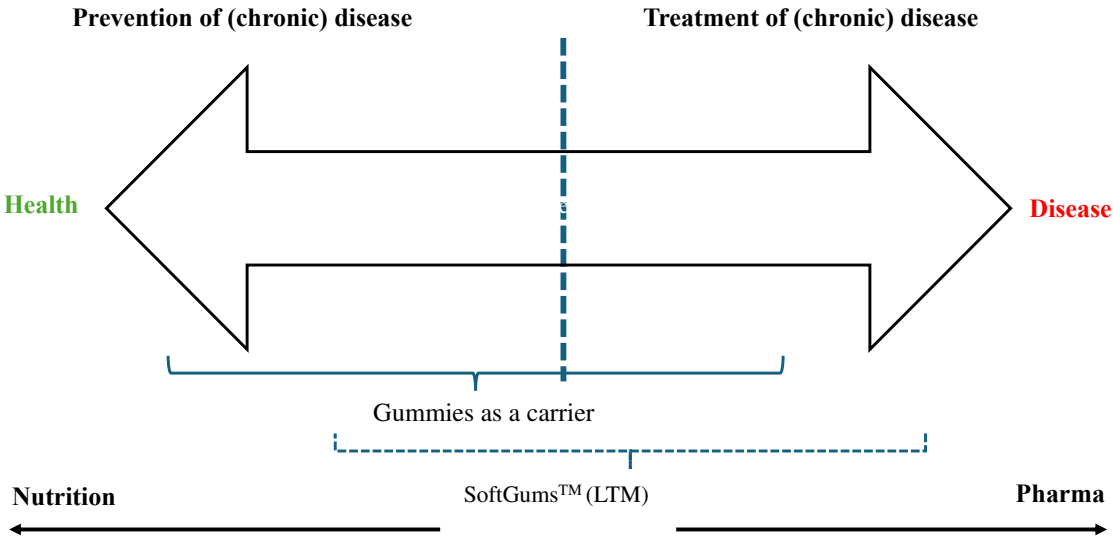
**Q3:** What are the benefits and drawbacks of FGs?

**Q4:** What are the essential requirements for optimal development in the market?

## 2. Influences on the Market: Analysis and Trends

### 2.1 Market Analysis

FGs represent a versatile category that straddles the realms of food supplements, nutraceuticals, and FFs, catering to a wide range of nutritional needs with their appealing form. In the framework of food supplements, typically with a comparatively substantial proportion of active ingredients, they provide specific vitamins and minerals in a convenient form (EFSA, n.d.). When defining FFs, one could argue that the process of consumption represents the ultimate asset, while offering health benefits beyond basic nutrition. However, the literature also presents differing perspectives, ranging from food with potential benefits (Bigliardi & Galati, 2013), to "[...] foods (FFs) that with their specific health effects could, in the future, indicate a new mode of thinking about the relationships between food and health in everyday life" (Ballali & Lanciai, 2012, p. 1) and even defining FFs as all foods for which a health claim can be made (Weststrate et al., 2002), entering the realms of food supplements. This dual identity not only underscores the nutritional potential of vitamin gummies but also highlights their role in modern dietary practices, offering a palatable and convenient way to incorporate essential nutrients into one's daily regimen, thereby enhancing health, nutrition, and wellness, going way beyond the spheres of conventional food (Moraes et al. 2021; Bigliardi & Galati, 2013; Ballali & Lanciai, 2012; Fernández-Ruiz et al., 2020; Sgroi et al., 2024). This study focuses on functional gummies in the context of the food supplement category, analysing the capabilities with regards to vitamins and minerals.



**Figure 1:** Nutrition-Supplement-Pharma Interface  
*Source: Own Illustration based on Fernández-Ruiz et al. (2020)*

Holistically, vitamins and minerals are categorized as dietary supplements / food supplements (EFSA, n.d.). These are defined as a product that is taken orally and incorporates a dietary component that is intended to complement the diet. Hereby it may contain one or a combination of substances such as vitamins, minerals, enzymes, botanicals and amino acids. According to the Food supplement Health and Education Act (DSHEA) and the European Food Safety Authority (EFSA), food supplements are classified in a special category under the general heading of foods, contrasted to drugs (Dickinson, 2011; EFSA, n.d.). The communication that reaches consumers is characterized by regulations and safety concerns. The education of the Consumer, awareness of ingredients and the associated health effects, as well as positive messages are recognized as being important drivers for understanding and use (Kuesten & Hu, 2020).

### 2.1.1 Food Supplements - Vitamins and Minerals

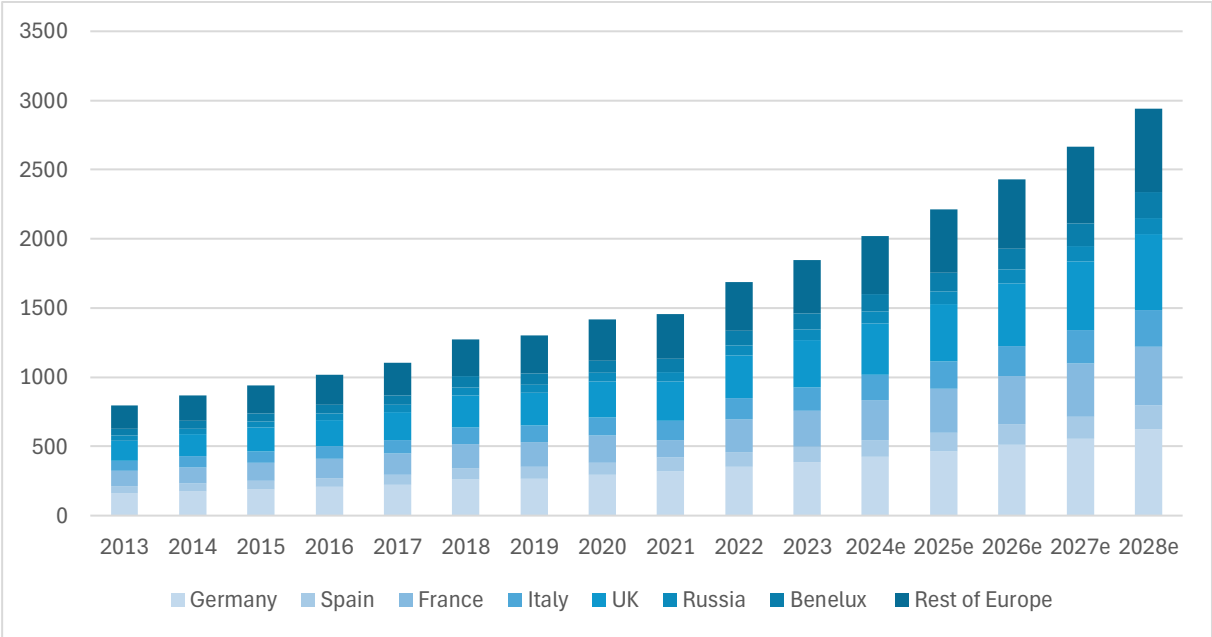
Vitamins and minerals are a significant segment of the Over-The-Counter (OTC) market globally. They can be defined as an organic substance that is crucial for our health. Our bodies are unable to produce vitamins themselves, so we need to obtain them from food and supplements. Technically, we wouldn't need to take supplements if we consumed all five food groups in sufficient quantities, but most people are unable to fulfil this requirement. Therefore, food supplements are needed to maintain good health. Each person needs different supplements depending on their state of health, age and current lifestyle (Mindell & Mundis, 2011). Understanding the market trends and consumer behaviour is crucial for stakeholders in this industry. Wang (2023a) projects a CAGR of +4.8% for the European market from 2022 to 2028, although this rate is lower compared to other regions like Asia and Africa, which exhibit higher growth rates ranging from 7.5% to 6.2%, it still is expected to outperform the CAGR of the USA, which is anticipated at 4.2%. In 2023, vitamins and minerals (excluding food products) accounted for 15% of the global revenue share in the OTC-market, resulting in an expected global market value of 35.35 billion USD (Statista, 2023; Wang, 2023a). Despite the growth potential, the majority of sales still occur offline, led by drug stores and pharmacies. Online channels contribute only 22% of the global market revenue. Consumer behaviour plays a significant role in shaping the market. Approximately 45% of the population in Germany regularly undergo medical check-ups and take proactive measures for their health. Furthermore, 60% of respondents have reported consuming vitamin food supplements in the past 12 months, reflecting a substantial demand for such products (Wang, 2023b). This also reflects when

examining the German market. In this regard, vitamins and minerals comprise more than half of the food supplement market. Additionally, an examination of consumer behaviour highlights minerals as the top-selling non-prescription medications within Germany's statutory health insurance system, with sales in this category accounting for 131 million euros (Statista, 2023).

2.1.2 Vitamin Gummies Market

According to current surveys, about 37% of consumers in the USA prefer taking vitamins, minerals, or food supplements in gummy form, with an increasing trend. This trend is now also noticeable in Europe, especially in Germany (Kotscha, 2022; Moloughney, 2022).

The market for gummy vitamins in Europe recorded sales of \$1.846 billion USD in 2023 and is expected to grow to \$2.939 billion USD by 2028, with an expected CAGR of 8.88% (Wantstats, 2023a). This exceeds past projections significantly, which had expected a CAGR of 4.9% (Transparency Market Research, 2017). Germany represents the largest market in Europe, with a CAGR of 9.2%, accounting for about 20% of the total market (Wantstats, 2023a).



**Figure 2:** European Vitamin Gummies Market and Forecast 2013 – 2028 (in Mio USD)  
*Source: own illustration based on Wantstats (2023a)*

In 2023, 19% of vitamin gummies were sold online, while the rest were distributed offline. This distribution is expected to remain stable until 2028 (Wantstats, 2023b). Currently, the majority of consumers, about 68%, are adults, while 32% are children (Wantstats, 2023c). Multivitamin

products account for 70% of sales, while single vitamins make up 30% (Wantstats, 2023d). Regarding ingredients, vitamins dominate with 75%, followed by minerals with 8%, while the remainder consists of Omega-3, protein-, plant-blends, and others (Wantstats, 2023e).

Consumers are increasingly aware of the impact of their food choices on the environment. In fact, a growing number of consumers have made significant changes to their diet for environmental and ethical reasons (Sanchez-Sabate & Sabaté, 2019). One noticeable development is the shift towards veganism or vegetarianism, resulting in potential projections stating that up to 60% of the global population may predominantly follow meatless diets (vegan & vegetarian) by 2040. This is expected to increase demand for gummy vitamins (The Business Research Company, 2024).

In the EMEA region, 89% of consumers prefer FFs and beverage products over food supplements, due to taste (80%), naturalness (69%), convenience (55%), and ease of integration into daily life (48%), especially for millennials trying to manage their hectic work schedules (Markets and Markets, n.d.; Weyermanns & Klein, 2024).

Another factor, favourable to the potential of gummies as a carrier, is that a significant amount of potential consumers, especially the older population, is having difficulty swallowing pills, capsules, and tablets, or experiencing pill fatigue. According to research, the prevalence of dysphagia for example in the US is at 40% for people being 60+ and even up to 60% in nursing homes (Adkins et al., 2019; Markets and Markets, n.d.; Schiele et al., 2013; The Business Research Company, 2024). Lastly, when analysing the holistic market, a fundamental trend towards the demand for sugar-free alternatives can be observed. This trend can be attributed to various factors, including increasing awareness of the health risks associated with excessive sugar consumption, such as obesity, dental problems and diabetes. Consumers are also becoming more health-conscious and are actively looking for products that meet their dietary preferences and health goals, which may include reducing sugar consumption. This suggests an increasing demand for sugar-free solutions, especially for health-related products (Selvasekaran & Chidambaram, 2021).

## **2.2 Regulatory**

Alongside innovations, nutritional recommendations and research, the field of sports nutrition is shaped by US and EU (EFSA) regulations and the World Anti-Doping Code (Arenas-Jal et al., 2019). Navigating the regulatory landscape of FFs and food supplements within the European Union is crucial for ensuring consumer safety and compliance with health standards.

The EU has established a comprehensive framework through various regulations and directives, aimed at overseeing the assessment, approval, and labelling of these products. This framework includes the pivotal role of the European Food Safety Authority (EFSA), specific regulations on novel foods and health claims, directives on food supplements and dietetic foods, and regulations ensuring clear food information to consumers. EFSA, in this framework, can be defined as the central authority in the European Union for risk assessment in the field of food and feed safety. It evaluates scientific data on foods and ingredients, including food supplements and FFs, to ensure they are safe and not harmful to health (EFSA, n.d.). The authorization for a health claim in Europe may be difficult and time consuming. Since 2003 there were around 13.700 new public applications for potential health claims authorizations. In 2008, the European Commission received a list of around 44.000 health claims by its member states. Those were consolidated to a list of 4600 health claims ultimately submitted to EFSA for evaluation. Currently, 9850 health claims have been authorized (EUR-Lex, 2021; EFSA, 2024; Tenhunen, 2023). Below is an overview of key EU regulations and directives governing FFs and food supplements:

**Table 1.** Specification of Directives and Regulations

<b>Directives / Regulations</b>	<b>Details</b>
<b>Novel Food Regulation (Regulation [EU] 2015/2283)</b>	This regulation governs the scale of novel foods and food ingredients in the EU, including certain types of FFs and food supplements. New foods or ingredients must be approved under this regulation before they can be introduced to the EU market.
<b>Health Claims Regulation (Regulation (EC) 1924/2006)</b>	This regulation establishes conditions under which health claims about foods, including food supplements and FFs, can be made. Claims must be scientifically substantiated and approved by the EFSA before they can be applied to products.
<b>Directive on Food Supplements (Directive 2002/46/EC)</b>	This directive sets out the minimum requirements for the manufacture, labelling and sale of food supplements in the EU. It also defines the vitamins and minerals that may be used in food supplements and sets maximum levels.
<b>EU Regulation on Food Information to Consumers (Regulation (EU) No 1169/2011)</b>	This regulation governs the labelling of food, including food supplements and FFs, regarding the labelling of ingredients, allergens, nutritional information, and other relevant details.
<b>Directive on Dietetic Foods (Directive 2009/39/EC)</b>	This directive applies to dietetic foods specially processed or formulated for people with particular nutritional needs or certain illnesses. Some FFs and food supplements may also fall under this directive if they possess specific nutritional properties.

Although there are several judgements from the highest courts on food supplements in classic form (tablets, capsules, powder), there have been comparatively few judgements in the area of food supplements in innovative form (e.g. gummies). This can be explained not least by the fact that this kind of food supplement is a new type of product. It usually takes at least 3-5 years before a lawsuit is heard by a supreme court (European Court of Justice, European Court of Justice, Federal Court of Justice) due to the previous instances, unless the proceedings are otherwise terminated beforehand (Greger, 2018). Nonetheless, there are first and second instance proceedings that deal with the procurement and form of gummies as well as the permissible advertising of such products, particularly regarding the distinction between "health claim" and "beauty claim". Whereas a "beauty claim" only advertises the cosmetic effect of a product, similar to a cream, a food supplement advertises the internal effect - in this case the improvement of skin elasticity and "internal plumping" to reduce any wrinkles. Such an effect may only be advertised if it is an approved "health claim" that has been expressly authorized by the EFSA - otherwise the advertising of the specific effect is not permitted (LG München, 2020). Another point of contention arises from the particular form of the gummy product. In a judgement by Munich Regional Court I, which was also confirmed by Munich Higher Regional Court, it was stated that a food supplement in the form of a gummy bear resembles the conventional gummy candy excessively and therefore poses a risk of overdose, due to the risk of confusion, for the consumer by taking more than two gummies (the recommended daily dose) (LG München I, 2021; OLG München, 2021).

Given the strict legal framework within the EU, it can be assumed that as sales of food supplements in innovative form increase, more and more legal disputes in this regard will have to be decided (by the higher courts) in the future.

### **2.3 Demographic Change**

Demographic change is a pertinent and recent topic, particularly in Europe. Birth rates are decreasing continuously, which means that the proportion of older people in the population is increasing (Botev, 2012). In the period 2002-2022, the proportion of people aged 65 and over, in all EU Member states, increased from 16% to 21%. Similarly, the median age rose from 38.7 years in 2002 to 44.4 years in 2022. Although the natural population trend in the EU has been negative since 2012, following the declining number of live births in the EU, the total population of the EU increased from 429 million to 447 million, representing a growth of 4% between 2001 and 2020 (Eurostat, 2023).

### **3. Literature Review**

#### **3.1 Innovation Theory**

In an innovative economy, innovation is sharply differentiated from invention (Schumpeter, 1942). While invention defines the creation of a (fundamentally) new process, method or idea, innovation involves the creation of new types of plant and equipment, in the context of new businesses emergence and the rise of individuals, willing to take on a leadership role (Schumpeter, 1976). Hereby it is crucial to grasp market demands, refine manufacturing procedures and product specifications, and foster an environment that nurtures the innovative process (Rosenberg & Kline, 2009). Innovators are faced with the difficulty of either developing completely new methods and innovations or trying to gradually expand their existing portfolio (Christensen, 1997). Academic research tends to present three scenarios for the rise of a technology (or product). The initial case can be defined as the natural progression where an established technology, through its maturation and refinement over time, emerges as the primary driver of an industry. The second case occurs, when consumer needs pivot towards a technology that offers a better fit than the current incumbent or a new technology arises, that fulfils better serves the market needs. Thirdly, the broader environmental context can also precipitate a shift in technological leadership, leading to a competitive advantage (Paap & Katz, 2004). Nevertheless, the literature also shows that product / technology innovation alone cannot generate a competitive advantage, achieve sustainable corporate growth, or create new markets. In this context, technologies can pose financial vulnerabilities and even lead to insolvency during their initial stages due to high development costs. But knowledge of the market and its present orientation can become a key competitive advantage (Atalay et al., 2013; Nagy et al., 2016; Rosenberg & Kline, 2009; Shelton, 2009).

##### **3.1.1 Disruptive Innovation**

Disruptive innovation can be seen as a spark, that enlightens social and economic development, resulting in advances in (social) welfare. It can stimulate the cycle that leads to new jobs, improved living standards and an increase in the overall market (Hart & Christensen, 2002; Si & Chen, 2020; Suseno, 2018). The disruptive innovation theory was holistically developed and researched by C. M. Christensen, in his book “The Innovators Dilemma”, following his article on disruptive technologies (Christensen, 1997) and the research of Anderson and Tushman (1986). According to recent literature, there has been a notable expansion in the scope of research content from merely focusing on disruptive technology to encompassing a thorough

exploration of various aspects such as products, strategies, business models, internal and external conditions of corporations. However, the underlying theory leaves scope for interpretations that do not strictly correspond to the origin of the idea. (Christensen et al., 2018; Si & Chen, 2020). In the context of the originating concept, disruptive innovation can be defined as by creating novel products, services, new customer segments or business models, gaining market dominance. The success of disruption can be attributed primarily to factors such as convenience, marketing strategies and price sensitivity (Christensen et al., 2015; Schmidt & Druehl, 2008). The literature furthermore differentiates between three characteristics of innovation, radical functionality, discontinuous technical standards, and ownership. While radical functionality refers to innovations that enable entirely new behaviours or tasks, often catalysing market creation, discontinuous technical standards represent innovations that significantly alter the production process, typically through new materials or methods, enhancing efficiency or reducing costs. Ownership, in this context, defines the strategic deployment and adoption of the innovation, influencing how an innovation is positioned, marketed, and ultimately, its ability to unsettle incumbent market leaders (Nagy et al., 2016). While internally, ownership structures influence for example costs, production, employee motivation and therewith the company's performance. Externally, the ownership of an innovation, through patents, copyrights and trademarks, limits and controls almost every aspect of an innovation (Huang, 1997; Nagy et al., 2016).

Reinhardt and Gurtner (2015) have subdivided this concept into three subsections. First, potentially disruptive innovations are defined as innovations that initially exhibit lower performance, often at a lower price, in the dominant dimension valued by mainstream customers.

Secondly, they introduce an extra performance dimension which is not present in the products that are dominant in the market. In this regard, “[...] typically related to a product's size, mobility, convenience, usability or price” (Reinhardt & Gurtner, 2015, p. 138). However, the additional performance dimension needs to comply with one of the above criteria but may also contradict other.

Thirdly, they initially either enter emerging or niche markets or target the lower end of an established market. Afterwards, through the iterative enhancements in technology processes over time, a disruptive innovation progressively aligns with the preferences of mainstream consumers (Reinhardt & Gurtner, 2015). This development may result in gaining market share from, or even displacing, established corporations in mainstream markets, it can therefore be seen as a process, rather than a sudden result (Si & Chen, 2020; Christensen et al., 2015). The

fact that disruptions are a process reflects the reason why some incumbent companies are partially oblivious to disruptors. The underlying structure of a disruption supports this construct, as disruptive innovations are sometimes not recognized until the products start meeting the needs of mainstream customers. Furthermore, the fact that the products generally seem inferior and the capital expenditure in relation to the standard market product also obstructs the view of existing companies (Christensen et al., 2015). This leads to the so called “Innovators Dilemma”, the state of established companies in the market, wherein their inclination to deviate from known technologies is typically constrained by invested capital and previous successes (Christensen, 1997).

Precisely discerning disruptive innovation accurately entails conducting a comparative analysis between the innovation in question and an existing product or service. This approach allows for a comprehensive understanding of its effects within the current value chain. The relevance of the innovation is determined in relative comparison with existing products. For example, the innovation may be disruptive for one product (-group) while its impact on another product (-group) is relatively minor (Nagy et al., 2016). When examining the source of disruptive innovation, it can be observed that market entry by new players is more likely to lead to disruptive solutions. On the other hand, a disruptive innovation creates a pull for new players in the market, who potentially enter the market via a lateral entry. Currently, this is evident in the automotive industry, for example, in the context of electric vehicles and autonomous driving (Wallin et al., 2022). Disruptive innovations are an even considerably greater appeal for start-ups, as they offer an opportunity to compete with companies that are in a significantly more robust financial position (Si & Chen, 2020). This also corresponds to the basic idea of the theory, which states that a relatively small company is able to challenge a larger company through disruptive innovation (Christensen et al., 2015).

### 3.1.2 Sustaining Innovations

Sustaining Innovations are the pendant to disruptive innovations. The fundamental concept of Christensen (1997) defines those as innovations that revolve around the notion of incremental and radical improvements to existing products or services that aim to meet the evolving needs of the mainstream customers. These innovations do not create new markets or value networks but instead improve upon the existing offerings within the current market framework. As an example, “[...] improvements in television picture quality, from black and white to color, HD and 3D [...]” (Reinhardt & Gurtner, 2015, p. 138) are mentioned. The defined goal of sustaining

innovations is to reduce costs, enhance the product performance, quality, or add additional features to acquire new customers and appeal to the mainstream market, thereby ensuring continued growth and competitiveness for companies.

#### *3.1.2.1 Incremental Sustaining Innovations*

Incremental Sustaining Innovations can be defined as small-scale improvements that refine existing products or services. These might include adding a new feature to an existing product, making a service more efficient, reducing costs through better materials or more efficient manufacturing processes. In this regard, the focus is on making slight adjustments that enhance the product's appeal or functionality for current users (Christensen, 1997; Tidd & Bessant, 2020).

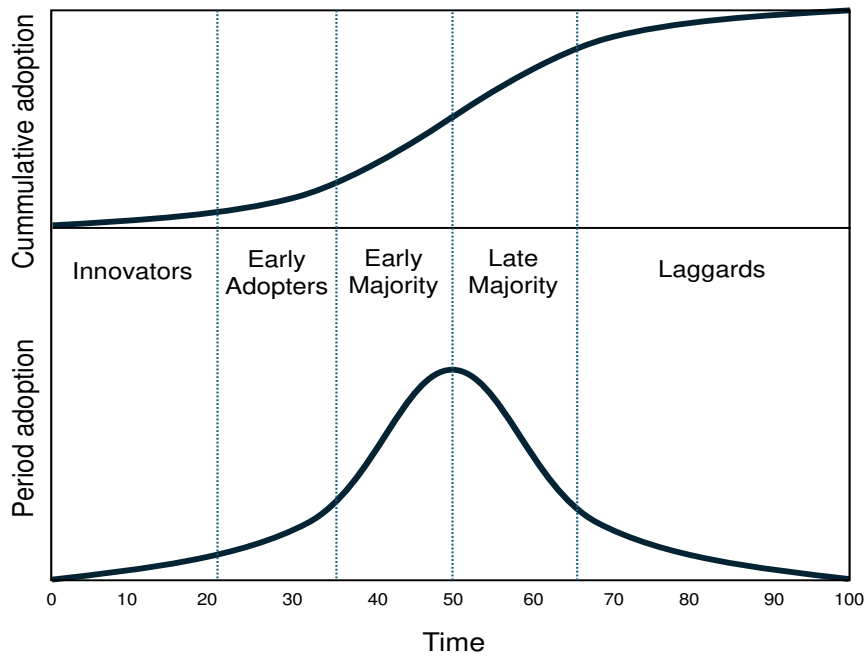
#### *3.1.2.2 Radical Sustaining Innovations*

Radical Sustaining Innovations, on the other hand, are significant advancements that substantially improve the performance or capabilities of a product or service. While they are more dramatic than incremental changes, they still target existing markets and customer bases. These innovations might involve adopting new technologies or re-engineering a product to achieve breakthrough performance levels, significantly enhancing the value proposition for existing customers (Christensen, 1997; Nagy et al., 2016; Tidd & Bessant, 2020).

#### *3.1.3 Innovation Diffusion Model*

The concept of the diffusion of innovations, concerns how an innovation is perceived and adopted by individuals over a certain period of time and through specific communication channels, within a social system (Bass, 1969; Meade & Islam, 2006; Rogers, 1995). Within this framework, it divides individuals into five different groups: Innovators, Early Adopters, Early Majority, Late Majority, and Laggards. In the theoretical process of diffusion, in which the adoption process can be described in a S-curve, innovators are expected to be the initial group expected to adopt the product. The early adopters have a significant influence on the spread of a product by providing positive testimonials at a larger state. The early majority group, in comparison with the late majority group, generally have a higher level of formal education and a higher social status, which enables them to cope with uncertainties at a smaller risk. This leads them to interact with the product at a comparatively earlier stage. Still, the journey to early

majority acceptance demands substantial time, but once reached, there's a noticeable acceleration. The late majority group represent a great challenge in customer acquisition and show a significant resistance to change, leading to a later adoption. Laggards are the last group to adopt an innovation, often characterized by a reluctance or resistance to change (Meade & Islam, 2006; Rogers, 1995). According to Rogers (1995), an innovation doesn't always have to be entirely original, rather, it must be subjectively perceived as new by individuals. The perceived novelty of a product could be associated with an individual's level of awareness and their subsequent decision to adopt it. The willingness to adopt innovations is influenced by various factors, including socio-economic variables such as education, age and income, as well as personality traits such as attitude towards novelty and curiosity. In addition, factors relating to communication behaviour, such as the type and quality of interaction and communication within the social unit, also play a role (Rogers, 1995). Core characteristics such as relative advantage, complexity, trialability, observability and compatibility are essential in defining an innovation's appeal. Together, they synergize to establish a (perceived) relative advantage, enhancing the likelihood of its adoption (Nagy et al., 2016; Rogers, 1995). According to Rogers (1995), the decision to accept or reject an innovation is not a random reaction, but a social process that takes place over a period of time and involves a series of actions. This sequential process includes the awareness of the innovation, the conviction of its advantages or disadvantages, the decision to accept or reject it, the implementation of the innovation and the subsequent confirmation or revision of the decision based on the experience of its application. This dynamic interaction between individuals and their social environment characterizes the adoption and dissemination of innovations (Rogers, 1995). This process may transform an initially narrow market into becoming appealing for a wider range of potential customers (Brown, 1992; Meade & Islam, 2006).



**Figure 3:** Innovation Diffusion Model

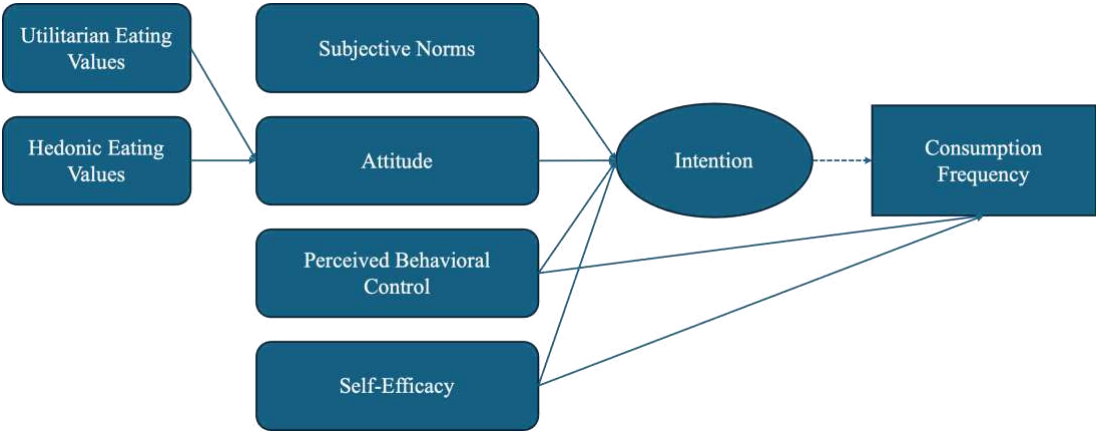
*Source: Own illustration based on Meade & Islam (2006)*

### 3.2 Consumer Behaviour - Theory of Planned Behaviour

The Theory of Planned Behaviour (TPB) has garnered widespread acclaim for its robust capacity to dissect and predict individual intentions and actions within a straightforward framework (Ajzen, 1991). This elegance stems from its consolidation of attitudes, norms, and control structures, which have proven to be remarkably effective across various behavioural domains (Ajzen, 2020). Within the development of the theory, the theory's competence in explaining a spectrum of health-related behaviours, from physical activity to dietary practices, was emphasized (Fishbein & Ajzen, 2009). According to the TPB, the most direct and important predictor of a person's behaviour is their intention to behave. This intention is influenced by three key factors: attitudes, subjective norms and perceived behavioural control. Thereby, attitudes towards the behaviour reflect a person's positive or negative evaluation of performing that behaviour, based on their beliefs about the expected outcomes of the behaviour and their evaluation of these outcomes. Subjective norms can be differentiated in injunctive- and descriptive norms. Injunctive norms refer to the perceived pressure from important others, such as friends or family, regarding whether the person should perform the behaviour. This includes the person's perception of what significant others think they should do and their motivation to fulfil these perceived expectations. Descriptive norms on the other hand refer to the perception of how people actually behave. Lastly perceived behavioural control refers to the individual's

perception of how easy/difficult it is to perform the behaviour, influenced by previous experiences and anticipated obstacles. This factor not only affects the individual's intentions but can also have a direct impact on the behaviour itself, particularly in situations where control over the behaviour is perceived to be limited (Ajzen, 2005).

Conceptually, perceived behavioural control and self-efficacy are not fundamentally different, as both reflect a person's belief that they are able to perform a certain behaviour. In practical application, however, these two concepts are often measured in different ways (Ajzen, 2020). In this regard, Terry and O'Leary (1995) have provided theoretical reasons for differentiating between two forms of perceived behavioural control. They argue that ability and motivation, i.e. self-efficacy, are internal control factors, while external control factors such as task difficulty, luck or access to necessary resources act from outside the individual. In this context, studies using the (TPB) model and incorporating separate measures of self-efficacy and perceived behavioural control (e.g. Nystrand & Olsen, 2020; Terry & O'Leary, 1995) shows that these constructs influence behavioural intention differently, and in some cases perceived behavioural control can even negatively influence intention.



**Figure 4:** Theory of Planned Behaviour Model  
 Source: Own illustration based on Ajzen (2005) and Nystrand & Olsen (2020)

The TPB's fundamental construct has invited several extensions aimed at augmenting its predictive power. These have addressed underlying influences such as personality traits, intelligence, demographic factors, and contextual nuances, acting as mediators and thereby affecting intentions and behaviours indirectly (Ajzen, 2011, 2020; Conner, 2015; Conner & Sparks, 2005).

Within the domain of health, TPB's relevance is well established, as seen in studies focusing on physical activity and smoking cessation (McEachan et al., 2011), as well as investigations into food consumption and healthy eating habits (Conner et al., 2002; Nystrand & Olsen, 2020; Povey et al., 2000). Yet, when it comes to consumer behaviour toward FFs, a segment where products blur the line between nutrition and health, there's a discernible gap in TPB application (Nystrand & Olsen, 2020). Patch et al. (2005) applied TPB to gauge intentions toward omega-3 enriched food consumption. Another paper was examining the Australian market's willingness to embrace FFs, in the context of attitudes, subjective norms and risk dread, reorienting the TPB to measure willingness rather than intention (O'Connor & White, 2010). More recently, Nystrand and Olsen (2020) have applied the theory to FFs and its regular consumption as a holistic category in Norway. In this context, one is also confronted with the dichotomy of hedonic versus utilitarian product benefits (Baker et al., 2022; Crowley et al., 1992; Nystrand & Olsen, 2020; Okada, 2005). Hedonic characteristics is primarily defined by an affective and sensual experience of aesthetic or sensorial indulgence, fantasy and enjoyment. In contrast, utilitarian goods are those whose consumption is more instrumental and goal oriented and therewith fulfils a practical or functional task (Dhar & Wertenbroch, 2000). This also presents a pertinent discourse for TPB's application in consumer behaviour, especially in the context of FFs. The prevailing sentiment suggests that while all food products harbour both utilitarian and hedonic characteristics, FFs purportedly offer enhanced utilitarian benefits such as health advantages and convenience, fulfilling their "functional" designation, therewith linking with the desire for health benefits and health concerns (Hauser et al., 2013; Nystrand & Olsen, 2020). This may lead to the willingness to potentially pay a higher price (Pappalardo & Jayson, 2016). Very recent, Alami et al. (2019) and Wong et al. (2021) have applied the theory to food supplements. While Alami et al. (2019) were analysing the behaviour of adolescent girls, Wong et al. (2021) applied the TPB-theory, in times of COVID-19, generating relevant findings with regards to attitude.

## **4. Methodology**

### **4.1 Research Design**

The previous section provided an overview of the status and influencing factors of FGs. This was achieved by analysing the available secondary data, with a particular focus on most recent data. The literature on management theory was summarised to provide an overview of the current state of the literature in the context of answering the underlying research question.

Subsequently, expert interviews and a survey were conducted, the results of which will be analysed based on the previously defined framework. Hereby valuable insights, particularly on the manufacturers' and suppliers' side were gained. In this context, by also implementing a customer faced survey, the method of data triangulation was employed, as a single research approach would be insufficient for the two-sided view, thereby also enhancing the study's robustness and validity (Denzin & Lincoln, 2008; Patton, 1999). The survey and interviews led to a better understanding of the obstacles that affect the diffusion of FGs. In addition, the potential customer market and the key factors for the introduction of FGs were identified.

## **4.2 Data Collection**

### **4.2.1 Primary Data Collection**

#### *4.2.1.1 Interviews*

In the context of the two-sided view of the market, an assessment of the market was sought by interviewing market experts (see appendix A). The in-depth interviews, which were conducted between March and May 2024, were semi-structured. This structure allowed to ask additional questions as needed if answers seemed unclear or incomplete and allowed for depth and nuance in understanding participants' perspectives. During the face-to-face interviews, the data was recorded. After the interviews, the recordings were transcribed. The interviewees were then asked to check the accuracy of the transcriptions. In case of ambiguities, the interviewees were approached again to clarify open questions. The interviews were personalised to the interviewee in order to extract the best possible insights from the experts (Gioia et al., 2013). The focus on the German and European market was defined beforehand.

#### *4.2.1.2 Survey*

In the first segment of the survey, the demographic information of consumers were gathered. This includes place of residence, age, gender, relationship status, income and education. Due to the focus on the German market, the scope was restricted in advance. In the subsequent part of the survey, the level of knowledge in relation to health and supplementation as well as the sources of influence, preferred place of purchase and status in relation to the consumption of food supplements were queried. To validate the respondents' answers, an attention check was implemented.

For the majority of questions, Likert-scale was implemented (1-5). This scale will improve comprehension of the range of measurement (Dawes, 2008). Furthermore, it can measure perceptions, attitudes and opinions of an individual or a specific group (Joshi et al., 2015). The fundamental question structure was adopted from Fishbein & Ajzen (2009) and Nystrand & Olsen (2020) and transferred to FGs.

The parameter Attitude (ATT) was measured in line with recommendations and standard practice (Fishbein and Ajzen, 2009; Nystrand & Olsen, 2020). Respondents were asked to conclude to the phrase "Eating functional gummies regularly would be...", followed by three adjective pairs: bad-good (global), boring-exciting (hedonic), and foolish-wise (utilitarian) (Nystrand & Olsen, 2020; Voss et al., 2003). For comparative purposes, the same was done for "traditional" food supplements.

Intention (INT) was measured with the fundamentals by Fishbein and Ajzen, 2009: "I intend to consume functional gummies regularly (as a food supplement)".

**H1.** *Intention is positively related to consumption frequency of FGs.*

Eating values were measured using six options (multiple choice) completing the stem: "It is important to me that the functional gummies I consume ...", the options opted to differentiate between hedonic values and utilitarian values. The utilitarian eating values were "do not increase my weight / help me to maintain my weight", "help me to avoid health issues" and "result in a noticeable improvement of my well-being". The three items reflecting hedonic eating values were "are fun to eat", "provide me good sensory feelings (good taste, smell, appearance)" and "are enjoyable to eat" (Nystrand & Olsen, 2020; Olsen & Tuu, 2017).

With regard to the participants' perceived control over behaviour (PCB), the following question was included: "Whether or not I eat functional foods regularly is entirely up to me". The question to measure self-efficacy (SE) was "If it were entirely up to me, I am confident that I would be able to eat functional foods regularly". This approach was in line with the methodology used in previous studies (Alami et al., 2019; Armitage & Conner, 1999; Nystrand & Olsen, 2020)

**H2.** *PCB is positively related with the consumption frequency of FGs.*

**H3.** *SE is positively related with the consumption frequency of FGs.*

With regards to subjective norms, it was differentiated between injunctive norms: “Most people who are important to me would want me to consume functional gummies”, and descriptive norms: “Most people like me eat functional gummies regularly” as well as “How many of the people who are important to you do you think eat functional gummies regularly?” as a control question (Nystrand & Olsen, 2020; Rhodes et al., 2006).

Lastly, the consumption of FGs was assessed with a single measure: “On average during the last 6 months, how often have you consumed functional gummies?”. A similar measure of frequency with regards to food/FFs consumption is presented in by Goetzke et al. (2014) and Nystrand & Olsen (2020).

#### 4.2.2 Secondary Data Collection

In order to retrieve relevant information and academic research for the literature review of this study, an extensive search was conducted in reputable databases such as ResearchGate, ScienceDirect, Scopus and JSTOR. Summaries of various management concepts were compiled, with a deliberate focus on high quality research from reputable journals. Recurring issues that emerged in the existing literature were critical to the formulation of the interview questions. This additional data informed the creation of structured discussion guides, as suggested by Snyder (2019) and Kraus et al., (2022). Analyses of the nutrition-, vitamin- and vitamin gummies market as well as demographic data from government sources and private sector reports provided a comprehensive and trustworthy synthesis of information. All statistical data was sourced from reputable data collection companies or official government agencies.

#### 4.3 Research Approach

This study used qualitative content analysis systematically analysing and interpreting data. In this context grounded theory was applied, thereby coding categories organically from the data, in order to enhance transparency as well as credibility, gain valuable insights and minimize biases. The methodology was tailored to the data, applying the principle of flexible orientation, which is considered fundamental to the theory (Gioia et al., 2013). Due to the incorporation of interviewees with different backgrounds and expertise, a diverse range of data that provides a more holistic understanding of the market was obtained. This approach was selected as it provides flexibility and allows for a better understanding of patterns in the data related to the

interviewee's opinions, experiences and perspectives. Furthermore, it ensures the reliability of the answers, as the interviewees were carefully selected, and their responses were cross-checked. The material was reevaluated after 25% and 50% of the interviews in order to determine the meaningfulness of the selected categories (Mayring, 2000, 2004). The survey was conducted to obtain relevant data concerning the consumer behaviour of (potential) consumers. In alignment with the dual-method approach, this was carried out to provide quantitative substantiation for the qualitative interview findings within the management framework. To exclude personal views from the scientific work as far as possible, assumptions, judgements and hypotheses were continuously challenged by the results of the interviews, the survey and a detailed literature review.

## **5. Analysis and Findings**

### **5.1 Qualitative Findings from the Interviews**

The interview material was analysed by coding the participants' responses and determining relevant categories in Atlas TI, an analytical tool for qualitative research commonly used by academic institutions (Mayring, 2014). Subsequently, the expert interviews are categorized according to the assigned codes and thematic context (see appendix A). Emphasis was placed on the most frequently discussed statements. To be able to assign each statement to the respective expert, they are labelled I01 to I07.

#### **5.1.1 Market Overview**

##### *5.1.1.1 Global Upturn*

FG are on the upswing globally. In the United States, the leading market for this category, gummies now account for over 50% of vitamin and mineral formulations offered in drugstores (I03; I04). Concerning the USA, costs associated with cases of illness drives the constantly growing prophylactic healthcare market (I03). In terms of growth, the Asian market has high potential, followed by the European market (I01; I03). In Europe, demand for healthcare products was driven significantly by the Covid-crisis (I04). With regards to the gelling agent used, gelatine makes up the largest proportion at a global scale. Especially in America, the customers do not see the difference in value, when compared with sugar-free and vegan options, if the portion size is small and are not willing to pay a price premium (I01; I03; Markets and Markets, n.d.).

#### *5.1.1.2 German Niche Market*

FGs are still in the early stages of market penetration in Germany and Europe and thereby represent a niche market (I01; I02). However, gummies are increasingly replacing conventional tablets and powders as the preferred form of consumption (I01; I02; I03). The market currently offers limited availability of solutions specially developed for children (I01).

#### *5.1.1.3 Market Development with Challenges but High Potential*

The food supplement market remains stable, boosted by increased demand during the Covid-19 pandemic. Especially FGs show a great growth potential (I01; I02; I03; I04). However, there is still resistance on the market, particularly from traditional food supplement producers/confectionery manufacturers, but even drug stores who are critical of changes in this segment. As a result, gummies as a form of food supplements were categorized as 'sweets' in initial negotiations and their placement on the OTC-shelf was questioned in the first instance. This development was also evident in the initial phase in the USA (I01; I03). Although traditional retailers are reluctant at first, some are slowly beginning to recognize the potential of these products and are listing individual FGs (I01; I03). A heterogeneous and comparatively large selection of gummies is already available online (I01). With regards to commercialisation of the products there are complications due to protracted authorisation procedures for new raw materials and health claims. These are defined as very important for product communication and acceptance (I01; I04).

### *5.1.2 Target Group and Consumer Perception*

#### *5.1.2.1 Broad Target Troup*

The target group for FGs is expected to be very broad. Women are named as the primary target group. However, in contrast to capsule and tablet products, the children's market in particular is also considered to have very high potential in terms of delivery form and therefore accessibility (I01; I02; I03; I04). Furthermore, pill fatigue can function as a driving factor (I03). These products are also aimed at people who want to combine the enjoyment of gummies with health benefits (I02; I04). There is also an associated growing potential for older people as a target group who are also interested in the benefits of these products (I01; I02; I03). However, it is expected that fundamental explanatory activities will be required (preferably through traditional media, doctors or pharmacists) to ensure that the older part of the population

recognises the functional benefits (I04). The target group is, therewith expected to have a middle to high income and level of knowledge (I01; I02; I04).

#### *5.1.2.2 Unique Consumer Behaviour*

The successful introduction of FGs is expected partly due to the fun factor and improved flavour that make the consumption experience appealing (I01; I02; I03; I07). These products have the capability to change the daily routine of supplement intake by transforming it into a positive experience that consumers actively enjoy (I02; I03; I04). However, there is a risk that the association of gummies with traditional sweets could potentially be perceived as unhealthy, which could deter certain consumers (I02; I04).

#### *5.1.2.3 Communication and Information Flow as Drivers*

Market participants are responsible for educating about their products (I01; I04). There is a significant need for education about the health characteristics, benefits and use of gummies compared to traditional forms of food supplements (I01; I02; I03; I04). Social media plays a crucial role in targeting specific audiences, especially young women (I01; I02; I04). Furthermore, studies, word-of-mouth, as well as pharmacies and doctors, are important factors in the dissemination and acceptance of these products (I01; I02; I03).

### *5.1.3 Innovation Assessment*

#### *5.1.3.1 Innovation Diffusion and Market Acceptance*

FGs offer an alternative dosage form in comparison with standard food supplements, they hereby can act as an eye catcher (I01; I02; I03; I04). They are particularly convenient for people who have difficulty swallowing pills or capsules (I01; I02). FGs have emerged as an established segment that is here to stay (I01; I03). However, it is not expected that gummies will completely replace tablets and capsules. Rather, both dosage forms will continue to co-exist (I01; I02; I03).

#### *5.1.3.2 Advantages and Disadvantages*

By default, gummies have a higher cost structure compared to capsules and tablets, which is often due to ingredient-overdosing as well as the additional ingredients and manufacturing process (I05; I06). One disadvantage attributed to the nature of gummies is the lower possible dosage possibilities compared to capsules and tablets (I02; I04).

In the context of the diffusion in the USA, FGs were marketed at over 300% of the capsule price. This pricing structure has adjusted over time due to the competitive market, meaning that gummies are now offered at a small price premium. This subsequently also attracted new customer groups (I03).

## **5.2 Quantitative Findings**

A total of 179 responses were submitted, 16 of which were not suitable due to incompleteness or place of residence being outside Germany. The older population is underrepresented in our study, partly explainable due to the digital survey method, which may be less accessible to this age group. The distribution of men and women is within a representative range for Germany. In terms of educational level, there is an overrepresentation of academics, which reflects a distribution similar to that in larger cities (DESTATIS, 2023; Geis-Thöne, 2024).

### **5.2.1 Socio-Demographic Characteristics**

The sample comprised people between the age of 10 and 65+, with more than 50% aged between 18-30 years. 52% of respondents were female. The majority of respondents (54.6%) had a high level of education (Bachelor's-, Master's degree or PhD), while the yearly gross income was below 45.000€ for the 41.72%, therewith being below the average income in Germany (DESTATIS, 2022). In addition, 41.72% of respondents were in a relationship, at the time of the survey.

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**Table 2.** Socio-demographic characteristics

(N= 163).

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<b>Variables</b>	<b>Per cent</b>
<b>Gender</b>	
Male	47.24
Female	52.15
Divers	0.61
<b>Age (years)</b>	
10-17	3.68
18-30	53.37
31-45	24.54
46-65	14.11
65+	4.29
<b>Status</b>	
Single	30.67
Relationship	41.72
Marriage	23.31
Divorced	1.23
Widowed	2.45
Not Specified	0.61
<b>Highest level of education</b>	
Certificate of Secondary Education	0.61
General Certificate of Secondary Education	6.13
A-Levels	11.66
Apprenticeship	25.77
Bachelor's Degree (or similar)	28.83
Masters's Degree (or similar)	23.93
PhD	1.84
Not Specified	1.23
<b>Gross salary</b>	
Less than 45.000€	41.72
45.000€-59.999€	19.63
60.000€-100.000€	25.15
More than 100.000€	5.52
Not Specified	7.98

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*Source: Survey data (2024)*

### 5.2.2 Nutritional Knowledge and Behavioural Patterns

The majority of respondents (40.49%) rate their knowledge of health and nutrition as good, while 38.04% rate it as average. The sources of information used are broadly diversified: 70.55% of respondents claim they use online research as a source of information. Moreover, 60.74% use social media to obtain an overview. Family and friends serve as sources of information for 47.24% and 36.20% also consult their doctor. YouTube and podcasts are important information channels for 30.06%, while 28.22% also research offline, reading books and magazines. Information from pharmacists is received by 16.56% of participants. A smaller group (8.59%) also obtain information through professional or study-related contexts.

With regard to the use of food supplements, half of the respondents (51.53%) plan to consume them regularly. A neutral 24.54% are opposed to this, while 23.93% refuse to consume them. A small majority of consumers purchase their food supplements online (52.15%).

Lastly, there is an observable discrepancy when it comes to the problem of swallowing pills: 19% of participants generally have difficulties, whereas 11% claim it is dependent on the characteristics of the capsule or tablet. Among female participants, 48% report problems with swallowing pills, compared to only 9% of male respondents.

### 5.2.3 Insights on Functional Gummies

FGs are already known among 77.30% of the respondents. In this context, 47.24% consume the FGs in different frequency models. In respect to the value proposition compared to capsules and tablets, 14.11% of respondents rated gummies as superior, while half (55.83%) considered there to be no difference in value. Conversely, over quarter of respondents rated gummies as inferior.

Furthermore, 49.69% of the respondents would use this dosage form to provide their children with vitamins and minerals. Over a third (39.26%) would consider this option, while only 11.04% would reject it.

In terms of willingness to pay, 30.67% of respondents are not willing to pay more for FGs than for capsules and tablets. A further quarter (29.45%) would pay up to 10% more, while 36.81% would be prepared to pay between 10 and 20 % price premium. Only 3.07% of participants would accept a surcharge of more than 20%.

Regarding the context of "eating value", the ability of gummies to prevent health problems and the noticeable improvement in well-being were identified as the most relevant factors for

consumption. Interestingly, these aspects are closely followed by the factor of the good sensory experience offered by the taste, smell and appearance of the gummies, as well as the pleasant form of consumption they represent.

Furthermore, a paired t-test was conducted to contrast the hedonic values (boring-exiting) of FGs and conventional supplements. The analysis revealed a statistically significant difference in hedonic ratings ( $t(162) = 10.559, p < .0001$ ). The mean hedonic value for FGs was significantly higher than that for conventional supplements, with a mean difference of 1.226 (95% CI). These results suggest that participants perceived FGs as more exciting compared to conventional supplements. With regards to utilitarian and global values, the analysis did not reveal a statistically significant difference.

### 6.2.3 Extensive Statistical Analysis

Before conducting the analysis, the data was checked for outliers, no irregularities were detected. The findings indicate that, on average, people were slightly more likely to eat FGs regularly (INT = 3.32). The attitudes to regularly eating FGs were moderately positive (ATT = 3.47). As mentioned above, both utilitarian and hedonic food values were considered relatively influential for the consumption (HED = 3.23; UT = 3.72; Glob = 3.47). Participants rated the social pressure to consume FGs as comparatively low (DN = 1.77; IN = 2.26). They also stated that they had control over whether they wanted to consume FGs and that they were self-confident in their abilities (PCB = 4.19; SE = 3.49).

**Table 3.** Correlation matrix for study variables

	<b>ATT</b>	<b>DN</b>	<b>IN</b>	<b>PCB</b>	<b>SE</b>	<b>INT</b>
<b>ATT</b>	1					
<b>DN</b>	0.526	1				
<b>IN</b>	0.613	0.612	1			
<b>PCB</b>	-0.047	-0.018	0.081	1		
<b>SE</b>	0.589	0.369	0.455	0.183	1	
<b>INT</b>	0.330	0.310	0.374	0.365	0.305	1
<b>Mean</b>	3.470	1.773	2.263	4.190	3.490	3.319
<b>SD</b>	0.882	0.714	1.154	1.168	1.234	1.304

*Source: Survey data (2024)*

The Pearson correlation does not show a value exceeding 0.7, which is an indication that there is no multicollinearity between predictor variables. Furthermore, a regression analysis was performed, investigating the effects of intention, attitude (hedonic, utilitarian and global), PCB, SE, DN, IN, gender, and income (see appendix B). In this context a Breusch-Pagan test was conducted to test for heteroscedasticity, resulting in a p-value of 0.084. The H0-Hypothesis was therefore not rejected, as there is no sufficient evidence of heteroscedasticity. In addition to that, the absence of multicollinearity was confirmed with analysing the VIF-values.

Reaching an adjusted R<sup>2</sup> of 0.625, the model explains a significant amount of variance (Chicco et al., 2021). Intention significantly (0.157, p<0.01) influences consumption, therefore supporting H1. An increase of intention by one unit, estimates a change in consumption by approximately 0.157 units, ceteris paribus. Furthermore, descriptive norms seem to have a significant (0.740, p<0.01) influence on the consumption of FGs. Meaning that by an increase of the descriptive norms value by one unit, the consumption is estimated to increase by 0.740 units, ceteris paribus. Attitude also seems to have a significant (0.402, p<0.01) influence on consumption, meaning that if attitude increases by one unit, the consumption is estimated to change by approximately 0.402 units, ceteris paribus. In comparison to male, female seem to be significantly (0.389, p<0.01) more likely to consume FGs. Lastly, people who made no statement on their income, are significantly less likely to consume FGs (-0.464, p<0.1) when compared to people with an income <45.000€. H2. and H3 have to be rejected.

With regards to the literature (Alami, et al., 2019; Norman & Conner, 2006; Nystrand & Olsen, 2020), a second regression model has been conducted. In the context of the scope and relevance in relation to the research question, a detailed analysis was suspended.

## **6. Discussion**

### **6.1 Opportunities and Drawbacks**

Vitamins play an important role in human health, especially with regards to the children's growth and maintenance of their health. In practice, deficiencies and their adverse effects on biological processes are frequently observed (Lesic et al., 2024). The challenge of swallowing pills affects many, with studies showing a significant percentage of both adults and children encountering difficulties. The studies by Schiele et al. (2013) and Adkins et al. (2020) show that between 17%-37.4% of the adult population cannot swallow capsules and tablets. This is in line with the findings of this paper, showing that especially women have problems with swallowing pills. With regards to children, more than 50% of the subjects were not able to swallow pills as well as up to 40% rejecting pill or liquid formulations (Polaha et al., 2008). Compared with gummies, one of the major challenges with liquid solutions is the inherent stability of their ingredients. The liquid state can act as a catalyst for chemical reactions, which may accelerate the degradation of active ingredients (I05; Thakur et al., 2011). Furthermore, some studies have shown improved bioavailability, even when compared to capsules and tablets (Evans et al., 2020; Wagner et al., 2019). Furthermore, gummies offer the opportunity to be sugar-free, vegan and contain a similar calorie level as capsules and tablets (Tarahi et al. 2024; I01; I02; I03; I05; I07). Thus, gummies as a carrier acquire further significance.

However, there are trade-offs, notably regarding dosage capacity of gummies compared to traditional tablets, which may influence consumer preferences across different age groups. Gummies as a carrier, in comparison to capsules and tablets, also have the fundamental requirement of flavour (I05; I07). Raw materials with a strong inherent taste (e.g. plant-extracts) pose a considerable challenge. Furthermore, the pricing of FGs is viewed as a drawback in contrast to capsules and tablets, given that the production costs for gummies encompass not only the manufacturing process but also the carrier material required for the gum base. Consequently, the production of gummies entails higher expenditures when juxtaposed with the streamlined production methods employed for capsules and tablets (I05; I06; I07). In addition to that, as noted before, there is a potential risk that the association of FGs with

traditional sweets could potentially be perceived as unhealthy, which could deter certain consumers (Baker et al., 2022; I02; I04). In contrary, other previous studies have revealed that consumers generally consider the enrichment of associated "unhealthy" foods to be more legitimate than the enrichment of foods that are considered healthy (Bech-Larsen & Grunert, 2003). Moreover, the argument could also be made that gummies as a sugar-free, vegan version are also a healthy alternative. It remains to be seen how the mainstream market will perceive this product category.

Lastly, with regards to the potential consumer group children, there is an associated risk of overdosing due to the playful and fun carrier, that is normally associated and learned with regards to snacking (Lam et al., 2006). To counter this aspect, providers are using safety-lids to be child-proof (I01; I07).

## **6.2 Analysing the Dynamics of Innovation**

The boundary between radical sustaining innovations and disruptive innovations is often blurred, especially in the initial stages, and may continue to shift as the market develops. The key to the classification as disruptive would depend on the market impact and how the competitive dynamics are influenced. Still, the relevance of identifying innovation types is derived from the literature, as it provides insights into the characteristics of adopters (Reinhardt & Gurtner, 2015).

According to literature, there are three central characteristics with regards to disruptive innovation. By initially underperforming with regard to the dosage capacity (depends on ingredient), that is valued as a central performance dimension by the mainstream market, FGs confirms the first characteristic. However, contrary to Christensen's original findings, gummies are not cheaper than capsules and tablets (Christensen, 2002). Recent literature suggests that this factor is not necessarily existent (Nagy et al., 2016; Reinhardt & Gurtner, 2015). The second and third characteristics are described as adding an additional performance dimension that existing products do not have and initially addressing the lower end of an existing- or a niche market. As FGs seem to target new/niche markets such as children, individuals that dislike the medicinal nature of traditional supplements plus individuals who have problems with swallowing pills, and thereby potentially create new markets, this could therefore be defined as a new-market disruption (Schmidt & Druehl, 2008). In the context of innovation theory, these tend to be the early adopters, as existing solutions have not met their needs (Reinhardt & Gurtner, 2015). This also follows the findings of Nagy et al., (2016) and fulfill the intrinsic

characteristics of radical innovations. By triggering the hedonic dimension, the consumption characteristics differ significantly from classic capsules and tablets and include the sensory, playful and lifestyle component and therewith also make use of the fact that taste is linked to memory (Miranda, 2012; Siro et al., 2008). According to research, hedonic innovativeness may also lead to higher involvement (Reinhardt & Gurtner, 2015). Furthermore, the performance dimension, convenience and the associated simplification of consumption is a key factor that could appeal to customer groups that would otherwise be deterred by the inconvenience of for example having to carry extra liquid or dissolve the tablet before consuming. This is a decisive factor, particularly in the USA (I03) and follows the definition of a disruptive innovation (Christensen et al., 2015; Schmidt & Druehl, 2008). Another performance dimension could be added by the potentially higher bioavailability, but this would need to be further quantified in the future. The innovator's dilemma with FGs could be characterised by acquisition costs, more complex manufacturing processes and higher production costs compared to conventional food supplements. This initially renders a commitment seemingly unappealing.

For the mainstream market, FGs currently tend to represent a different, potentially more convenient form of food supplement, thereby, due to its characteristics, could increasingly take over market share from established supplement formats. When drawing the line separating it from FFs, the contents and form of consumption represent a format that theoretically allows daily consumption solely as a means to an (utilitarian) end. Evaluating the currently biggest market (USA), it can be observed that a co-existence with capsules and tablets (equal shares) is occurring.

As FGs are still at an early stage of development, their full market impact will only become apparent in the future. As innovation is not equally disruptive for everyone and disruptive innovations, as Christensen (2002) characterises them may not act disruptive, it will also be interesting to see to what extent the market structure changes and which stakeholders are affected (Reinhardt & Gurtner, 2015; Tiberius et al., 2021).

### **6.3 Factors influencing Consumer Behaviour: Insights from the Theory of Planned Behaviour**

In previous studies on food, the significance of the influencing factors has varied. Social norms are a constantly occurring factor, as reflected in the past research (McEachan et al., 2011; Nystrand & Olsen, 2020). With regard to food supplements, this relationship is also evident to

a certain extent (Alami et al., 2019). Only a small number of papers show little or no effect (Conner et al., 2002; Norman & Conner, 2006). The results of this paper are consistent with social norms, preferably descriptive norms, representing a significant factor in relation to consumption. This goes along with the findings of Nystrand & Olsen (2020). However, it should be noted that descriptive norms appear to have a direct influence on consumption. On one side it may be attributed to the lifestyle character, on the other side, it could be argued that the awareness of the consumption of food supplements causes consumers to perceive that they also should consume functional products (FPs), in which case gummies tend to be the soft-entry point to the category. Furthermore, it could be an indication of the complexity of human behaviour, which may not be fully explained by the theoretical model. Reflecting on the findings and literature, it is apparent that emphasising social norms could prove beneficial in the marketing of FGs. In particular, the inclusion of descriptive norms could, both for future research and practice, help to understand the construct of social pressure also in the context of (FGs) consumption.

With regards to PCB, there was no significant positive influence on the consumption. This is in line with the findings of Conner et al. (2002) and Nystrand & Olsen (2020), implying that perceived control may not be directly relevant with regards to the FGs/FFs consumption.

In contrast to Conner et al. (2001) and Nystrand & Olsen (2020), self-efficacy does not appear to have a significant effect on intention and consumption behaviour. Interpreting this result would mean that the motivation to consume FGs does not depend on consumers' confidence in their ability to do so. In this context, however, it should be kept in mind that this statement refers to only one question and survey, and further research should be conducted in the future to confirm these results.

Consistent with other papers, intention was found to be a significant determinant of consumption/frequency of consumption. This is in accordance with the TPB model and confirms the assumption that behavioural intentions predict actual behaviour. Conversely, a positive purchase of FGs stimulates further consumption. Attitude, contrary to the initial theory, appears to have both a direct influence on consumption and a positive effect on intention. It is influenced by the consumers health history (personal experience and social environment), indirectly or directly through their belief in the connection between health and nutrition (Szakály et al., 2019). For instance, the probability of functional acceptance increases with the existence of an ill relative (Santeramo et al., 2018). This is in line with previous papers, as this initial situation is evident for both FFs and traditional food supplements, whereas attitude constitutes a centrally relevant influence (Nystrand & Olsen, 2020; Patch et al., 2005;

Santeramo et al., 2018; Szakály et al., 2019; Wong et al., 2021). Meaning that the positive basic attitude towards FGs is a significant driver for actual consumption. Thus, it also has a significant influence on the consumer's willingness to pay (Szakály et al., 2019). The direct influence could be attributed to e.g., habits or strong incentives that go beyond intention formation, such as attractive packaging that potentially leads to a direct incentive to purchase or being a lifestyle product.

The utilitarian and hedonic values also constitute a key finding of this paper. It shows that, unlike with traditional food supplements, hedonic values are a significant consumption factor for FGs. Next to the importance of utilitarian values, the sensory aspect in particular, but also the fun factor, tends to be important food-choice criteria. This seems to be another key difference between FGs and conventional FFs (e.g. yoghurt) and introduces a new element to product development, marketing and consumer behaviour in comparison also with regard to capsules and tablets (Nystrand & Olsen, 2020). In this context, consumers may also ignore strict numerical differences and buy FGs, that have less dosage of active ingredients than the comparable capsules (Balasubramanian & Cole, 2002).

Being a woman appears to significantly influence the probability of FGs consumption, with regards to men. This confirms the assumption and observation of the market.

The conservative mindset of the German market was reflected in the responses to the survey, indicating that people who conceal their income also tend to be less willing to consume innovative products such as FGs. This principle was also seen in previous studies (Siro et al., 2008).

The TPB variables do not explain 100% of the purchase and consumption decision, as in the model presented in this paper, which is a constant criticism of the theory (Sniehotta, Presseau, & Araújo-Soares, 2014). Other parameters become relevant for a complete explanation, such as the influence of BMI, habit, past behaviour, ethnicity and current mental state, even if the evidence is contradictory (Baker et al., 2022; Chaloupkova et al., 2020; Tan et al., 2017). Furthermore, according to literature, age as well as adequate nutritional knowledge can change attitudes and habits in relation to nutrition and ultimately influence their acceptance, but this could not be replicated and therefore confirmed in this study (Hung et al., 2016).

## 6.4 Market Diffusion and Managerial Implications

### 6.4.1 Market State

The consumer's acceptance of the functional product concept and a deeper understanding of the driving factors are generally recognised as key elements for market responsiveness, consumer-oriented product design and the successful exploitation of market potential. (Ares & Gámbaro, 2007; Baker et al, 2022; Martinho, 2021; Siro et al, 2008; Verbeke, 2005). The FGs market seems to be still in the early stages of development in Europe and Germany, potentially falling into the early adopter's category/state of the diffusion theory (I01; I02; I04; I07). Although, according to the survey conducted, 77% of respondents are aware of FGs and 16.5% consume FGs weekly to daily, although the actual figure in the German population may be lower. Demographic change and the subsequent problems indicate an increase in supplementation and represent a positive outlook for FG (Eurostat, 2023). With regards to the conducted survey as well as current data furthermore emphasises the importance of targeting both the online and offline market to reach a broader consumer base (Wang, 2023b).

### 6.4.2 Market Catalysts

#### 6.4.2.1 Convenience and Familiarity

The increasing importance of convenience, particularly in relation to food intake, is continuously gaining in importance, especially among couples and in households with children (Casini et al., 2015; I01; I02; I03; Weyermanns & Klein, 2024). The results of this paper show, that almost 90% would be potentially open to buy FGs for their children. Furthermore, research shows that people are more likely to substitute an existing habit if the new habit is considered more comfortable (Brunner et al., 2010). In this context, FGs offer an additional advantage of familiarity, yet the extent to which a relative advantage will be recognised by the overall market remains to be seen. The initial preference for familiar foods tends to be higher compared to new, unfamiliar foods, as innovative food products are repeatedly categorised as a potential risk in the literature, as consumers are slow to adopt new technological innovations such as FFs and are often sceptical about the health effects (Santeramo et al, 2018; Szakály et al, 2019; Tan et al, 2017; Trijp & Van Kleef, 2008).

#### *6.4.2.2 Trust, Knowledge and Reputation*

Trust and the perception of product quality, such as brand names, publicity and guarantees, are relevant factors, especially for young companies, which are often underutilised (Chu & Chu, 1994). A company's reputation correlates directly with its ability to signal quality and technological superiority. Therefore, it can be advantageous for young companies with (radical) disruptive innovations to market their products through existing and reputable partners (Montaguti et al., 2022; Teece, 1992). Inworld, a dynamic newcomer in the industry, already cooperates with larger companies in the industry and benefits from their reputation and expertise, including one of the largest supplement brands in Germany and a major food retail customer. These collaborations support trust, which is a significant factor in the diffusion process, especially after early adopters have been reached (Baker et al., 2022; Hu et al., 2019). Regarding the overall market, renowned brands such as Bayer, Doppelherz and Centrum have now entered this sector (I01; I07; Markets and Markets, n.d.). This may further boost the trust in the form of delivery. Research suggests that perceived trust in peers has a significant impact on the likelihood of influencing purchasing decisions. Consumers no longer only believe in clinical studies, but also in the experiences of people who have tried the product and had a positive experience with it (Hu et al., 2019; Jadhav et al., 2023). In this context, the influence of social media and positive customer loyalty is gaining significance.

#### *6.4.2.3 Health Awareness and Consumer Education*

Research shows that women have a higher consumption rate of FPs than men, as they are more open to nutritional habits. This customer group also drives consumption in relation to children (I01; I02; I03; I04; I07), but also the older population seems to have a preference for FPs (Baker, Lu, Parrella, & Leggette, 2022). The presence of children in the household is a relevant factor for the acceptance (Santeramo et al., 2018). Reluctance can be attributed mainly to knowledge gaps and socio-demographic factors (Chaloupkova et al., 2020; Jadhav et al., 2023; Sgroi et al., 2024; Siro et al., 2008). Knowledge and familiarity have a significant influence on the intention to adopt (disruptive) innovations (Reinhardt & Gurtner, 2015). According to research, increased health awareness supports the likelihood of consuming FPs (Hung et al., 2016). This could not be replicated in this study. Nevertheless, this might be due to the fact, that the level of knowledge was self-identified. Furthermore, consumer health motivation is an important variable that positively influences the acceptability of FPs (Siegrist et al., 2015; Siro et al., 2008). In this regard, the information provision should be improved, bottom-up as well as top-

down. The health claim certification process should be accelerated and official sources (e.g. news, doctors, consumer-centres) should provide information about the benefits of supplementation. For example, there are many deficiencies, especially in Germany, such as vitamin D, whose problems have only been recognised by the state in super-slow processes (I07; Saturnus et al., 2019). On the other hand, the responsibility for education also lies with the organisations in the market. Channels such as social media, fairs or major campaigns can be used to raise awareness. It is important to remember consumers only have to understand the benefits, not the "science" of the product. Overall, it should be kept in mind that European consumers are generally more critical of new products/technologies than American consumers (I03; I07; Siro et al., 2008).

#### *6.4.2.4 Product Characteristics*

Research shows that the acceptance of FFs/FGs is far from unconditional. One of the main prerequisites for acceptance is flavour, convenience, price, quality and the credibility of health claims (Baker et al., 2022; Sgroi et al., 2024; Siro et al., 2008). It must therefore be considered that functional benefits can offer added value for consumers but cannot prevail the sensory characteristics. Furthermore, as FGs seem to not only incorporate utilitarian, but also hedonic, characteristics. Marketing by manufacturers and vendors should therefore emphasise the playful, joyful and lifestyle aspect of gummies.

#### *6.4.2.5 Price and Willingness to Pay*

Innovation is a factor that is strongly related to willingness to pay. However, consumers appear to place a high value on price and are unwilling to compromise if they perceive an imbalance between price and value (Chaloupkova et al., 2020; Okpiaifo et al., 2023; Siegrist et al., 2015). This was replicated, with only 3% willing to pay a price premium of over 20% for FGs. However, it must be noted that almost 70% would be willing to pay a price premium compared to capsules and tablets. Vendors should be aware of this, in the current market FGs are offered at up to 300-500% price premium (I01; I02). To ensure market growth, prices should be adjusted proportionally to capsules and tablets.

### 6.4.3 Newcomer Potential - Outlook

Disruptive innovations offer potential start-up corporations' great opportunities in mature markets (Si & Chen, 2020; Wallin et al., 2022). InWorld GmbH is endeavouring to exploit this opportunity. Its potential lies in the LTM process (SoftGums<sup>TM</sup>), a production process, designed specifically for this category and protected by global Patent Cooperation Treaty (PCT) patents (WO 2007/128150 and WO 2010/072847). The LTM follows the definition of sustainable innovation, by building upon existing processes in a commercially viable way. It changes primary activities with regards to the value chain, having a higher significance with regards to the potential (Nagy et al., 2016; Porter, 1985). By operating at room temperature, and constantly monitoring >30 production-related parameters, instead of incorporating the active ingredients at 70-90°C, the potential could particularly be found in the medical sector and for heat sensitive materials, where with current technical standards, no conventional technology could be applied and no products with similar characteristics are available (Ge et al., 2021). However, it remains to be seen how the technology will be perceived by the market. Objectively it includes mechanisms of relative advantage and unique ownership, characteristics, that positively impact the innovation diffusion (Nagy et al., 2016).

## 7. Limitations:

As the field of research is comparatively novel, relevant literature, as well as market data in this context is limited. Therefore, the scope of the literature was extended to include FFs and food supplements. The absence of similar studies and papers, concerning FGs, limits the ability to perform comparative analysis. In the literature review relating to the selected management theory, only a part of the existing literature was analysed. Even though the analysis was limited to the highest quality and most referenced sources, other works may differ from the selected studies. In addition, the time frame made it difficult to analyse in-depth changes in the perception of FGs, especially among people with little or no previous contact with this product category. Another limitation is the number of questions included for each variable. In order to obtain more robust data, in future research, multiple questions per category should be included. Furthermore, the fact that the sample may not be representative of the German consumer population in terms of age and education distribution, may limit the significance in relation to overall market. The older, conservative generation, which represents a large potential market,

was not fully included due to the format of online survey. Nevertheless, the initial target group of potential early adopters was reflected with young people having a high level of education.

The results of the survey concentrate on consumers in the German market. As past studies have suggested, the German market potentially represents a unique case for the acceptance of FFs (e.g. Siegrist et al., 2015). Therefore, the findings may not be applicable to other countries and cultures.

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## Appendix A

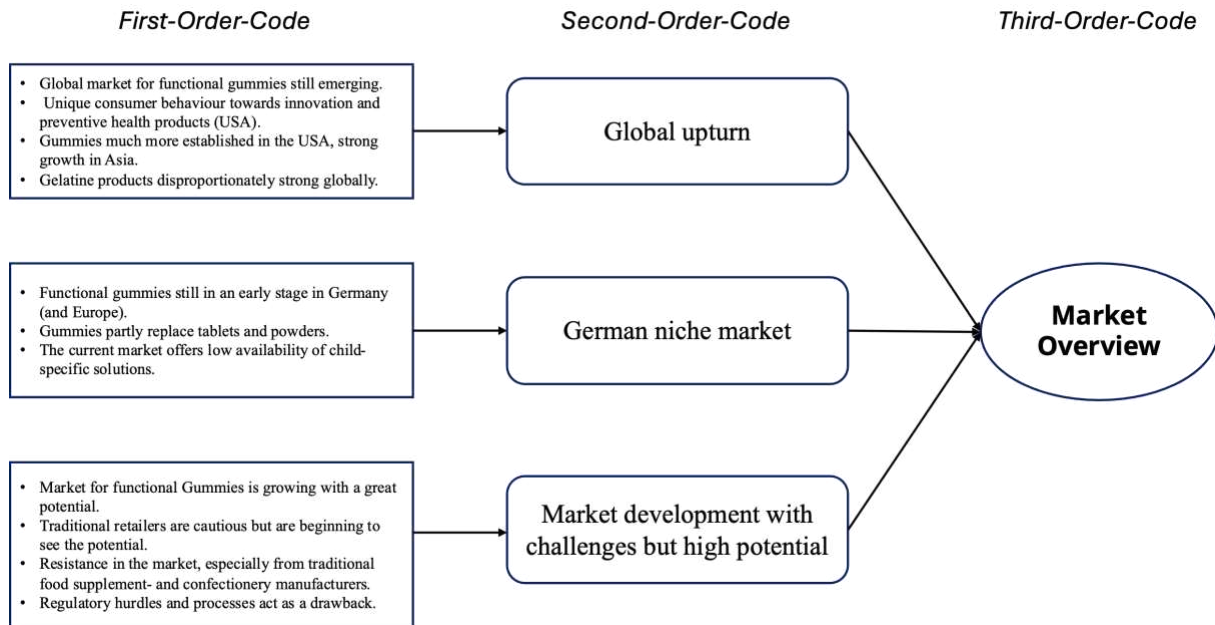
### A1. Table: List of interview partners and their background

Below you will find information about the interview partners, their background and expertise.

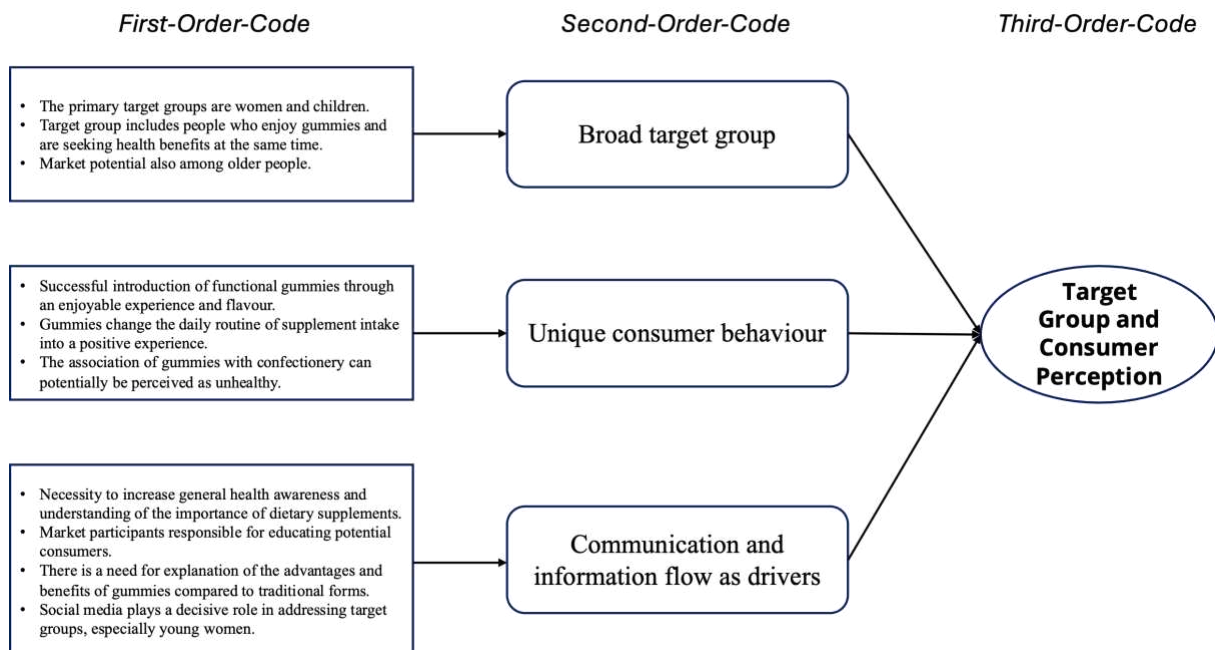
Interview Number	Role	Status
<b>I01</b>	Head of Sales & Business Development (Manufacturer)	>10 years of market experience
<b>I02</b>	Consultant and Nutritional Supplement Market Expert	>10 years of market experience
<b>I03</b>	Consultant and Nutritional Supplement Market Expert (USA)	>40 years of market experience
<b>I04</b>	Head of Sales and Marketing (Of one of the biggest German Food supplement producers)	>10 years of market experience
<b>I05</b>	Head of R&D and Process engineering (Manufacturer)	>15 years of experience
<b>I06</b>	Head of Controlling & Material Management (Manufacturer)	>3 years of experience
<b>I07</b>	Chief Executive Officer (Manufacturer)	>20 years of experience

## A2. Data structure - qualitative data collection

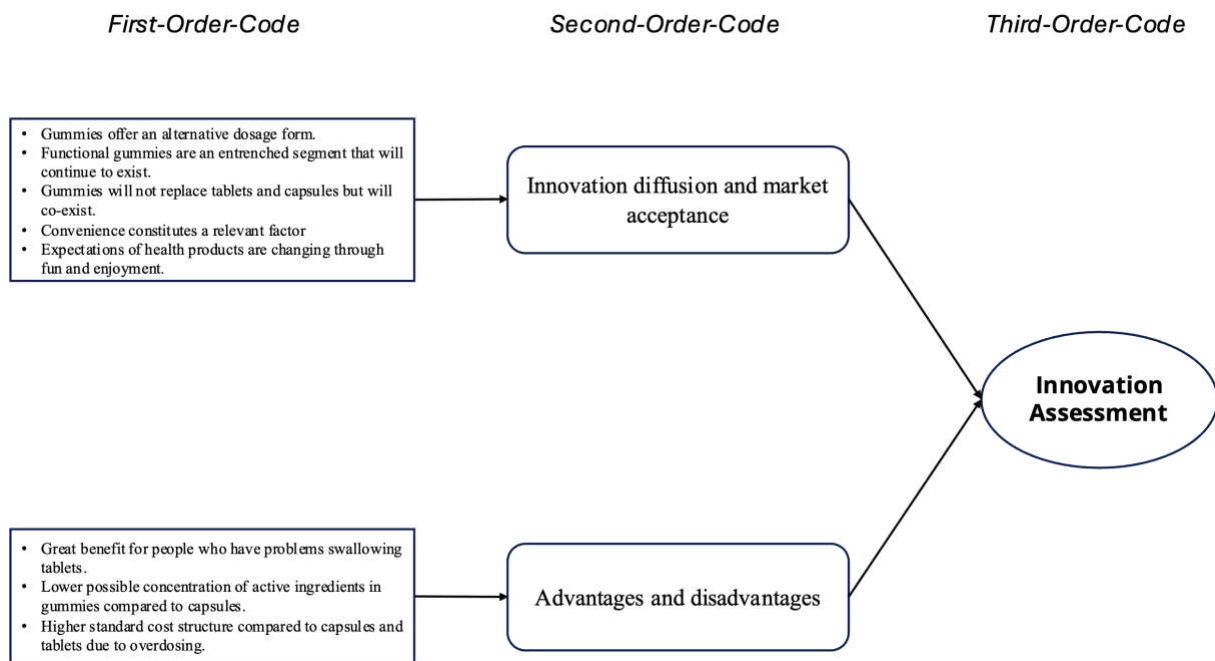
Below you will find the data structure regarding the qualitative data collection, following the structure of Gioia et al. (2013).



**Figure 1A:** Data structure – Market Overview  
*Source: Own illustration based on Gioia et al. (2013)*



**Figure 2A:** Data structure – Target Group and Consumer Perception  
*Source: Own illustration based on Gioia et al. (2013)*



**Figure 3A:** Data structure – Innovation Assessment  
*Source: Own illustration based on Gioia et al. (2013)*

### A3. Interview Questions

Below you will find the interview structure, divided into the fundamental construct and additional questions that emerged during the interviews.

#### **Fundamental Framework:**

##### **Market Evaluation:**

- Please describe the current functional gummy industry from your perspective.
- Where does the German/European market currently stand?
- Where do you currently see the "pain points" in the food supplement market?

##### **Market entry and Classification of the Innovation:**

- How do you assess the role of functional gummies compared to traditional food supplements also in terms of their ability to disrupt the existing market?
- Do you see the potential of functional gummies completely replacing capsules and tablets in the future?
- What do you see the advantages and disadvantages?

**Target Customer:**

- In your opinion, what is the target customer and how do you reach them?

**Innovation Diffusion:**

- What needs to happen for the market to develop optimally? What role do education and the flow of information play? And what role do social networks and opinion leaders play?

**Consumer Behaviour:**

- To what extent do functional gummies change consumer behaviour and expectations of food supplements?
- Do you see a change in consumption patterns or in the perception of health products?

**Resistance to Innovation:**

- Are functional gummies meeting resistance in the market?
- What challenges do you see in overcoming traditional consumer preferences and habits?

**Outlook:**

- Where do you see the industry in 10 years? Which trends or developments could strengthen or weaken the market
- Please also give your opinion on functional gummies

## **Additional Questions (Resulting from the interview process)**

### **Market Evaluation:**

#### EU Market

- From your perspective, is the market more focussed on individual raw materials, i.e. high doses of vitamin C without raw materials, or is the European and German market more focused on multivitamin products?
- How do you see vegan and sugar-free in the future, i.e. do you think the tendency/trend will continue to rise, stagnate or decline?

#### USA Market

- If you analyse the market or examine the products, a lot of them are still sugar-based. Is it gelatine or are they vegan alternatives? Is it 50/50 or how would you describe the distribution?
- Do you think starch gummies (SoftGums) are something that would work well on the market?
- Are the very innovative formulations sold online in the US or are they also available in CVS or even in the OTC-category?

#### Global

- where do you see the greatest potential globally?

### **Innovation Diffusion:**

- How would you categorise the responsibility for the dissemination of innovations and products? Does it mainly fall on those who have direct B2C contact, or should manufacturing companies also aim to do more educational work?
- Do you think that (almost) all gummies will be functional in the future and that snacking will shift towards enriched products?

### **Target Customer:**

- If you analyse the market, it is limited to women and children. Or would you say the target group includes older people and also the male part of the population?
- How do you perceive demographic change in the context of functional gummies?
- To what extent does the education provided by pharmacists and doctors in relation to food supplements have an effect on older peoples purchase decisions?

**LTM Technology / InWorld:**

- Could you also produce the same kind of gummies with a normal mogul system if you were to exclude the cooking process?
- From a stability perspective, does the LTM it have an advantage over pectin or gelatine? Is there a difference in terms of shelf life?
- can the temperature be reduced even further in the drying process?
- what specific cost reductions or increases have you observed?
- In the context of food supplements on classic mogul systems, for example, is the overdosing in the product the same in theory or can you say that less overdosing is required with the LTM technology?

**LTM Technology / InWorld:**

- How is the added value created by LTM technology perceived by customers? If so, which aspects of product are particularly appreciated?
- How do you assess the ownership structure in relation to everyday processes and the feasibility of decision-making in the organisation?
- How does your company invest in research and development for LTM technology? How is the importance of innovation compared to traditional methods?
- To what extent can the concept of sustainability be quantified on the part of LTM?

**LTM Technology / InWorld technological questions:**

- How does LTM differ from standard Mogul technology?
- Are there advantages/differences in terms of water content?
- Are there plans for further developments or new application possibilities?

## Appendix B

### B1. Insights on functional gummies - Statistics

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Insights on functional gummies (N= 163).

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<b><u>Variables</u></b>	<b>Per cent</b>
<b>Frequency of consumption</b>	
Never	52.76
Rarely	22.70
Regularly	7.98
Weekly	8.59
Daily	7.98
<b>Willingness to pay</b>	
No price premium	30.67
Less than 10%	29.45
10-20%	36.81
More than 20%	3.07
<b>I would provide my children with functional gummies</b>	
Yes	49.69
Maybe	39.26
No	11.04
<b>Provided values</b>	
Give me a good sensory experience (good taste; smell; appearance)	66.87
Help me to avoid health problems	80.98
Bring about a noticeable improvement in my well-being	80.37
Don't increase my weight / help me control my weight	43.56
Create fun while eating	36.20
Are pleasant to eat	49.69

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*Source: Survey data (2024)*

## B2. Linear Regression Model 1 (Consumption)

	<i>Dependent variable:</i>
	Consume
Intention	0.157*** (0.058)
Attitude	0.402*** (0.108)
DesNorms	0.740*** (0.117)
Injunctive_Norms	0.054 (0.079)
Perceived_Control	0.046 (0.061)
Self_Efficacy	0.040 (0.068)
Genderfemale	0.389*** (0.132)
Genderdivers	0.771 (0.834)
Income45.000€-60.000€	0.010 (0.174)
Income60.000€-100.000€	0.062 (0.164)
IncomeMore than 100.000€	-0.443 (0.272)
Incomenot specified	-0.464* (0.252)
Constant	-1.880*** (0.375)
Observations	163
R <sup>2</sup>	0.652
Adjusted R <sup>2</sup>	0.625
Residual Std. Error	0.794 (df = 150)
F Statistic	23.470*** (df = 12; 150)

*Note:* \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

*Source: Survey data (2024)*

### B3. VIF – Statistics (Model 1)

	GVIF Df GVIFDf))		
Intention	1.475	1	1.214
Attitude	2.344	1	1.531
DesNorms	1.804	1	1.343
Injunctive_Norms	2.151	1	1.466
Perceived_Control	1.328	1	1.152
Self_Efficacy	1.805	1	1.344
Gender	1.216	2	1.050
Income	1.250	4	1.028

*Source: Survey data (2024)*

#### B4. Linear Regression Model 2 (Intention)

<i>Dependent variable:</i>	
	Intention
Attitude	0.263** (0.146)
DesNorms	0.225 (0.160)
Injunctive_Norms	0.172 (0.108)
Perceived_Control	0.402*** (0.078)
Self_Efficacy	0.021 (0.092)
Constant	-0.134 (0.504)
Observations	163
R <sup>2</sup>	0.291
Adjusted R <sup>2</sup>	0.269
Residual Std. Error	1.115 (df = 157)
F Statistic	12.897*** (df = 5; 157)

*Note:* \* p<0.1; \*\* p<0.05; \*\*\* p<0.01

*Source: Survey data (2024)*