


## Review

# Review of the Potential of Consumer Neuroscience for Aroma Marketing and Its Importance in Various Segments of Services

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**Abstract:** In the current era of a strongly competitive business environment, it is more difficult for companies to attract customers. Consumer neuroscience has growing potential here, as it reveals internal consumer preferences by using innovative methods and tools, which can effectively examine consumer behavior and attract new customers. In particular, smell has a great ability to subconsciously influence customers and, thus, support profitability. This paper examines the importance of consumer neuroscience and its modern technologies used for exploring human perceptions to influence customers and benefit from the aromatization of business spaces. We focused our analysis on various service sectors. Despite the potential of the examined issue, there are a limited number of studies in the field of service providers that use neuroscience tools to examine the effect of aromas on human emotions. Most studies took place in laboratory conditions, and the used methodological procedures varied widely. Our analysis showed that, in spite of the positive impact of aromatization in the majority of aromatized spaces, service companies still do not use the potential of consumer neuroscience and aroma marketing to a sufficient degree. Innovative methods and tools, in particular, are still very underused.

**Keywords:** consumer neuroscience; neuromarketing tools; aroma marketing; human perception; services; aromatization impact; scents



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## 1. Introduction

The marketing industry, as well as other sectors, is increasingly facing the problem of visual and information overload. This has caused consumers to become increasingly resistant to traditional marketing actions, thus registering them in a state of so-called perceptual blindness [1–4]. Hence, it is becoming more difficult to attract customers at the point of sale, which is the last chance to potentially reverse a person's decision to purchase a product. This is the main reason why there is an increased interest in targeting several senses at the same time to affect shopping behavior. One option for marketers is to focus on smell as it has great potential in this field.

Traditional research tools, including questionnaires, tend not to provide enough relevant information, and those that have already been applied are no longer sufficient to determine the exact needs of consumers. This is due to several reasons, including, to a large extent, the hectic time we live in, since people in these surveys either do not have the time to think properly on what they are asked about, do not understand the question, simply do not want to answer truthfully, especially when it comes to sensitive questions, or their response is in accordance with what society expects [5]. These factors lead to the use of advanced methods which can detect active parts of the brain when monitoring stimuli, thereby determining what emotions are evoked in the consumer [6].

Compared to the aforementioned traditional research methods based on questionnaires and interviews, neuromarketing and consumer neuroscience research provides more accurate information about consumer perception [7]. It has also been proven to offer information on consumer preferences that cannot be obtained using conventional methods [8]. Consumer neuroscience is an interdisciplinary field that combines knowledge from various scientific disciplines while trying to study how the human brain responds to external marketing stimuli [9]. At the same time, the neuro-approach can help solve potential problems in businesses that were previously invisible or ignored due to limitations stemming from traditional approaches [10].

Consumer neuroscience tools applied in consumer surveys have helped gain new insight into different aspects of brand perception [11–15], product packaging [16,17], emotional response to advertisements [18,19], and new product development [8]. Last but not least, it has enabled to survey the impact of different aromas on affective and cognitive processes [20,21].

In the context of smell significance, another field in marketing is also becoming more important. This is known as aroma marketing, based on aromachology, which is a science that studies the psychological and physiological effects of inhaling aromas and examines, with the use of fragrance technology, feelings and emotions produced by scents stimulating olfactory pathways [22,23]. Aroma marketing refers to the usage of scents to set a mood, promote products, or position a brand. The main goal of aroma marketing is the creation of a pleasant atmosphere in order to encourage customers to stay in stores longer and, accordingly, buy more products and raise their final consumption [24].

Neuromarketing research is justified in the field of aromachology in the services segment. A pleasant atmosphere within the field of services, in a workplace, or in a public space can fundamentally affect the overall perception of people if impacted by a properly chosen aroma, which will ultimately affect the economic results. The question is how to choose the right aroma, as its effect is mainly unconscious. One of the options is the use of biometric and neuroimaging tools, which provide a more detailed view of human emotions under the influence of particular aromas. Thus, an aroma can be chosen that will positively contribute to improving the perception of the environment, not only of customers but also of employees.

## 2. Materials and Methods

It is an undeniable fact that consumer neuroscience has attracted the attention of academic researchers, as well as practitioners. Since it is quite a new topic in marketing (especially aroma marketing), there are currently only a limited number of studies in this field at present, while a considerable increase in their number is expected in the near future. Therefore, related studies were reviewed and are presented to gain an understanding of this phenomenon and its potential impacts.

The present work was carried out within the framework of the Erasmus + KA2 Strategic partnership project NEUROSARTOLOGY (no. 2018-1-SK01-KA203-046324), which aims to increase the amount of knowledge and information that is available in the scientific literature regarding aromachology, especially in relation to services, not retailing in general, where companies usually carry out private investigations and do not share the gathered findings with the public and/or the scientific community.

The research objective in the present study was to explore the potential application of consumer neuroscience in aroma marketing and the field of various service providers. The present study aimed to highlight potential new possibilities for monitoring the specific effect of aromas on human emotions by using consumer neuroscience tools. It is, thus, possible to make a more relevant aroma selection for the space in question and eliminate the risk of inappropriate selection.

For the study of the literature within the area of scientific interest, we chose the most frequently used scientific information databases and search engines globally, such as Google Scholar, SCOPUS, Web of Science, and ResearchGate. In deciding the selection

of keywords, we relied primarily on our previous experience and the area of research (see studies mentioned in Section 1). Since this review focuses on the application of aromachology in various segments of services, the main inclusion criteria were studies that presented experimental data on ambient scents of different service areas (HORECA segment, medical facilities, cultural facilities, financial institutions, travel agencies, and telecommunication companies) in relation to consumer behavior.

Thus, the initial search included more keywords (including “ambient scent”, “aroma marketing”, “aromachology”, “consumer behavior”, and the individual selected types of services) and their modifications in publication titles, abstracts, and keywords, which resulted in us finding several articles outside the main field of interest (e.g., within chemistry and medicine).

The next step was to define the criteria for which of inclusion of the available articles in the analysis. The inclusion criteria for the study were as follows:

1. Articles written in English;
2. Articles published since 2005 and before May 2021;
3. Articles from peer-reviewed scientific journals or conference proceedings;
4. Articles focused on the area of scent marketing in various segments of services;
5. Articles related to aroma and neuroscience;
6. Articles including experimental design;
7. Articles in short or full version (not only an editorial or abstract).

The articles found were then screened until the end of May 2021 in order to exclude those unsuitable regarding their topics and contents (not from the field of business, management, marketing, food sciences, and economics). Finally, from the 2360 results from different databases, 33 full-text articles were selected on the basis of the relevance of their data and findings to this study. Those selected articles were analyzed in depth including type of environment, laboratory or real conditions, tested scents, sample subjects, sample size, used methodology (traditional vs. neuromarketing research tools), measured parameters, and main findings. The contribution of this detailed analysis was to point out the currently used tools of consumer neuroscience in aromachology research in the various service segments and possible implications for further research.

### 3. Results and Discussion

#### 3.1. Potential of Consumer Neuroscience for Aroma Marketing

Consumer neuroscience combines knowledge from neuroscience, psychology, economics, and information technology and, using modern tools, investigates the emotions that influence consumer behaviour [25]. Neuromarketing examines the mind and brain of the consumer and can identify their needs and opinions about a particular company, advertisement, or product [6]. Therefore, “neuromarketing or consumer neuroscience can be understood as a subarea of neuroeconomics that addresses marketing-relevant problems with methods and insights from brain research. With the help of advanced techniques of neurology, which are applied in the field of consumer neuroscience, a more direct view into the “black box” of the organism should be feasible” [26]. However, consumer neuroscience should not be seen as a challenge to traditional consumer research; instead, it constitutes a beneficial complementary advancement for further investigation of specific decision-making behavior [26].

Accordingly, it is possible to divide the research tools and techniques of neuromarketing into two main categories (Table 1): biometric measurement (measuring the reactions of the body) and brain measurement (measuring the response of the brain) under the influence of aroma/marketing stimuli [27]. Each approach captures a different type of signal, and each brings a number of various advantages and disadvantages depending on the used measurement technique.

**Table 1.** Neuromarketing measures from the body and the brain.

Neuromarketing Measures			
Body Measures		Brain Measures	
Somatic (SNS) measures	Automatic (ANS) measures	Blood flow measures	Electrical measures
Facial expressions	Electrodermal activity (EDA)	Blood oxygenation (fMRI)	Electrical fields (EEG)
Facial muscle movements	Heart rate	Positron emissions (PET)	Magnetic fields (MEG)
Eye movements and fixations	Blood pressure	-	-
Eye blinks and the startle reflex	Respiration	-	-
Behavioral response times	Pupil dilation	-	-

There are many studies around the world that used neuroimaging and biometric methods to demonstrate the effect of odors on brain activity, which analyzed human response using the EEG signal [28] or the effect on emotions from a mood and physiology perspective [29–31]. In general, consumer neuroscience has helped gain new insights into consumer research by examining the effects of different aromas on affective and cognitive processes [20,21,32]. More detailed knowledge about brain processes influenced by scents was provided by a study [33] using functional magnetic resonance (fMRI). A prerequisite for applying consumer neuroscience in the selection of scents is that their influence is manifested mainly at the unconscious level. This statement was also confirmed by [34,35], which emphasized the fact that almost 75% of the feelings that occur during a day are regulated by scents. This assumption was surveyed in a study evaluating several floral, herbal, and fruity scents and their effect on emotions, which showed that the most popular scents were those that were the most pleasant [36]. There are several studies that used consumer neuroscience tools to demonstrate the effect of particular aromas. In an experiment [37], the effects of eucalyptus aroma, which is considered as an energizing one [38], and linalool, which is considered a sedative one [39,40] were tested. The aim was to find out whether it is possible to influence the attention of participants by simultaneously aromatizing the space with contrasting scents. Secondary outputs of the research were traditional data (potentials) related to the response to events and the strength of the oscillating activity of the brain. Another study [20] focused on surveying the emotions caused by odor stimuli and how odors play a role in evoking emotions in individuals with different olfactory abilities. Participants were presented with fragrances and then asked to identify them by choosing from five options, which included an “empty” option displayed on a computer screen. Their brain activity was monitored by EEG throughout the process. EEG uses electrodes applied to the upper part of the skull (scalp) and records a very low electric current from brain fields 2000 times per second, generated by the rapid movement of neurons due to nerve impulses [20,41,42]. In fact, it is a measurement of a very weak signal that permeates the skull and soft tissue to the surface of the head; however, the EEG can amplify this signal and filter out noise [43]. It is a dynamic test of frequency, which changes with brain maturation, alertness level, age, and drug use. EEG frequencies can be varied either diffusely or locally, by transient, fixed, or progressive change [44]. The results indicated that normal individuals do not pay as much attention to odor information unless specifically asked to do so. On the other hand, olfactory-sensitive individuals seem to implicitly pay a certain level of attention to odor information that evokes a natural state (passive odor). Another study [21] was focused on examining the effect of stimulation duration and time of response (TR) in the form of blood-oxygen-level-dependent imaging, or BOLD contrast imaging, in the activation pattern of four olfactory brain areas: the anterior and the posterior piriform cortex, the orbitofrontal cortex, and the insula. BOLD fMRI, which is dependent on neural activation in the olfactory cortex, has facilitated, in particular, the identification of cortical and subcortical structures of the brain involved in olfactory processing [45]. A time-course analysis of the activation of the general linear model (GLM) in these olfactory brain areas revealed that short TR is associated with a

more pronounced relative increase in signal compared to long TR. Long stimulation was associated with a longer time-to-peak signal and an oscillating BOLD response. Accordingly, the traditional GLM analysis confirmed that the combination of short stimulation and short TR can lead to visually more extensive activation in the olfactory cortex. The question whether masked body odors influence any decision-making role or whether their influence is specific to moral dilemmas was also researched in another experiment [46]. This one focused on examining how the emotional response is represented in the human brain during the cross-interaction between odors and trigeminal stimuli and whether the degree of agreement between the two types of stimuli affects these emotional responses and their neural processing. fMRI is a derived variant of MRI. Its concept is based on a conventional MRI scanner, but it also records two other phenomena—blood perfusion (flow) and oxygen supply [47]. This method is a popular tool of academic researchers, and it can currently be considered the most widespread in the research of cognitive functions, emotions, and personal qualities.

There are several studies in neuroscience focusing on the sense of smell and its direct connection to the limbic system and memory centers in the brain. An example is the phenomenon of Proustian memory [48]. The Proust phenomenon is the basis for the hypothesis that odor-evoked memories are more emotional than memories evoked by other stimuli. Currently, there is descriptive and laboratory-based support for this proposition. Descriptive autobiographical memory studies have shown that odor-evoked memories are highly emotional, as measured by both self-report and heightened heart rate responses [49–51]. Several cross-modal laboratory experiments have further demonstrated that memories associated with odors are more emotional than memories associated with cues perceived through other modalities (vision, tactile, and verbal) [52]. The sample size for such surveys ranges from 15 to 30 respondents. The effect of aromas was examined using electroencephalography (EEG) on a sample of 16 respondents in Croatia [53]. A commercial research agency in Slovakia monitored the effect of Christmas scents on consumer emotions in a sample of 20 respondents [54]. The European Society for Opinion and Marketing Research (ESOMAR) argues that most research agencies which use consumer neuroscience have much smaller samples of respondents than in traditional market research, with 15–30 respondents sufficient to achieve quality results [55].

In addition to the use of these technologies to determine the specific effect of scents on human brain activity, the selection of the right aroma for real-world use also comes to the fore. Marketers are increasingly using ambient scents as a strategic tool to differentiate themselves from the competitors, attract customers, stimulate sales, influence moods, and create an overall pleasant and unforgettable shopping experience [56]. Several aspects affect the consumer's decision making and choice, including mood or emotional state [57,58]. The role of emotions in the consumer decision-making process is explained by the principle of neurological and cognitive frameworks, such as the theory of somatic markers [59], which focuses on the so-called attention to the negative effects of decision making.

Proof of that is the application of consumer neuroscience tools in the food industry which has recently gained considerable popularity in academia and commerce. Large research companies such as Nielsen, Kantar, or Ipsos have included these tools in their commercial offerings [60]. Despite many critical aspects, such as questioning the privacy limit or the concept of free will, the incorporation of these technologies into consumer behavior and market research currently forms an essential part of understanding and meeting research goals [61].

The development of consumer neuroscience in food and retail also faces some concerns about the interpretation and findings of some commercial studies conducted so far [62], due to the fact that some companies even make controversial claims without evidence-based citations [63,64]. Thus, it should be noted that academic studies are based on strict protocols and adherence to methodological procedures [65], which allows for a new perspective on unconscious consumer perception. Nevertheless, there are some critical views on the existence of strong unconscious influences on decision making and related behavior [66].



Usually, traditional surveys are used for understanding the perception of aromas, but these approaches require larger samples of respondents to obtain reliable results and are based on the assumption that participants are able to express their preferences [67]. However, it should be highlighted that food stimuli can also affect preferences and eating habits on an unconscious level [68]; therefore, the use of neuroscientific methods has its justification in this area. Their main goal is to measure crucial aspects of consumer perception not only in the unconscious (attention, emotional response, and memory), but also in the declarative area (attitudes and preferences) [69,70], so that the findings can be applied in managerial decision making in the creation of effective sales strategies [60].

### 3.2. Importance of Aroma Marketing in Various Segments of Services

The current era is characterized by intensifying competition of individual business environments and entities. The acquisition and the maintenance of customers are becoming more challenging, not excluding the area of services. Therefore, in this marketing environment, new strategies and approaches have also been expanding, which focus on the use of various and innovative technologies to explore consumer behavior and the possibilities of its influencing. Therefore, in the service sector, communications focused on human senses and, in our case, especially on the sense of smell in the form of consumer neuroscience, are also of great importance, because they help to reveal consumer decision-making processes in their subconsciousness [71]. The intangible nature of services makes it significantly more difficult for customers to evaluate their offer before the actual consumption. According to Goldkuhl and Styvén [72], aroma marketing using scents and various innovative technologies offers an effective tool for increase the tangibility of services. Examining customer behavior is becoming more important and a frequent purpose of research and studies in every area of today's operations. It focuses mainly on the attractiveness of the premises in which customers move, as well as the attractiveness of the services provided to consumers. Therefore, much research is focused directly on the use of aroma marketing in services such as cafés or restaurants, hotels, travel agencies, transport, medical facilities, financial institutions, and many others, as well as on the effects of aromatization on customer behavior [25].

### 3.3. Gastro Sector

Specifically, we can look at the restaurant segment. There are many scents for this service industry that are suitable for application to a given space. These are mainly the aromas related to the dominant offered item. Thus, it is often a food aroma. When entering service areas (as well as other services), the first impression is particularly important, which decides whether customers will feel comfortable, which of course will affect their spending and possibly whether they will come back. According to many surveys of aromatization already carried out, we can observe that it is advantageous for gastronomic establishments to aromatize their premises, thus influencing their customers and increasing their spending, because various aromas (such as the smell of chocolate, fresh bread, or even beef and many others) also increase salivation and, thus, the overall appetite (see, for example [73]).

The important role that aroma marketing plays, especially in such facilities, is also the neutralization of negative odors. Another very important impact that the aromatization of services has, as demonstrated through realized research, is the visible positive economic effect. Furthermore, Errajaa et al. [74] claimed, according to their research focused on the gastro services and experiment realized in a French café, that, when the scent is perceived as congruent with the brand image, reactions in the store are more favorable. It is not only about the use of scent, but also whether it is congruent with the environment. However, the scent must be perceived by consumers as consistent with the brand image. This improves guest satisfaction, intention to revisit, and perceptions of the product and service. These findings highlight the importance for services to use scents to generate a positive impact on their guests. One of the studies important to us was carried out in Slovakia, which examined the effect of aromatization used in the SportPub restaurant in Brezno and the

effect of smell on consumer preferences when selling baked baguettes, i.e., paninis. Two different aromas were applied to the space—"chicken soup" and "crunchy bread". The results, after comparing sales in the period with and without aromatization, showed that the aromatization of the restaurant was beneficial. On average, more paninis were sold in the period with aroma [25]. Another experiment that was carried out, also using the innovative neuroscience technology (specifically, the FaceReader device), examined aromatization in the Sport Café in Nitra. The research consisted of testing in laboratory conditions, where a group of respondents—customers of a given café—were surveyed on the basis of conscious and unconscious feedback in choosing the appropriate aroma. The selected aroma was a coffee house. It was then tested in real conditions, implemented in the space of the café. The results of testing confirmed the assumption that the aromatization used in the selected café increased coffee sales. An increase of approximately 30% was observed during the testing period [5]. Further research focused on the effect of aromatization in the gastro segment was carried out in a pizzeria in Brittany, France. Two different aromas were dispersed in the restaurant environment in different places: lavender and lemon. The sales results from the aromatization period were compared with the sales results before the aromatization. They showed that the lavender aroma increased the length of stay of the customers and the amount of food they ordered. Lavender had a relaxing effect on people, which led them to stay in the aromatized area longer. In the pleasant relaxing atmosphere, customers ordered additional items and, thus, increased the final amount spent. However, in the case of lemon aroma, such an impact and increased sales were not demonstrated [75], which highlights the need to choose the appropriate aroma for scenting. Because, when the aroma and its intensity are not chosen correctly, such aromatization may have the opposite effect. A similar experiment was carried out in Maltese restaurants [76]. The objective was to assess if lavender and lemon scents impact the customer's dining experience in terms of money and length of time spent in mid-range restaurants in Malta. The experiment was conducted in three restaurants. However, their findings suggest that scents did not statistically impact the time and money spent in restaurants by consumers. Gaillet et al. [77] presented a study conducted in Dijon, France, where groups of participants were exposed to the scent of melon (as a typically entrée-related aroma in France) to the scent of pear (a typically dessert-related aroma). Both were presented at a very low and imperceptible level. They compared the impact of these scents to the experiment with no scent. The results showed that those who were exposed to the melon scent tended to choose more salads and less fatty entrées than those who were not exposed to this scent. Furthermore, those exposed to the pear aroma chose more fruit desserts than those in the no scent group [77]. Research about the impact of aromatization on customers was also carried out, for example, in the KFC fast food network in Mauritius. The campaign aimed at smelling their unique spice was realized. The restaurants delivered this aroma with food orders to companies at lunch time. The shipment contained chicken, byproduct, and biscuit. The intention was to release the aroma of fried chicken throughout the office and to evoke a taste for the food in busy research participants. According to the survey, 46.3% of participants felt excited about the aroma, 31.3% of participants felt very happy, 12.7% of participants felt nothing, and 9% felt relaxed [78,79], which points to the positive impact of aroma on customers. The study was based mainly on surveys conducted through questionnaires submitted to 133 random respondents—customers of KFC—to find out how sensory marketing affects the consumption level of rational individuals. The study confirmed that our five senses have a tremendous impact on how consumers purchase and experience products, services, and brands, as well as contribute to a company's strategic marketing. The result was that the smell of the restaurant motivated customers to choose the KFC restaurant without planning [80]. Another experiment was realized in restaurants in Sri Lanka. For the study, Randiwela and Alahakoon [81] chose the world-known restaurants McDonalds, KFC, and Manhattan Fish Market. Through the questionnaire, they collected data and realized a limited number of interviews to explore in-depth information. Data were collected from respondents (guests of the restaurants), as well as through several

in-depth interviews. Findings supported the assumption that sensory marketing has a strong impact on customers, whereby smell was one of the strongest factors. We can find many other experiments realized by sellers and various concerns with using the power of smell and scents which had a positive impact, mostly on sales. We can also mention, for example, the world-famous company focused on selling donuts (Dunkin' Donuts), the company focused primarily on selling coffee (Starbucks), the Cinnabon bakery network, the Subway or Burger King fast-food chains, and many others (see more in [71]).

### 3.4. *Traveling and Travel Agencies*

The transport industry is also making progress in finding new ways to increase the wellbeing and comfort of passengers, with the primary focus on increasing profits. One of the strategies that is increasingly used is aroma marketing. Whether the goal is to achieve customer loyalty or brand awareness, aromatization has proven to be beneficial. Today, it is also becoming a common strategy in this segment of services. Thanks to the right choice of aromatization, such companies can induce in passengers a pleasant feeling of traveling, as well as a feeling of luxury or a relaxing environment.

Travel agencies are also among the service sectors in which aroma marketing plays an important role. Until recently, they only used holiday catalogs, brochures, and pictures to attract customers and promote sales. At present, this area of services is increasingly using the potential of aromas, where it uses scent to try to induce in its customers a holiday feeling the moment they enter the office. Studies have shown that specially designed exotic scents directly evoke the right holiday atmosphere in potential customers in the travel agency, affect their time spent in the office, and affect their desire to book additional holidays and spend more money than originally planned (see more in [71]). In such operations, the smell of coconut, which evokes the atmosphere of an exotic holiday, the smell of orange, which is reminiscent of a holiday in the Mediterranean, or the smell of the sea breeze, which is associated, for example, with sea cruises, are used most often.

As an example, we can mention the use of aromatization within one of our experiments in the travel agency AVOCADO, whose space was aromatized with two selected scents—North Sea and apple. The results confirmed the positive impact of the effectiveness of aroma deployment on the customers and on the economic indicators of the agency, because, in the period of aromatization, there were obviously more sales than before and after the aromatization [71].

The senses are also widely used to attract tourists during traveling in various ways. For example, in Finland, research was conducted in buses and ferries carrying tourists. It was examined whether the senses, mainly smell, can raise the number of sold trips. In buses, pinewood resin was disseminated via a scent machine. Sales increased during this period by 51%. Multiple sensory studies were conducted; however, smell was found to strongly affect sales. In ferry, scents and sounds were applied. The scent used was fresh linen. However, in this study, the scent stimulus did not affect visitor perception. The reason may have been the bad position of the scent machine, which was placed in the corner of the ferry [82].

Another study focused on aroma marketing in the field of tourist services. The study [83] identified the forms and ways of influencing people's senses in the process of selling consumer goods, providing some examples from this sector of services. The popularity of using sensory marketing was also mentioned in Luxurious cruise ships, for example, the Voyager of the Seas operated by Royal Caribbean International, which uses numerous multisensory facilities for the guests. There is a large casino, theater, basketball field, golf course, rock-climbing wall, ice-skating rink, and numerous themed restaurants including an Italian-style Portofino, which evokes the atmosphere of restaurants from the 1960s where the managers try to stun all human senses, whereby smell is a highly effective one. This is very beneficial for the company.



Public transport is also increasingly being aromatized by individual companies to attract more passengers and increase their turnover. Quite large field experiments in this area were done by Girard et al. [84] on railways to examine the effect of aroma on customers. The researchers examined the short-term and long-term effects of ambient scents. The experiments were conducted in collaboration with a major German railway company, in which consumers were exposed to a pleasant, nonconscious processed scent. The results demonstrated the scent effectiveness in the specific service context of train journeys in an olfactory-rich environment. The second experiment lasted for 4 months, whereby regular commuters were examined. This experiment confirmed the positive ambient scent effect. Other consumers were then surveyed in unscented conditions, and this brought about a surprising result, as the effects persisted even when the scent was removed from the services cap.

We can also mention the Paris metro as one of the first forms of public transport to scent its vehicles in 1959, using clove flowers. During the last few decades, it faced quite a large problem due to a very unpleasant scent. Therefore, in 1998, it started another campaign to become the sweetest scented metro. Not every customer liked it, but it was better than the smell globally associated with Paris metro. Accordingly, we can also mention the Metro in Madrid, which has realized several marketing campaigns focused on smell and has implemented scent into its coaches. These campaigns were successful and popular (see more in [71]).

### 3.5. Telecommunication Companies and IT Industry

Using aroma in the marketing service industry strives to create unique aromas that connect customers directly with their services and brands, with the same main goal as in other segments—to increase turnover and profit. Visiting such spaces is often associated with solving some problems. Therefore, it is necessary to pay attention to the appropriate aroma and its intensity, which can have a significant positive effect on the customer. It can calm them in communication, while it can also have a relaxing effect when waiting in line for a long time; it can increase brand confidence and increase brand awareness, as well as awareness of new products or services, which in turn brings the company's campaigns into a new dimension and makes it easier for customers to remember and identify the brand (see also [85]). For example, the largest telecommunication companies in Slovakia also aromatize their spaces—Telekom and Orange—with the intention of keeping customers in the store for as long as possible, evoking a positive and friendly feeling, making their time in stores more pleasant, encouraging them to buy and spend more, and influencing their emotions and shopping behavior.

An interesting study was focused on challenging the measurement of the effectiveness of scent marketing when applied to products and services that have low olfactory affinity. Findings from the research stemmed from two studies; the first revealed that 17% (after 6 weeks) and 6% (after 12 weeks) of participants recognized a past administered scent (orange scent). Even more interesting was, however, the second study, where ATMs were scented with a sweet orange scent. This study showed that 15% of the interviewees detected the scent flow around the machine at the time of exposure despite significant environmental disturbances (nearby bakery, wintertime face masks). None of the interviewees felt uncomfortable toward the scent, and nearly half of them supported the “scented ATM”. The result was that scent can foster customers to create positive attitudes and positively impact purchase intention toward products and services, even in the absence of scent affinity [86].

A relatively unusual sector where aroma marketing also has importance is the IT segment, as discussed by Gosain and Mohit [87]. They presented various dimensions of olfaction in the IT industry, focusing on ongoing research. They showed that smell is somehow used in connection with computers. There has also been some work on smell in virtual reality, albeit to a lesser extent. However, this is quite an underestimated area with

great potential. The researchers also perceive the usage of aroma in the field of fire fighter training, where smell gives valuable and potentially life-saving information.

As presented above, telecommunication industries have also found the value of aroma. For this industry, smell has been successfully introduced as a new sensory modality for interactions between human and mobile devices. The first smelling mobile phones were placed on the market in 2008; Sony Ericsson SO701i was scented with an aromatherapy fragrance to support relaxation during phone calls. German inventors later patented a mobile phone with a smell chip, which allows sending and receiving smell messages [87]. Scent has also been integrated into TV screens, which waft smells from a spot on the display when corresponding objects appear. The smell-o-system is used here. However, the authors believe that there is a notable absence of the use of smell in the ambient media literature, which they feel is strange, given that smell is such a perfect ambient medium; it can move easily from our periphery to the center of attention and back out again [87].

### *3.6. Aromatization in Medical Facilities*

Aromatization of space is also widely used in medical facilities of various types, from hospitals to dispensaries and different places providing healthcare. The sterile scent typical of these facilities can be replaced by something more pleasant to distract patients from their health problems, make it more bearable for them to wait before an examination, or calm them down before the procedure itself. Proof was shown, for example, in the study by Lehrner et al. [88], conducted in a dentist's waiting room, which confirmed that patients exposed to the scent (orange or lavender) had lower levels of anxiety, were in a better mood, and were generally calmer. From the methodological point of view, only classical feedback in the form of a self-assessment questionnaire with the Likert scale was used to assess the emotional states researched. Further evidence of the use and impact of aromatization in medical settings was provided in the study by Naja, Bree, and Zaichowsky [89], which focused on whether scents and aroma can influence evaluations of a service experience and perceptions of personal wellness. The testing took place in the hospital's pediatric ward, examining three situations: odorless, with a relaxing scent (exotic fruit), and with a stimulating scent (citrus fruit). From the research methods, traditional methods were used, such as in-depth interviews conducted directly with hospitalized children, with their parents, or with medical staff, along with added insight from observing children in contact with nurses or other patients. Although the study confirmed the importance of aromatizing such spaces, the authors indicated the need for further research in this area due to the current study's limitations, either due to sample size or the possible influence of other factors on the variables studied. Another study was performed in the waiting room environment of a plastic surgeon [90]. The subject of their research was the influence of ambient scent or aroma (lavender) and music (instrumental music) on patient anxiety, evaluation of the waiting environment, and perceived waiting time. From a methodological point of view, patients evaluated the monitored indicators only through a questionnaire. This study concluded that both scent or aroma and music effectively reduce patient anxiety, but only if used separately. When both are active, it is necessary to carefully consider the possible interactions.

### *3.7. Aromatization in Cultural Facilities*

Cinemas, theaters, museums, galleries, casinos, or any other spaces intended for cultural, entertainment, or leisure activities can also be classified as spaces where the use of aroma is essential. The goals of aroma marketing can be different in these cases, depending on the focus of the operation, from eliminating unwanted odors, making the time spent in the facility more pleasant, or enhancing the experience to increasing sales of additional goods, extending time spent in a particular space, and increasing the intention to return. The number of such oriented scientific studies is still relatively low. An example is, e.g., the study [91] carried out in the actual conditions of the González Santana Museum on a sample of 234 visitors, where three different aromas were used: the scent of clean clothes,

apple pie, and aftershave. From a methodological point of view, feedback from visitors was collected only at a conscious level through questionnaires using a five-point Likert scale. The study results showed that scent has a significant effect on the perception, evaluation, and the repeated intention to visit the museum. A considerable benefit of this study is in its implementation in the natural conditions of the museum and in offering opportunities for managers of art institutions to differentiate their offer and build the image of their facilities. A similar study [92] was performed in a gallery, even though it was only a virtual exhibition in laboratory conditions. Their study researched the effect of the scent of the environment on the perception of valence, excitement, and memorization of works of art. A total of 86 participants evaluated a series of paintings by two artists while being present in an environment flavored with two scents—citrus and talc. The study confirmed that a pleasant aroma could significantly affect the evaluation and memorization of works of art. However, the research had its limitations, in the form of simulated conditions of a virtual exhibition, testing only two scents, focusing on images by two authors, and testing the scent without interacting with other senses, which opens up opportunities for further research. Another valuable study in natural conditions, this time in a cinema complex, was carried out in Lisbon, Portugal [93]. A sample of 407 spectators aged 14–81 participated in the experiment under aromatization conditions and without any. The findings showed that smell causes significant positive differences in cinema's evaluation, environment, and intention to return. From a methodological perspective, only classical feedback was collected from the participants at a conscious level. Other limitations of the research due to the realization of the study in the natural environment included an unrepresentative sample, as the participants of the experiment were a voluntary audience, and the inability to control all exogenous variables. Another con of the study was the failure to research the effect of scent in combination with other stimuli (music, lighting, colors, etc.) which could be the subject of further research in the future, as consumers perceive their surroundings as a whole. However, despite all the limitations, the study can be considered very beneficial. Another interesting study [94] was carried out in the environment of an aromatized cinema. They tested the effects of olfactory and visual stimuli on remembering information in cinema advertising. A combination of rose and sandalwood scents was chosen for the flavoring following a preselection. Because previous research has suggested that there may be gender differences in fragrance preferences, only 100 women took part in the survey. They found that, while both image and scent improved brand ranking and overall ad memory, they found that scent generated even more positive brand feelings. However, to verify these conclusions, further research will be needed in natural conditions, as this study was conducted in simulated conditions, although it tried to keep a high degree of realism, e.g., by dimming the room. How scents or smells can affect the audience's experience was also the focus of Spence [95] within his research. He claimed that, although the goal of aroma marketing was initially to eliminate unpleasant odors from the audience itself, there has recently been a growing interest in aromatization to make the experience of the performance more enjoyable. Experiential multisensory events are also becoming a trend [96]. In conclusion, we state that the study of aroma marketing in this segment of services has its justification and future.

### 3.8. Aromatization in Hotels

The intensely competitive environment in the hotel industry or the HORECA segment leads to a constant search for ways to become unique and differentiate oneself from the competition. One of them is sensory marketing, which can get into customers' hearts, minds, and wallets using all five human senses [97]. A pleasant atmosphere is what every successful hotel, guesthouse, restaurant, café, or pastry shop is built on. In a hotel environment, aroma marketing can create an impressive welcome effect, eliminate unpleasant odors, e.g., around the toilets, or create an olfactory logo characteristic only for the hotel, which guests will remember, making them happy to return to the hotel. Smell or aroma has long been neglected in the hotel industry, but today's hoteliers are aware that scents

can enhance guest experience or increase the perceived level of service. The choice of a suitable scent for a hotel depends on the focus of the hotel. For example, business hotels are likely to choose universally acceptable scents that create the impression of sophistication, whereas modern hotels will choose a fresh or floral scent. The most frequently flavored areas of hotels include entrance halls, corridors, elevators, and other public areas [98]. This is why most hotel research was carried out in public spaces; however, there was insufficient evidence of the effects of introducing fragrances in private hotel areas such as guest rooms. The study [99] carried out in a four-star hotel in Barcelona aimed to analyze the effect of the scent used in the hotel room on customers' emotions. The authors chose lavender as the scent of the environment for the experiment because it is considered one of the most pleasant scents for humans. In addition, one of the significant benefits of this study lies in the methodological apparatus used, as emotional valence was measured using the FaceReader technology and was not only based on directly asking respondents through questionnaires. This study suggested that the introduction of fragrance into a hotel room can evoke positive emotions in customers. Individuals who experienced a flavored room showed a higher intensity of happiness and emotional valence than individuals who experienced a room without smell or aroma. The author of another study [100] believed that scent can evoke an immediate emotional reaction in hotel guests. He carried out his experiment on a sample of 200 guests at the ITC Sonar Hotel in Kolkata, although he collected feedback only using a classic questionnaire. ITC Sonar operates a whole network of luxury hotels in Kolkata, with its olfactory brand evoking a feeling of luxury. The refreshing scent of white tea welcomes guests as soon as they enter the hotel and contributes to building customer loyalty to the brand itself. The experiment results confirmed that, thanks to the scent, guests felt more relaxed and more pleasant, with more than 85% of customers also expressing their intention to visit the hotel repeatedly. Another study [101] was realized in a hotel in Hong Kong, which also flavors only the entrance public spaces and the reception with a specially created scent, a combination of ginger flower, lily, tuberose, lemongrass, and vanilla. The purpose of their research was to uniformly research the emotional states of guests evoked by the hotel's scent, using a questionnaire technique with a versatile range of scents to measure feelings. The results showed that happiness, pleasure, and sensuality can be included among the most dominant emotions that the scent evoked in the guests. A deeper analysis confirmed that these positive emotions are also associated with motivation to revisit the hotel, overall satisfaction with staying at the hotel, a feeling of loyalty to the brand, or a willingness to buy a scent for home or office.

### *3.9. Aromatization in Financial Services*

Aroma marketing has a specific meaning for financial institutions as well. Banks, insurance companies, leasing companies, or other financial service providers can provide a pleasant scent, e.g., entry welcoming effect, making long queues more pleasant for clients, freeing them from unpleasant duties, or creating a trustworthy and safe atmosphere. Financial services were the subject of a study by [102] who focused on the influence of scent and music. A properly chosen musical background also makes the environment more pleasant and contributes to maintaining a discreet atmosphere. According to the available literature and sources, the authors found fast contemporary music to be the most suitable for testing, along with the scent of lavender mixed with wormwood and nutmeg, as it alleviates anger. Feedback from 607 experiment subjects was obtained via a questionnaire distributed while waiting in line at customer centers during peak hours. The research confirmed that a long wait for the service evoked negative emotions in the clients, which was subsequently reflected in the negative evaluation of the services. Although music had a more significant positive effect on customer reactions in this study, the main advantage of scent is that it is not annoying. In the future, however, the authors suggested testing different musical styles or different intensities of scent. The mentioned study proves that even institutions, in which the visit is not pleasant or expected to be the most pleasant, can

be turned into places with a pleasant atmosphere through the correct use of marketing communication tools.

In addition to the mentioned service segments (Table 2), aroma marketing can be applied elsewhere. We did not mention energy service providers, centers for the elderly, entertainment centers, fitness centers, car shops, fashion boutiques, administrative centers, etc. It is possible to create the desired atmosphere and influence consumer behavior almost anywhere; therefore, its further investigation is justified.

**Table 2.** Studies related to aroma marketing in various segments of services.

Authors/Year	Environment	Scent	Research Techniques	Subjects	Measures
Errajaa et al. (2020)	Restaurants, cafés, hotels	Congruent scent	Traditional	Not reported	Guest satisfaction—brand image
Girard et al. (2019)	Railways	Pleasant ambient scent	Traditional	330 customers—pre-test; 204 customers—1. experiment test and 100 + 74 customers 2. Experiment	Ambient scents' positive long-term and aftereffects on consumers' situational service perception through the survey
Berčík et al. (2016)	Restaurant	Crunchy bread, chicken soup	Traditional	Not reported	Increase in sales of paninis was examined
Spence (2015)	Restaurant/food and beverage sector	Appropriate product aromas	Traditional	Many experiments analyzed	Examining of the various fields of this segment
Kumamoto and Tedjakusuma (2013)	Business	Orange scent	Traditional	2 studies—45 surveyed students, 69 interviewed shoppers	The feasibility of scent as an effective promotional tool for business
Goldkuhl and Styvén (2007)	Services	Not reported	Not reported	Not reported	Examining various fields of this segment
Berčík et al. (2020)	Services	Coffee house	Neuroscience	8 respondents in laboratory and 50 respondents in café	Examining various fields of this segment and the economic impact
Berčík et al. (2020)	Services	Not reported	Traditional	-	Examining various fields of this segment and the economic impact
Randiwela and Alahakoon (2016)	Restaurants	Food aromas	Traditional	Survey—300 respondents and several in-depth interviews	Surveys to examine the impact of sensory marketing elements on perceived quality and brand loyalty in restaurants
Randhir et al. (2016)	Restaurants	KFC food aroma	Traditional	133 respondents	Survey—impact of scent on customers
Hussain (2018)	Fast-food restaurants	Restaurant food aromas	Traditional	300 respondents	Survey—impact of aromas on customers
Hussain and Azeem (2019)	Restaurants	Restaurant food aromas	Traditional	1600 respondents	Survey—impact of aromas on customers—spent time and higher consumption
Camilleri and Mizzi (2020)	Restaurants	Lavender and citrus aromas	Traditional	Observation of customers	Scents' impact on a customer's dining experience in terms of money and length of time spent in mid-range restaurants in Malta
Guéguen and Petr (2005)	Restaurants	Lavender and lemon aromas	Traditional	Observation of customers	Scents' impact on a customer's dining experience in terms of money and length of time spent



Table 2. Cont.

Authors/Year	Environment	Scent	Research Techniques	Subjects	Measures
Isacson, Alakoski and Bäck (2009)	Tourism	Pinewood resin scent, fresh linen	Traditional	Did not report the exact number of respondents	Exploring the effects of ambient scent in combination with film and sound on sales of excursions
Kuczamer-Kłopotowska (2017)	Tourism	Not reported	Not reported	Not reported	Positive impact of smell and other senses onto the customers
Gosain and Sajwan (2014)	IT industry	Not reported	Not reported	Not reported	Positive usage of the scent in various spheres of the IT industry—digitalization of the smell
Darabi and Mirabi (2018)	Mobile industry	Natural scent	Traditional	150 clients of one of the customer service offices of the mobile operators	The effect of the ambient scent on feelings of comfort, perception of waiting time, loyalty, and charming sensation
Proserpio (2017)	Restaurants	Beef, chocolate, melon, cucumber	Traditional	87 female participants	Investigating food intake, saliva production, and appetite in response to ambient odor
Gaillet et al. (2013)	Restaurants	Melon, pear	Traditional	Two experiments—58 + 70 participants	Examining whether an olfactory food cue could have an impact on food choices
Lehrner et al. (2005)	Dental office	Orange, lavender	Traditional	200 respondents (18–77 years)	Examining whether ambient odors could reduce anxiety and improve mood in patients waiting for dental treatment
Naja, Bree and Zaichowsky (2012)	Pediatric department	Exotic fruit, citrus fruit	Traditional	61 participants (children 8–12 years + parents + staff)	Investigating evaluations of a service experience and perceptions of personal wellness in response to ambient odor
Fenko and Looock (2014)	Plastic surgeon	Lavender	Traditional	117 participants (14–88 years)	The effect of the ambient scent on patient's anxiety, evaluation of the waiting environment, and perceived waiting time
Cirrincone, Estes and Caru (2014)	Virtual exhibition	Talcum, citrus	Traditional	86 participants	Investigating perceived valence, arousal, and remembering of artworks in response to ambient odor
Vega-Gómez et al. (2020)	Museum	Clean clothes scent, scent of apple pie, scent of aftershave	Traditional	234 participants	Investigating influence of scent on perceptions and evaluations, as well as on the intentions to revisit the institution
Verissimo and Pereira (2013)	Cinema complex	Not reported	Traditional	407 participants (14–81 years)	Examining whether scent could produce positive differences in the evaluation of the theater, its environment, and intention to return
Lwin and Morrin (2012)	Simulated movie theater setting	Rose/sandalwood	Traditional	100 female participants	Effects of multisensory cues on brand evaluation and advertising recall

Table 2. Cont.

Authors/Year	Environment	Scent	Research Techniques	Subjects	Measures
Anguera-Torrell et al. (2021)	Hotels' private areas	Lavender	Neuroscience	99 participants	Examining whether ambient scent in a hotel guest room can elicit positive emotions in customers
Chatterjee (2015)	Hotel	White tea	Traditional	230 participants	Investigating influence of scent on attention, experience, and revisiting intention
Denizci Guillet, Kozak and Kucukusta (2019)	Hotel	Combination of ginger flower, peace lily, tuberose, lemongrass, vanilla	Traditional	326 participants	Scents' impact on guests' emotional states
Ali and Ahmed (2019)	Hotel	Not reported	Traditional	400 respondents	The effect of sensory marketing on hotel market share
McDonnell (2007)	Financial services	Lavender, blended with sagebrush and nutmeg	Traditional	607 participants	Examining whether music and scent could increase customer satisfaction among customers kept waiting in a line and reduce queue rage
Yao, Song and Vink (2021)	Aircraft cabin	Lavender, cedar, mandarin	Traditional	276 university students	The effect of scent on the perceived comfort of an environment

We can summarize that the use of aromachology in the service segment has gained significant importance in recent years and has, therefore, been the subject of several scientific studies.

There is substantial research available directly focused on aroma marketing in services such as cafés or restaurants, hotels, medical facilities, financial institutions, cultural facilities, and many more. Table 2 summarizes all 33 studies described by us considering selected indicators (place of experiment, type of aroma used, size of the researched sample of respondents, and researched variables). According to the available resources, we conclude that aromachology is probably the most widely used in the HORECA segment's services [5,25,73–81,97,99–101].

We have described the options of using and researching aromachology in the selected types of services above. Therefore, we conclude that the studies were aimed at researching the impact of aroma in the service segment on selected variables such as customer satisfaction, evaluation of the service, attention, experience, revising intention, and emotional states. Some studies also researched the economic impact of aromatization [5,25,75,76].

The sample size of respondents in individual surveys varied diametrically from tens of respondents [5,73,77,86,89,92,99] to hundreds of respondents [78–81,88,90,91,93,94,97,100–102]. The limitation of certain studies was the omission of these data [72,82,87], the selection of respondents, e.g., involving only women in the survey [73,94], or carrying out the survey on a sample of students [86,103]. Another limitation of several types of research was their implementation only in simulated conditions [92,94,103].

The research of customer behavior due to aroma was, in most cases, researched through explicit feedback through questionnaires [88,90,91,100], in-depth interviews [81,89], or observations [75,76,89]. The use of innovative technologies to research the effect of aroma on consumers' emotions or consumer behavior was relatively limited in particular studies. The benefit of only two up-to-date studies [5,99] was the methodological apparatus used, as emotional valence was measured using the FaceReader technology. Because odors

and fragrances have mainly a subconscious effect, we see huge potential in extending explicit testing to implicit feedback research using biometric and neuroimaging tools in consumer neuroscience. In addition to monitoring the effects of aromatization, qualitative air conditions should also be of interest, as they were also taken into account in only a limited number of research studies [5,25].

#### 4. Conclusions

Despite the fact that the relative importance of smell within the human senses is 3.5% [104], it has great importance in marketing. The marketing industry, as well as other sectors, is increasingly confronted with the problem of visual and information overload. This has caused consumers to become increasingly immune to traditional marketing activities and, thus, they register them in a state of so-called perceptual blindness [1–4]. Hence, it is becoming more difficult to attract the customer at the point of sale, which is the last chance to potentially reverse a person's decision to purchase a product. This is the main reason why there is increased interest in influencing several senses at the same time, which could guide shopping behavior. One option is for marketers to focus on the use of smell.

While all other sensory systems represent a long way of transmitting information to the brain, including the transfer and transmission of information, the sense of smell is directly connected to the centers of the brain responsible for emotions and memory. Smell is the most sensitive sense of the human body. Similarly to taste, it uses chemoreceptors to detect the signal, with which we constantly monitor our surroundings.

There are only a limited number of studies in the field of service providers that used neuroscience tools to examine the effect of aromachology on human emotions. Methodological procedures varied widely between each study, making it difficult to compare and extrapolate them. Explicit forms of obtaining feedback through a questionnaire or an in-depth interview were used most commonly. Very often, an olfactometer device was used, which enabled a subjective evaluation of the pleasantness or unpleasantness of odor perception, most often in laboratory conditions. Due to the fact that fragrant compounds and odors mainly have a subconscious effect, it is necessary to extend the methodological apparatus to implicit research using the tools of consumer neuroscience.

In this context, subconscious measurement can be performed using a device that monitors electrical brain activity, e.g., an electroencephalograph, similar to the one used in medicine, but a mobile version. These measurements can also be extended by a biometric method for measuring galvanic skin response (GSR). A less complicated device is for the observation of facial expressions and dilation of eye pupils, where the recorded face video is analyzed by a special software (FaceReader).

Furthermore, new technologies for gaining unconscious feedback are emerging, which work with anonymized data and can monitor the emotional index of a given space through special cameras. The device captures people's emotions when entering and exiting a given space, thus being able to record changes in the feelings of customers or clients. Simultaneously, it can identify whether this change occurred in a positive, neutral, or negative direction. The development of the emotional index can be monitored over time, e.g., at hourly, daily, and monthly intervals.

Given the findings, there is a clear need for research in aromachology in the field of services, not only with the use of consumer neuroscience tools, but also their implementation under real conditions, since environmental factors such as air quality can fundamentally affect overall consumer perception.

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