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## Faculteit Bedrijfseconomische Wetenschappen

master handelsingenieur in de beleidsinformatica

### ***Masterthesis***

***From Text to Insights: Reviewers Perceptions of Conservation, Education and Entertainment Values of Conservation Institutions***

**Bram Laczewny**

Scriptie ingediend tot het behalen van de graad van master handelsingenieur in de beleidsinformatica

### **PROMOTOR :**

Prof. dr. Stephan BRUNS

### **BEGELEIDER :**

De heer Tuan NGUYEN



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This master's thesis, titled "From Text to Insights: Reviewers' Perceptions of Conservation, Education and Entertainment Values of Conservation Institutions", marks the final step in my Master of Business and Information Systems Engineering at Hasselt University.

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# From Text to Insights: Reviewers' Perceptions of Conservation, Education and Entertainment Values of Conservation Institutions

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## Abstract

This thesis analyzes TripAdvisor reviews of conservation institutions to identify key themes and associated sentiments related to conservation, education and entertainment. Sentiment analysis, topic modeling, and keyword extraction, along with lexicon-based categorization, were used to extract insights from reviews of Pairi Daiza, Meise Botanical Garden and Sea Life Blankenberge. Across all venues, entertainment emerged as the dominant theme, comprising over 60% of the reviews. Differences emerged in thematic emphasis: Pairi Daiza reviews focused on immersive experiences and park design, Meise reviews emphasized peaceful walks and natural beauty, and Sea Life reviews centered on short visits with children. However, while overall sentiment toward entertainment was fairly positive, it was more polarized compared to education and conservation. A significant portion of criticism targeted cost, crowding, and value for money, especially at Pairi Daiza and Sea Life Blankenberge, which contributed to lowering overall sentiment. Motivations related to conservation and education are less emphasized, but often show more positive sentiment. Pairi Daiza had the strongest conservation-related mentions, often linked to enclosure quality and animal care, while Meise Botanical Garden featured limited educational content, mainly related to plant signage and exhibitions. However, they were typically embedded within broader entertainment narratives. Sea Life Blankenberge showed some conservation and educational engagement, but these were overshadowed by concerns about park size and cost, partly explaining the lower overall sentiment at the institution. These findings confirm prior research on visitor motivations but also reveal that even when visitors engage with conservation and education, they do so primarily through the lens of entertainment. This thesis highlights the importance of mining unsolicited feedback from visitors to uncover how thematic focuses influence perceptions. It also provides a replicable method for institutions to assess and improve the balance among entertainment, education, and conservation in their programs. Future research with larger samples in more institutions is needed to confirm these results further.

**Keywords:** *Sentiment analysis; Topic modeling; Conservation institutions; Visitor motivations; TripAdvisor reviews*

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# 1 Introduction

The emergence of Web 2.0 enabled online user interaction and collaboration, leading to increased user-generated content (UGC) which is defined as content created by the general public rather than paid professionals and is primarily shared online (Bahtar & Muda, 2016; Kirilenko et al., 2018; Nguyen & Tong, 2023; Sun et al., 2024). Online reviews - one of the most prevalent forms of UGC - have a remarkable influence on consumer behavior (Kirilenko et al., 2018; Sun et al., 2024). Nguyen & Tong (2023) stated that the application of UGC reshapes both how travelers seek information and how they plan their trips.

In the tourism domain, TripAdvisor has emerged as a dominant platform for UGC. Tourists increasingly depend on reviews rather than advertisements or travel guides (Guerreiro & Rita, 2020; Sun et al., 2024). They gather information and share their experiences on these platforms (Manosso & Domareski Ruiz, 2021; Zakarija et al., 2024). Moreover, research outlined that people are remarkably influenced by online reviews, even in their travel planning and decision-making (Chu et al., 2022; Lee, 2006; Zeng & Gerritsen, 2014).

Hence, reviews on TripAdvisor offer relevant information on the different destinations (Sun et al., 2024). Being capable of collecting insights from these reviews is critical given its importance in management decision-making (Kirilenko et al., 2018). In particular, conservation institutions such as zoos, aquariums, and botanical gardens can leverage these insights as they increasingly strive to balance conservation, education, and entertainment (Azevedo et al., 2011; Gusset & Dick, 2011; Huang et al., 2019; Hutchins et al., 2018). Over the past decades, zoological facilities—zoos and aquariums (hereafter zoos)—have shifted their focus from recreation and entertainment to conservation-based education and conservation, evolving into organizations that now focus on conservation, animal welfare, education and social interaction over solely providing entertainment (Baltantyne et al., 2021; Huang et al., 2019; A. Moss & Esson, 2010; Nygren & Ojalammi, 2017; Scalfi et al., 2022; Schilbert & Scheersoi, 2023; Villarroya et al., 2024).

According to Escribano et al. (2021), zoos are increasingly being seen as institutions supporting conservation and education. This is also acknowledged by Hutchins et al. (2018), who state one of the primary roles of zoos is to educate visitors on various aspects of wildlife, including their biology, behavior, habitats and conservation status. On top of that, Mellish et al. (2021) highlight the increasing employment of educational approaches and communication strategies to promote conservation.



Nygren & Ojalampi (2017) further note that zoos address, in fact, four functions: the conservation of species, entertainment, environmental education and research, even though balancing those four roles is complex as zoos heavily depend on the entrance fees of visitors primarily seeking entertainment.

In addition to zoos, there are also botanical gardens, which, according to Botanic Gardens Conservation International (BGCI), can be described as facilities that maintain recorded collections of living plants for scientific study, conservation, exhibition and education (Botanic Gardens Conservation International, 2025). Focused initially on these functions, Hermann & Bouwer (2023) and Wassenberg et al. (2015) state these gardens have since developed their role to include recreation, offering visitor services such as playgrounds, restaurants or guided tours to satisfy a range of visitor needs since their motivations are often recreation-related.

Furthermore, G. Chen & Sun (2018) state that the primary focus of botanical gardens is the collection of living plants, conserving plants and preserving species crucial for human use, while also emphasizing education and entertainment. Acheampong et al. (2021), Heywood et al. (2017) and Mounce et al. (2017) also emphasize the fact that these gardens are mainly occupied with the conservation of their botanical resources.

Despite this evolving mission, these are not the main drivers for zoo visitors (Huang et al., 2019). Even though zoos offer educational programs and are increasingly dedicating resources to educating the public about conservation, visitors have a variety of drivers for a zoo visit as numerous factors shape their motivations and experiences. According to the literature, visitors are mainly attracted by the opportunities to socialize, view animals and be entertained (Collins et al., 2020; Huang et al., 2019; Knežević, 2016; Nygren & Ojalampi, 2017; Scalfi et al., 2022). Additionally, the desire to see animals that people may not normally see is still a major incentive. Also, visitor interest is greatly influenced by species size, activity and proximity (A. Moss & Esson, 2010).

With regard to visitor motivations for botanical gardens, multiple papers identified escape, relaxation and education as important drivers (Hermann & Bouwer, 2023; Phau et al., 2013; Wassenberg et al., 2015; Wiegand et al., 2013). Furthermore, stress relief, meaningful shared experiences with loved ones and mental health benefits are being mentioned as primary motivations in the research of Wassenberg et al. (2015). Besides, Hermann & Bouwer (2023) and Phau et al. (2013) discussed multiple factors that motivate visitors which include escape, relaxation, nature experience/appreciation, education, social contact and conservation. Botanical gardens provide more extensive societal functions in addition to the above-mentioned individual advantages: functioning

as ecotourism venues, supporting conservation by protecting local species and cultural heritage (Phau et al., 2013).

The shifting institutional role of zoological and botanical facilities, on the one hand, and the given visitor motivations, on the other hand, indicate a misalignment. Given the growth in popularity of travel platforms and the increased importance visitors attach to information shared on them, these might be valuable sources of information that these organizations can leverage to extract and examine important, previously undisclosed information from unstructured data (Kiliç & Çadirci, 2022; Kirilenko et al., 2018; Sun et al., 2024; Zeng & Gerritsen, 2014). That way, these organizations could have a better understanding of their customers' perceptions, the alignment of the mission and the public's perceptions and where they could improve (Annisa et al., 2019; Kiliç & Çadirci, 2022). Although the vast number of textual reviews makes manual analysis impractical and inefficient, there has been an increase in research utilizing natural language processing (NLP) and text mining techniques to analyze this data effectively (Nawawi et al., 2024; Sun et al., 2024).

Despite the advancements of these techniques and the potential to extract valuable insights from these growing social media platforms, there is very little research focusing on gaining insights from these platforms with regard to reviews of zoos, aquariums or botanical gardens. Research papers examining visitor perceptions in conservation institutions typically rely on surveys, interviews, or observational methods rather than online reviews, for instance, the study of Moss et al. (2019), which combined an observational study with a survey. But, up until now, research has rarely focused on the analysis of online reviews. This thesis aims to address this research gap by analyzing TripAdvisor reviews of Pairi Daiza, Meise Botanical Garden, and Sea Life Blankenberge. Using sentiment analysis, word frequency analysis, and topic modeling, The thesis will explore the insights that TripAdvisor reviews provide regarding the motivations of visitors to Pairi Daiza, Meise Botanical Garden, and Sea Life Blankenberge in terms of conservation, education, and entertainment. To determine this, this thesis will examine the main review topics for each organization, the sentiments associated with these topics, and the similarities and differences in visitor perceptions across the three institutions.

The remainder of this paper is structured as follows. Section 2 covers the methodology that was followed during this thesis. In section 3, the results will be presented, followed by a discussion in section 4. The conclusion of this thesis will be presented in section 5.

## 2 Methodology

The scope of this thesis is to summarize and compare the reviewers' sentiments and topics from TripAdvisor reviews across three different conservation institutions - namely Pairi Daiza, Meise Botanical Garden, and Sea Life Blankenberge - in terms of conservation, education, and entertainment. This will be done employing text mining techniques: sentiment and word frequency analysis, and topic modeling in the form of Latent Dirichlet Allocation (LDA). In this section, the complete approach of this thesis will be outlined. First, the data collection, cleaning, and preprocessing processes will be outlined. Then, the analysis phase, including the explanation of the used methods will be described.

### 2.1 Data Collection, Cleaning and Preprocessing

#### 2.1.1 Data Source

TripAdvisor has been selected as the data source for gathering the reviews. This choice is firstly because TripAdvisor is a widely recognized platform among travelers for reviews of various venues and places. With over one billion reviews, the platform offers a vast and comprehensive information resource (Sun et al., 2024; Zhao et al., 2019).

Secondly, TripAdvisor is a reliable source as it ensures the quality of its reviews through a thorough assessment process. Before a review is published on the website, it checks the author's IP address and email address to identify any suspicious trends or the use of offensive language. Additionally, users can report any questionable information, which a team of quality assurance experts will then review and evaluate. This process helps guarantee that the consumer reviews are legitimate (Burkov & Gorgadze, 2023; Q. Chen et al., 2024; Sun et al., 2024; Zhao et al., 2019).

#### 2.1.2 Data Collection

With interest in understanding the key factors that attract or deter visitors related to conservation, education and entertainment, and how these interests vary across organizations, Pairi Daiza, Meise Botanical Garden, and Sea Life Blankenberge were selected in the context of 'popular conservation organizations in Belgium.' More specifically, Pairi Daiza ranks as the top result for zoos in Belgium, while Sea Life Blankenberge ranks the highest for aquariums on TripAdvisor. Meise Botanical Garden ranks high among botanical gardens, but was mainly picked due to its collection of 20,000 plant species, making it one of the largest botanical gardens in the world (Meise Botanic Garden, 2024;

Tripadvisor, 2025).

The reviews from these organizations are collected through web scraping. More specifically, reviews from the TripAdvisor platform are extracted using Apify, a web scraping tool (Apify, 2024). Apify has been chosen as it has a built-in TripAdvisor scraper designed to extract the reviews. The following information will be extracted per review as the scraper provides: review text, URL, rating, travel date, published date, basic reviewer info, owner's response, helpful votes, images, review language and place details (Apify, 2024).

Table 1 displays descriptive information about the scraped datasets. To guarantee a grasp of the dataset's attributes, this table summarizes the metadata, including the number of reviews per venue, the number of different languages in which the reviews are written, and the date of the first and last reviews.

<b>Institution</b>	<b>Reviews</b>	<b>Languages</b>	<b>First review</b>	<b>Last review</b>
Pairi Daiza	2 500	9	2023-05-02	2024-11-21
Meise Botanical Garden	341	12	2012-10-27	2024-09-24
Sea Life Blankenberge	1 021	11	2012-05-27	2024-11-12

Table 1: Descriptive table of TripAdvisor data

### *2.1.3 Data Cleaning & Preprocessing*

The first step is to translate all reviews in other languages to English to conduct the analysis in a single language. To do this, all three datasets are converted to a Google Sheets file. In the Google Sheets file, an additional column is created in which the GOOGLETRANSLATE function is used, needing three arguments: the review itself, the language of the review, and the desired language of the review. Given that the scraped datasets came with a column indicating the language in which the review was written, this column is used within the function to convert the review to English.

After translating the reviews into English, the next steps are converting the reviews to lowercase, tokenization, the removal of stop words and lemmatization. Tokenization is a crucial procedure that will split each review into words, allowing to work more effectively with the text (Parlar et al., 2019). Lemmatization normalizes words to their root forms. Algorithm 1 outlines the procedure of the preprocessing step.

---

**Algorithm 1** Preprocessing of reviews

---

**Input:** Raw reviews

**Output:** Preprocessed reviews

```
1: procedure PreprocessReviews
2:   for each review do
3:     Convert text to lowercase
4:     Remove special characters using regular expressions
5:     Tokenize the text into individual words
6:     Remove English stopwords from the list of words
7:     Lemmatize each remaining word using WordNet
8:     Join the processed words back into a single string
9:     Store the result in a new column
10:  Convert the cleaned_text column into a list of documents
```

---

## 2.2 Analysis

During the analysis phase, the focus is on examining reviews at a general level, followed by a more detailed examination at the organizational level. This two-tiered approach aims first to develop a comprehensive understanding of the data, developing a lexicon to extract insights regarding the distribution of the reviews with regard to conservation, education and entertainment. Then, the focus will shift to the organizations for detailed analysis, supported by the insights from the lexicon-based analysis, where topic modeling, sentiment analysis and keyword analysis will be used to gain deeper insights into institution-specific themes and explore differences in visitor perceptions across institutions.

### 2.2.1 *Lexicon*

A lexicon is created to identify whether a review emphasizes conservation, education, and/or entertainment. The starting point of the lexicon development is the application of Term Frequency-Inverse Document Frequency (TF-IDF). TF-IDF is a technique that assesses the significance of words by looking at how frequently they appear in a corpus (in this case: the reviews) (Amira & Irawan, 2020; Mishra et al., 2019; Sun et al., 2024). More precisely, when conducting a TF-IDF analysis, there are three steps (Amira & Irawan, 2020; Mishra et al., 2019):

1. the frequency of each term in a document (in this case: review) will be calculated: Term Frequency (TF)
2. the uniqueness of a word across a collection of documents (corpus) will be calcu-

lated: Inverse Document Frequency (IDF)

3. the product of TF and IDF will be calculated: Term Frequency-Inverse Document Frequency (TF-IDF)

For each term, its maximum observed score is retained. By analyzing the distribution of these maxima, 0.50 appeared as the natural inflection point. Terms surpassing this limit tend to occur frequently in at least one review while being uncommon in others. Then, the terms in the remaining selection are reviewed manually and grouped into the most applicable category. The procedure is illustrated schematically in Algorithm 2.

---

**Algorithm 2** Generate thematic lexicon

---

**Input:** Preprocessed reviews

**Output:** Thematic lexicon for conservation, education, and entertainment

```
1: procedure GenerateLexicon(documents)
2:   Compute the TF-IDF score for all unique terms across the corpus
3:   for each term do
4:     Identify the maximum TF-IDF score observed across all documents
5:   Analyze the distribution of maximum TF-IDF scores
6:   Select all terms with a maximum score above the threshold
7:   Manually review the selected terms
8:   Assign each term to one of three thematic categories:
9:     - Conservation
10:    - Education
11:    - Entertainment
12:   Return the finalized lexicon
```

---

The next step is expanding this lexicon, manually going through a sample of reviews to detect new terms. More specifically, 300 reviews were sampled. From this subset, a purely manual extraction of all lexical items that reviewers used to refer to the three predefined aspects is conducted. Each review was read in full, and any term that seemed to signal one of these dimensions was added to one of the lexicon categories.

Subsequently, the lexicon is evaluated using a new sample of 300 reviews to determine if it can accurately identify whether a review addresses a specific aspect. The evaluation suggested that the lexicon was sufficiently accurate in identifying references to conservation, education and entertainment, thus validating its use for categorizing the full dataset. The final lexicon is shown in Table 2.

After developing and testing the lexicon, it is used to iterate over all the reviews. If a review contains a term from the predefined lexicon associated with a specific aspect, the review is assigned a TRUE value in the corresponding column. This results in a dataset

ready to analyze further.

Aspect	Terms
Conservation	animal care, animal friendly, animal-friendly, animal well being, animal well-being, awareness-raising, biodiversity, breeding, cared for, conservation, endangered, environmental, environmental impact, fauna, flower, flowers, flora, greenhouse, greenhouses, habitat, inbreeding, natural, natural environment, pampered, preservation, rescue, species, taken care of, treat, treated, tree, trees, well cared, well-being of the animals, welfare, wildlife
Education	discover, discovery, discoveries, education, educational, explanation, explanations, explanatory, explore, exploration, exhibition, guide, information, informative, interactive, learn, learned, learning, presentation, presentations
Entertainment	animation, animations, amusement park, attraction, attractions, bar, boutique, brasserie, cafeteria, catering, castle pond, children, Christmas, decoration, decorations, daughter, drink, drinks, Easter, entertainment, entertained, entertaining, Estivales, event, family, family outing, family-friendly, feeding, food, fun, game, grandchild, Halloween, leisure, membership, orangery, outing, parents, play, play area, playground, playgrounds, pleasant, recreation, relaxation, restaurant, scenery, shop, shops, show, son, subscribers, subscription, subscriptions, terrace, walk, walking, walks

Table 2: Lexicon Categorized by Aspect

### 2.2.2 Keyword Analysis

To gain an initial understanding of the content embedded within visitor reviews, a comprehensive keyword analysis was conducted as a preliminary step to support the subsequent topic modeling using Latent Dirichlet Allocation (LDA). This had two main objectives: first, to explore the lexical patterns and frequently occurring terms within the reviews, and second, to identify preliminary indicators of the underlying motivations driving visitor engagement related to conservation, education, or entertainment, and support findings in the topic models.

The keyword analysis involved creating word clouds A1, A2 and A3, which can be found in the appendices, in which the frequency of the words within the reviews is calculated and

used to calculate the size of the words in the word cloud. The largest words in the word cloud are the words that are used most frequently in the reviews. To make the most meaningful word clouds, "park", "pairi", "daiza", "sea", "life", "blankenberge", "meise", "botanical" and "garden" are removed. These words are mentioned often as people tend to use the name of the park in their review, but do not add to the interpretation of essential aspects for the visitors. An example of such a review would be: "Pairi Daiza was just stunning and way exceeded our expectations."

### 2.2.3 *Topic Modeling (LDA)*

The first step in the topic modeling process is estimating the number of topics for the LDA (Latent Dirichlet Allocation). The optimal number is derived from a combination of the semantic coherence and exclusivity scores, like Bellary et al. (2024) did in their research. They outlined the reasoning behind this choice: semantic coherence evaluates cohesiveness by analyzing the frequency at which words related to a topic appear together. Exclusivity gauges the uniqueness of words associated with each topic. Combining these two metrics provides a balance to determine the ideal number of topics with high semantic coherence and exclusivity scores (Bellary et al., 2024).

Algorithm 3 describes the procedure used to train models with varying topic numbers and compare their performance. Both the coherence and exclusivity scores need to be relatively high in order to represent meaningful topics. In some instances, the graphs might indicate multiple options regarding the number of topics. In that case, all options are tested and eventually, the option with the most well-separated and interpretable topics is picked to analyze.

From Figure 1, the optimal number of topics for the Pairi Daiza reviews can be derived. The coherence and exclusivity scores remain relatively high until four topics, after which the exclusivity score decreases sharply. After that point, the coherence score approximates the score at four topics, but the exclusivity score is significantly lower. Therefore, four topics were picked as optimal. The reasoning for determining the number of topics for Meise Botanical Garden and Sea Life Blankenberge is the same as that for Pairi Daiza. The graphs can be found in the appendix (Figures A4 and A5).



---

**Algorithm 3**

---

**Input:** Preprocessed texts and documents

**Output:** Coherence and Perplexity evaluation plot

```
1: procedure LDACoherencePerplexity(texts, documents)
2:   Create a Gensim dictionary from the tokenized texts
3:   Filter out words that appear in fewer than 5 documents or more than 50%
4:   Convert texts to a bag-of-words corpus using the dictionary
5:   Convert documents to a document-term matrix using CountVectorizer
6:   – Ignore words that appear in more than 90% or fewer than 2 documents
7:   Initialize empty lists for coherence and perplexity scores
8:   for number of topics from 2 to 24 do
9:     Train a Gensim LDA model on the corpus
10:    Compute the Coherence Score using CoherenceModel
11:    Append the coherence score to the list
12:    Train a Scikit-learn LDA model on the document-term matrix
13:    Compute the Perplexity Score
14:    Append the perplexity score to the list
15:  Normalize both score lists for better visual comparison
16:  Create plot
```

---

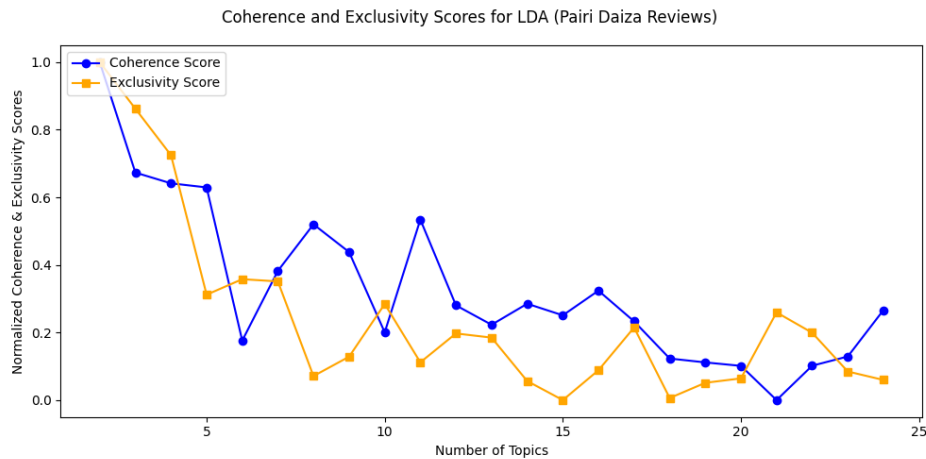


Figure 1: Coherence and Exclusivity (Pairi Daiza)

Once the optimal number of topics is derived, the topic modeling can be applied to the reviews. Algorithm 4 outlines the application of the LDA to the reviews.

---

**Algorithm 4**

---

**Input:** Preprocessed documents

**Output:** reviews\_institution\_lda.csv

```
1: procedure LDA(file_path, output_path)
2:   Load data from CSV file into a dataframe
3:   Convert documents to a document-term matrix using CountVectorizer
4:   – Ignore words that appear in more than 90% or fewer than 2 documents
5:   Train an LDA model with a predefined number of topics
6:   Extract top words for each topic
7:   for each topic in the model do
8:     Print the top 15 words contributing to the topic
9:   Transform document-term matrix into topic distributions
10:  Determine the dominant topic for each document
11:  Add dominant topic as a column to the dataframe
12:  Export the dataframe to a csv file
```

---

#### 2.2.4 Sentiment Analysis

Regarding the application of sentiment analysis, literature suggests three approaches: the lexicon-based approach, the machine learning approach and the hybrid approach (Q. Chen et al., 2024). A preliminary analysis revealed that the machine learning approach likely performs better than others in this particular study context. The model that was picked, was the Bidirectional Encoder Representations from Transformers (BERT), a text sentiment classification model that offers multiple benefits, primarily its ability to understand the context of words within a sentence. This offers a significant advantage over lexicon-based approaches. It also supports zero-shot learning, meaning the model can perform tasks it was not explicitly trained for. This capability is due to its deep contextual understanding and extensive pre-training knowledge (Nawawi et al., 2024). BERT is a pre-trained model in the natural language processing (NLP) domain, proposed by Devlin et al. at Google in 2018.

The specific BERT model that was applied was *nlptown/bert-base-multilingual-uncased-sentiment*, which is available in the public official repository of Hugging Face (<https://huggingface.co/nlptown/bert-base-multilingual-uncased-sentiment>). This model has been fine-tuned for sentiment analysis on reviews. It predicts the sentiment of the text review and assigns a star rating (1-5) (Darko et al., 2024). These ratings were converted into three categories: negative (1-2), neutral (3) and positive (4-5).

These sentiment scores were also used to assign a sentiment to every topic. The number of reviews per sentiment score (1-5), that was assigned by BERT, is calculated per topic.

Then, this number was multiplied by the sentiment score. This gives the weighted sentiment, which is divided by the number of reviews within a sentiment score in a topic. The outcome of that calculation is the sentiment score of the topic. This allows for an overall understanding of how visitors feel about a topic. The exact procedure of the sentiment analysis is outlined in Algorithm 5.

---

**Algorithm 5**

---

**Input:** all\_reviews\_aspects\_detected.xlsx

**Output:** bert\_updated\_all\_reviews\_aspects\_detected.xlsx

```
1: procedure SentimentAnalysis
2:   Load pre-trained BERT sentiment model
3:   for each review do
4:     Perform inference using the BERT model
5:     Apply softmax to get sentiment probabilities
6:     Choose the most likely sentiment class (1–5 stars)
7:     Assign sentiment score to a new column bert_sentiment
8:     Categorize sentiment scores into positive, neutral or negative
```

---

### 3 Results

In this section, the results of the analyses are presented and interpreted. First, general findings concerning the distribution of conservation, education, and entertainment reviews and the associated sentiments are discussed. Afterward, the review topics and associated sentiments for each organization will be discussed. Lastly, the similarities and differences in reviews across the organizations will be highlighted.

#### 3.1 Distribution and Sentiment of Visitor Motivations

The combination of the lexicon-based classification and sentiment analysis to the reviews results in a structured dataset that links each review to one or more thematic categories — conservation, education or entertainment — alongside a sentiment label (positive, neutral or negative). This enabled the comparative analysis shown in Table 3 and Figure 2, illustrating the relative sentiment distribution per aspect across the three venues.

Venue	Conservation	Education	Entertainment	Total
Meise Botanical Garden	210	93	249	552
Pairi Daiza	485	431	1475	2391
Sea Life Blankenberge	133	291	748	1172
<b>Total</b>	864	815	2472	

Table 3: Total number of mentions per theme across venues

From Table 3, it is clear that lexicon-based classification reveals that entertainment is the most important motivation for the visitors across all three institutions. At the same time, conservation and education vary in prominence depending on the institution. Meise Botanical Garden reviews emphasize conservation more, while Sea Life Blankenberge reviews focus more on the educational aspect.

From Figure 2, it is remarkable that the general sentiment of Sea Life Blankenberge reviews is lower than that of the Pairi Daiza and Meise Botanical Garden reviews. This suggests that, across the three aspects, there may be a common underlying concern or issue that influences overall visitor impressions more negatively. Furthermore, entertainment is the least positive aspect of the three. Combined with the findings from Table 3, this indicates that visitors focus on entertainment and tend to be more critical about this, even though the majority is still positive.

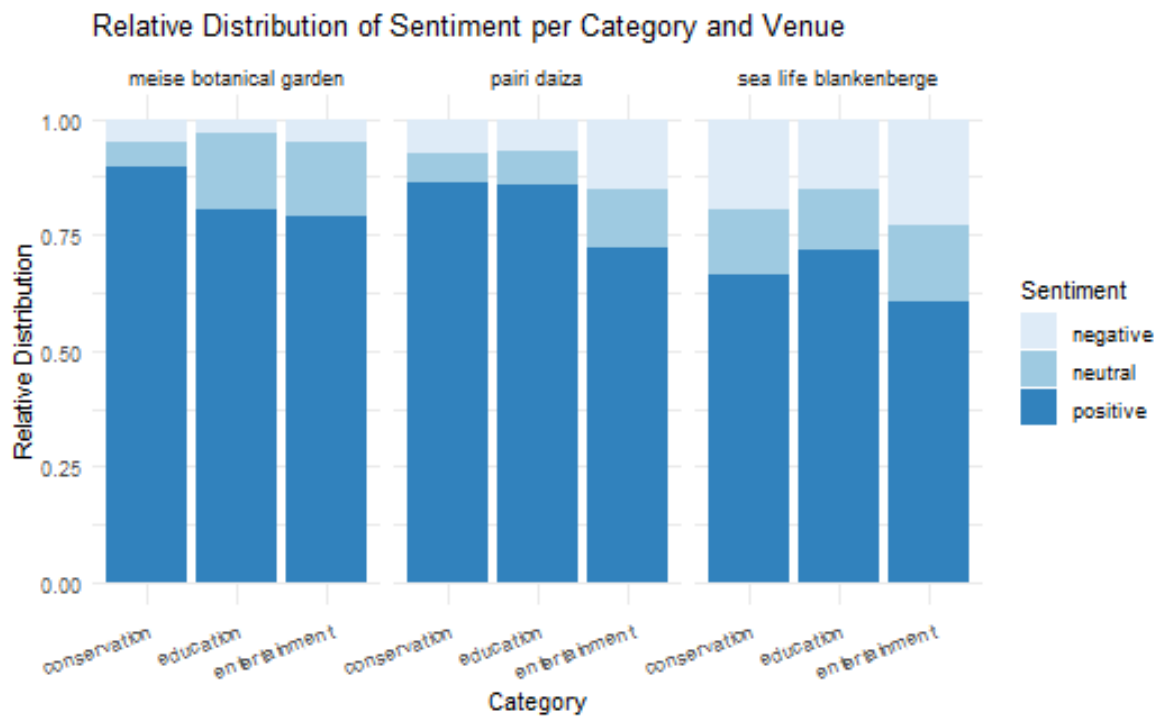


Figure 2: Relative Distribution of Sentiment per Aspect per Venue

### 3.2 Pairi Daiza

The obtained topics from the LDA analysis of the Pairi Daiza reviews are presented in Table 4. Conservation-related aspects are reflected in the fourth topic, with frequent mentions of words such as "enclosure", "animal", "space", and "large", indicating that visitors are attentive to the welfare of the animals and the size of their living spaces. However, the presence of words like "magnificent" and "beautiful" suggests that visitors' focus is not solely on conservation, but also on the aesthetic quality of the enclosures. Additionally, the most frequently mentioned word in this topic is "staff", pointing to an emphasis on operational quality rather than purely conservation efforts. Although the associated sentiment score of 4.22 is relatively high, it is likely driven more by satisfaction with the park's aesthetics and staff performance than by conservation aspects alone. Nonetheless, the frequent appearance of terms such as "care" and "species" in the wordcloud A1 indicates that conservation remains an underlying element of the visitor experience.

Entertainment is the dominant theme across the topics. The first topic highlights practical entertainment aspects such as food and drinks in the restaurants. However, the low associated sentiment score of 3.30 and frequent mentions of "expensive", "lot", "people" and "closed" suggest that visitors are dissatisfied with these facilities, particularly due to high prices, crowding and occasional closures. The second topic is also linked to entertainment, focusing on the overnight stays with animal views, which visitors highly appreciate given the high sentiment score of 4.54. The third topic emphasizes family-oriented entertainment, with mentions of "subscription" indicating ongoing engagement through repeated visits. The high sentiment score of 4.56 reflects strong satisfaction with this aspect. Besides, the frequent use of "wonderful", "magnificent", "beautiful" along with "experience", "scenery" and "discover" further supports the strong engagement with entertainment.

In summary, the topic modeling reveals that visitors are primarily occupied with entertainment, such as the restaurant, the room experience, visiting with their family and having subscriptions. Aspects directly tied to conservation are less noticeable and tend to be interwoven with aesthetics. Educational elements are not even noticeable.

#	Topic	Top N Words	Sentiment	%
1	Expensive & facilities	animal, point, people, little, closed, food, entrance, drink, restaurant, price, expensive, lot, parking, park	3.30	16.46%
2	Great room experience & beautiful park	great, night, time, room, experience, zoo, daiza, pairi, place, world, beautiful, day, animal, park	4.54	14.50%
3	Family-friendly & subscriptions	daiza, subscription, magnificent, new, great, family, come, beautiful, animal, day, time, year, visit, park	4.56	34.25%
4	Staff, cleanliness & enclosures	staff, large, visit, good, clean, really, space, day, magnificent, enclosure, zoo, beautiful, park, animal	4.22	34.79%

Table 4: Topics obtained in the LDA analysis (Pairi Daiza Reviews)

### 3.3 Meise Botanical Garden

The obtained topics from the LDA analysis of the Meise Botanical Garden reviews are presented in Table 4. Several topics highlight the frequent mentions of words related to plant species which can be seen as conservation-related. However, given the context of these topics they are mentioned in, these can also be seen as entertaining or educational. The first topic, for instance, entails "orchid" and "plant", but in combination with "explanation", it might indicate that visitors have learned something about these rather than being occupied with the conservation of these plants. This applies for the other topics as well. In Topic 3, the combination of these species with walking implies that visitors enjoy seeing these species during their walk rather than being occupied with conservation. Topics 6, 7 and 8 also highlight specific plant species, but consistently in combination with other aspects that emphasize the entertainment aspect more.

Regarding education, only the first and fourth topics are relevant. Visitors highlight the explanations during their walk about several plant species in the garden and greenhouses in Topic 1. The associated sentiment of 3.5 indicates a relatively average satisfaction with this. However, given the small portion of reviews attributed to this topic, this topic might not be important to visitors. Topic 4 underscores a pleasant exhibition with a high sentiment score of 5. However, again this topic covers a very small portion of the reviews.

The dominant theme of the reviews centers on the entertainment aspect, highlighting the enjoyable and leisurely elements of the botanical garden experience. Multiple topics cover walking through the beautiful garden and greenhouses, with emphasis on the castle and the possibility of enjoying drinks in the restaurant and terrace. These findings suggest that entertainment is not just about leisure, but it encompasses a complete experience that combines aesthetic enjoyment with services, with high sentiment ratings across the topics that cover the entertainment aspects. Also, aesthetics seem to be important again. According to wordcloud A2, visitors enjoy the "wonderful", "magnificent" and "beautiful" aspects of the park.



#	Topic	Top N Words	Sentiment	%
1	Walk with explanations among flowers and greenhouse	walking, like, great, explanation, botanical, flower, day, orchid, definitely, place, different, plant, beautiful, greenhouse, garden	3.5	3.85%
2	Well-maintained, species, tree & worth	specie, tree, maintained, enjoy, worth, time, walk, botanical, beautiful, park, visit, plant, greenhouse, garden	4.64	21.30%
3	Beautiful walks	people, beautiful, walking, tree, good, park, visit, like, day, flower, road, garden, great, lot, place	4.40	4.14%
4	Exhibition & worth	pleasant, exhibition, admire, dotted, entire, big, place, different, easy, access, day, visit, worth, beautiful, park	5.00	1.48%
5	Restaurant, terrace & service	restaurant, nature, walk, parking, place, garden, terrace, greenhouse, time, beautiful, service, entrance, drink, nice, park	5.00	4.14%
6	Greenhouse, castle & drinks	brussels, enjoy, drink, flower, light, lot, botanical, worth, greenhouse, castle, nature, walk, garden, beautiful	4.83	8.88%
7	Greenhouse, castle & walks	tree, place, day, botanical, large, nice, walk, visit, castle, greenhouse, garden, plant, park, beautiful	4.67	49.70%
8	Parking & plants	parking, hop, greenhouse, beautifully, meise, free, brussels, castle, plant, botanical, walk, worth <sup>22</sup> , park, garden, nice	4.17	6.51%

Table 5: Topics obtained in the LDA analysis (Meise Botanical Garden Reviews)

In summary, while conservation and educational aspects are present in the reviews, they appear to play a secondary role compared to entertainment. Visitors primarily value the aesthetic beauty, leisurely atmosphere, and additional services offered by the Meise Botanical Garden.

### **3.4 Sea Life Blankenberge**

The obtained topics from the LDA analysis of the Sea Life Blankenberge reviews are presented in Table 6. Topic 2 stands out as the most directly linked to conservation. It centers on various animal species such as "otter", "penguin", "seal", "lion" and "fish". However, the frequent appearance of "beautiful" and "great", which indicate positive sentiment in combination with the relatively positive sentiment score of 4.19, does not show occupation with conservation but more with the satisfaction of seeing the animals. With the presence of "child" and "time", the emphasis appears to be on enjoying a great experience at the aquarium with children, particularly in observing the animals.

Educational elements are not prominently featured across the topics, indicating that this aspect may not be a major perceived function of the park from the visitor's perspective. However, wordcloud A3 suggests that there are definitely visitors that are engaged with educational aspects of the park, with frequent use of "explanation", "educational" and "tour". Thus, even though it is not a major theme for many visitors, they remark the educational efforts.

Entertainment dominates the reviews across multiple topics. Topic 3 highlights a family-friendly and enjoyable experience, featuring keywords like "good", "fun", "nice" and "child" along with indicators for multiple visits per year, such as "visit" and "year". While the sentiment score of 3.68 suggests some dissatisfaction, it is difficult to discover the reasons for the lower sentiment, given the presence of positive words. Similarly, topics 1 and 7 emphasize that the park is small, so the time spent there is relatively short. However, visitors do not tend to be negative about this. They perceive this as "pleasant", "interesting", "good" and "fun". The appearance of "ticket" in Topic 1 and "price" in Topic 7 could explain the average sentiment scores. However, from these topics it is hard to explain why. On the other hand, Topics 4, 5 and 7 can explain this as these reveal recurring dissatisfaction with value for money, primarily in combination with the park's size. These are the three most negative topics in this organization, so a large portion of visitors are dissatisfied with this.

#	Topic	Top N Words	Sentiment	%
1	Short time spent	short, sealife, aquarium, small, interesting, bit, limited, sea, quite, really, good, seal, ticket, child	3.08	4.94%
2	Species	otter, really, time, beautiful, penguin, child, lion, fish, aquarium, great, life, animal, seal, sea	4.19	20.16%
3	Friendliness & fun visit with children	good, really, year, park, friendly, sea, small, day, fun, visit, hour, animal, child, nice	3.68	20.78%
4	Parking & small	parking, lion, hour, little, life, child, price, park, seal, small, animal, visit, aquarium, sea	3.08	22.43%
5	Small park & entrance ticket	sea, day, quite, little, entrance, ticket, small, hour, park, child, people, animal, visit, price	2.37	9.77%
6	Expensive & old park	place, expensive, coast, ticket, staff, old, year, small, child, little, price, nice, visit, park	3.03	10.08%
7	Small & short time	pleasant, price, hour, fun, park, life, good, time, small, sea, place, visit, animal, child	3.50	11.83%

Table 6: Topics obtained in the LDA analysis (Sea Life Blankenberge Reviews)

In summary, while conservation and education are present in the visitor reviews, they

are secondary to the dominant entertainment theme. Visitors mainly emphasize the pleasure of observing animals and enjoying time with their children, rather than concentrating on conservation efforts or educational programs. Although some engagement with educational initiatives is visible, it is not a major driver of visitor satisfaction.

### **3.5 Comparison between organizations**

When comparing the three venues, a clear pattern emerges in how each attracts visitors. Entertainment and the overall experience play a more prominent role than dedicated conservation or educational initiatives. All three organizations showcase elements of conservation, including marine species at Sea Life Blankenberge, plant diversity at Meise Botanical Garden, and various animal exhibits at Pairi Daiza. However, visitor reviews suggest that features related to conservation primarily serve as scenery for leisure activities, rather than effectively conveying conservation messages.

Among the venues' reviews, conservation rarely emerges as a standalone theme. At Sea Life Blankenberge, only one topic explicitly lists animal species such as "otter," "penguin," "seal," "lion", and "fish". However, accompanied by words like "beautiful" and "great," this topic suggests that the focus is more on the aesthetic and emotional aspect of observing these animals instead of being motivated by the conservation of the species. The same applies for Meise Botanical Garden's topics. There are several topics that feature the frequent appearance of plant species (keywords like "orchid" and "hop"), but these are always coupled with educational or entertainment aspects. Meanwhile, also the reviews of Pairi Daiza hint at conservation, but not as a standalone theme. Although animal enclosures are mentioned, they are embedded within a broader topic, being praised for their aesthetics and the space animals have, and not singled out for their conservation message.

Educational aspects emerge most clearly in the Meise Botanical Garden reviews, involving topics concerning explanations and exhibitions. Visitors are primarily positive about these topics. However, these topics represent only a small portion of the reviews for Meise Botanical Garden, and therefore, the educational aspect seems not to be important to visitors of this organization. This aligns with their mission, which emphasizes research and conservation rather than education explicitly. However, given the efforts of Meise Botanical Garden to engage educational audiences through various on-site programs and exhibits, including school and public programs, as well as practical workshops, it raises the question of how they can enhance these initiatives to gain greater recognition from visitors and to see this reflected in their reviews (Botanic Garden Meise, 2025). By

contrast, in Sea Life Blankenberge and Pairi Daiza, the presence of education-related keywords is minimal. At Sea Life Blankenberge, a small portion of visitors remark on the educational efforts, but not enough to lead to a whole topic. At Pairi Daiza, there are no indications of educational awareness. This actually contradicts their mission statements, as both Sea Life and Pairi Daiza integrate education more directly into their missions than Meise Botanical Garden. Sea Life aims to inspire ocean conservation through learning, and Pairi Daiza explicitly lists education as a core objective alongside conservation. Both actively promote school programs and interactive experiences (Pairi Daiza, 2025; SEA LIFE, 2025). Pairi Daiza and Sea Life Blankenberge could enhance how they convey their educational efforts to more clearly reflect the educational objectives articulated in their mission.

Entertainment is the dominant theme across all three venues and is reflected in several similar topics. Both in Pairi Daiza and Meise Botanical Garden, the restaurant with its food and drinks seem to be very important to the visitors. While these are perceived as expensive at Pairi Daiza, in combination with the lowest sentiment score across the topics, visitors of Meise Botanical Garden express general satisfaction and positive sentiment with this. Furthermore, at Pairi Daiza and Sea Life Blankenberge, a large portion of the reviews focuses on enjoyable family experiences, whereas none of the topics for Meise Botanical Garden highlight family experiences. It is remarkable that topics focused on these family experiences always entail "animal" as well. This suggests that the animals are an important aspect for the children. The frequent use of "subscription" in the Pairi Daiza topic related to family experiences also suggests that visitors with children may find it easier to opt for a subscription compared to those without children. Besides, in the Sea Life topic, also "year" and "visit" might indicate multiple visits per year. Also, in both organizations, the sentiment is relatively high compared to the other topics for both organizations. At the Meise Botanical Garden, the overwhelming narrative is that of an aesthetic and leisurely outing, with visitors commenting on the pleasure of walking in beautiful gardens and admiring the castle. The sentiments associated with these leisure-oriented topics are consistently high.

In summary, when comparing these organizations, a consistent pattern emerges: the largest portion of topics revolves around the enjoyment of the aesthetics of the park and leisure. Even when conservation or educational aspects are mentioned in topics, these always coexist with words that revolve around entertainment. The sentiment across the topics is generally positive for Pairi Daiza and Meise Botanical Garden. The topic that receives the lowest sentiment score is related to the prices, indicating visitors often find it expensive. This also applies to Sea Life Blankenberge for which the sentiment scores

are generally lower than the others' topics. However, this is primarily due to the park being perceived as small and old, with the visitors expecting more in advance for the money they paid.

## 4 Discussion

This thesis focused on visitor motivations and the associated sentiments of reviewers across three different conservation institutions, offering important insights into how themes of conservation, education and entertainment shape public perception.

One of the most important findings is that the largest portion of visitors' motivations revolves around entertainment. The reviews center on the enjoyment of the park's aesthetics, seeing the animals and its entertainment facilities, like the restaurant. This aligns with the statements previous literature provides, which note that visitors are mainly attracted by the opportunities view animals and be entertained when visiting a zoo or aquarium (Collins et al., 2020; Huang et al., 2019; Knežević, 2016; A. Moss & Esson, 2010; Nygren & Ojalammi, 2017; Scalfi et al., 2022). These articles also state that visitors are motivated to socialize (Collins et al., 2020; Huang et al., 2019; Knežević, 2016; A. Moss & Esson, 2010; Nygren & Ojalammi, 2017; Scalfi et al., 2022). However, this did not emerge from the analysis. The only indication of the analysis in this direction would be the appearance of "people" in the wordcloud of Pairi Daiza reviews. However, this can not be confirmed as it also can imply that people often mention that there are many people in the park during their visit, in which case "people" would be focused on overcrowding.

With regard to a visit to a botanical garden, visitor motivations appeared to center on escape, relaxation, nature experience/appreciation, social contact, conservation and education (Hermann & Bouwer, 2023; Phau et al., 2013; Wassenberg et al., 2015; Wiegand et al., 2013). The results in this thesis align with the literature regarding escape, relaxation, nature experience/appreciation and education. However, this thesis's results do not align with the literature regarding social contact and conservation. There are no dedicated topics on conservation or social contact, nor are there indications that this could be an important theme.

Moreover, despite the shift in focus of zoological and botanical institutions from entertainment to education and conservation as highlighted by Escibano et al. (2021), Huang et al. (2019), A. Moss and Esson (2010), Nygren and Ojalammi (2017), Schilbert and Scheerso (2023), and Villarroja et al. (2024), visitors' reviews still primarily revolve around entertainment. The lexicon-based categorization shows that more than 60% of the reviews cover an entertainment aspect, while conservation and education-related aspects are mentioned in around 20% of the reviews. Additionally, the topic models reveal that there are no dedicated topics to conservation and education. Most of the topics are

related to entertainment. Conservational or educational aspects are only covered in combination with an entertainment focus. Thus, while zoos are increasingly recognized as institutions that support conservation and education (Escribano et al., 2021), and botanical gardens primarily focus on plant conservation while also emphasizing education and entertainment (G. Chen & Sun, 2018), many visitors still perceive them primarily as places for entertainment.

## **4.1 Limitations**

Even though this thesis provides valuable insights, there are some limitations that could be addressed in future research. First, the BERT model that has been used to assign sentiment scores to the reviews can be trained on a more specific dataset. In this thesis, the performance of the BERT model depends on the original training data, and thus, certain things may be misinterpreted. Also, the fact that the reviews were automatically translated into English may lead to a loss of meaningful linguistic nuances. This could potentially affect the interpretation of the results. Second, the small sample size of institutions may limit the applicability of the results across a broader context. This applies to the lexicon which is based on the words used in the reviews of these institutions, along with the topics and associated sentiments that were identified. Third, the application of text mining techniques involves that findings are not as nuanced as possible.

## **4.2 Recommendations for the conservation institutions**

Conservation institutions should incorporate education into entertainment so that visitors leave feeling informed and inspired. Both the literature and this thesis show that people attend zoos, aquariums and botanical gardens primarily for fun and socializing, so institutions should first meet these expectations and then embed learning opportunities within that framework. Additionally, these institutions could focus on clearly connecting tickets and programs to real-world impact, which reinforces the value for money. Lastly, staff and volunteers could focus on having friendly conversations about an exhibit's conservation context. In summary, institutions must prioritize maintaining the excitement and wonder of the experience while ensuring that visitors of all ages leave with a tangible understanding of conservation and the importance of protecting nature.



## 5 Conclusion

This thesis focused on visitor motivations in relation to conservation, education and entertainment across three different institutions: Pairi Daiza, Meise Botanical Garden and Sea Life Blankenberge. The objective was to examine whether visitors are motivated by these three aspects. To do so, this thesis covered the application of lexicon-based categorization, sentiment analysis, topic modeling and keyword analysis on the visitor reviews. That way, the main review topics, the sentiments associated with these topics, and the similarities and differences in visitor perceptions across the three institutions could be identified. By analyzing these factors, the thesis was able to assess the extent to which conservation, education and entertainment effectively serve as motivational drivers for visitors, thereby fulfilling its main objective. Each institution was examined individually, after which the results were compared.

Based on the results of this thesis, the following partial conclusions can be drawn. At Pairi Daiza, three of the four topics reveal a clear connection with entertainment, representing 65% of the reviews. Two of the topics related to entertainment have a positive sentiment, representing reviews that describe great experiences in the park's rooms and visits in a family context, with many visitors talking about having a subscription. The other one is more neutral. This is due to the fact that visitors perceive the restaurant (and the parking) as expensive. However, a sentiment of 3.30 across this topic indicates does not indicate total dissatisfaction.

At Meise Botanical Garden, multiple topics cover entertainment. Visitors mostly talk about the beautiful walks they had during their visit, the greenhouse, the castle, the restaurant and the terrace. They are predominantly positive about these aspects. Two topics focus on an educational aspect, but only represent five percent of the reviews. In these, an exhibition and a walk with explanations are discussed. However, both are combined with words that indicate admiration of the park's aesthetics and plants. Besides, the same applies to conservation. Many topics involve the frequent use of specific plant species. However, none of the topics indicate that visitors are engaged with the conservation aspect of this; instead, they seem more focused on the enjoyment and admiration of these.

Furthermore, visitors leaving a review for Sea Life Blankenberge tend to be less satisfied than visitors from the other two institutions, as shown by the lower overall sentiment across topics. This seems mainly due to the park being perceived as old and small, and therefore, visitors find it not worth the money. However, every topic also displays positive

words. Visitors find the experiences they have interesting, good, great, pleasant and fun, emphasizing entertainment in a family context. Moreover, there is a clear emphasis on the animals as they get mentioned frequently, but again, more in relation to the enjoyment of seeing them rather than the conservation.

Based on the partial conclusions, the overall conclusion is that entertainment is the dominant driver of interest across all three institutions. Educational and conservation themes are secondary and often embedded within a broader entertainment context, even though the institutions' mission statements focus on these. This indicates a potential gap between institutional missions around biodiversity awareness and public engagement, and the actual experiences valued by the visitors. These insights could help guide future strategies to more effectively integrate and communicate conservation and education efforts within appealing and engaging formats. However, future research on more institutions with larger samples and in various contexts is needed to further verify and extend these findings.

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## A Appendices

### A.1 Wordclouds



Figure A1: Wordcloud - Pairi Daiza





## A.2 Coherence and exclusivity score graphs

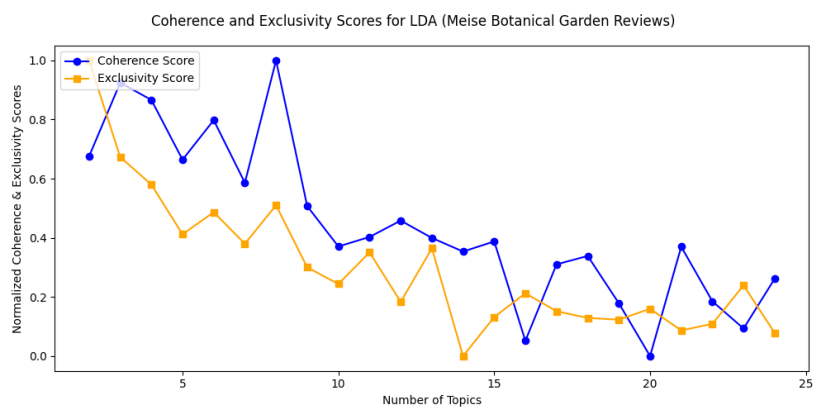


Figure A4: Coherence and Exclusivity - Meise Botanical Garden

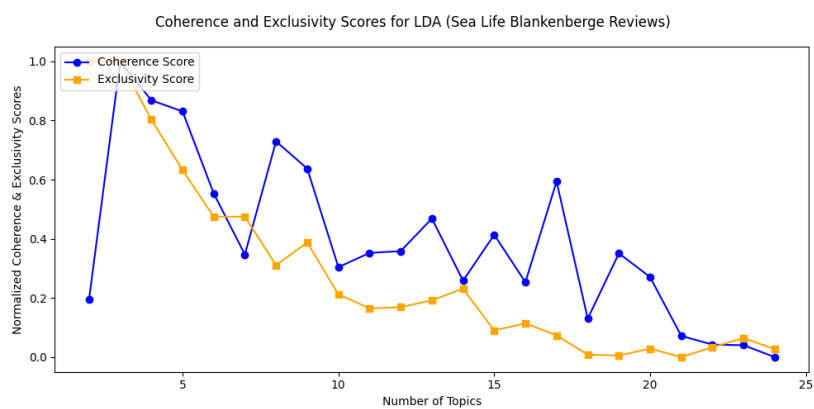


Figure A5: Coherence and Exclusivity - Sea Life Blankenberge