Destination Image of DMO and UGC on Instagram: A Machine-Learning Approach

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Abstract. Social media plays a key role in shaping the image of a destination. Although recent research has investigated factors influencing online users' perception towards destination image, limited studies encompass and compare social media content shared by tourists and destination management organisations (DMOs) at the same time. This paper aims to determine whether the projected image of DMOs corresponds with the destination image perceived by tourists. By taking the Austrian Alpine resort Saalbach-Hinterglemm as a case, a netnographic approach was applied to analyse the visual and textual posts of DMO and user-generated content (UGC) on Instagram using machine learning. The findings reveal themes that are not covered in the posts published by marketers but do appear in UGC. This study adds to the existing literature by providing a deeper insight into destination image formation and uses a qualitative approach to assess destination brand image. It further highlights practical implications for the industry regarding DMOs' social media marketing strategy.

Keywords: Machine learning · Instagram · Destination image

1 Introduction

The rise of social media has changed the process of information creation and communication, which affects consumer behaviour, marketing strategies, and brand image [1]. Social media further fosters the production of user-generated content (UGC), referring to any content created by consumers online [2]. Meanwhile, UGC has become a more critical source of information for consumers due to its richness, diversity [3], and authenticity [4] compared to traditional advertising and official sources. One industry that relies heavily on communication technologies is tourism. Since UGC can influence brand image creation and consumer behaviour [3, 5], social media is earning a leading role in the multiphasic travel stages, from pre-, during-, to post-travel experiences, for information gathering and sharing [1]. Recent literature further reinforces that a destination's online image positively affects consumer behaviour in increasing one's intention to visit, revisit, or recommend the destination [5–7]. Notably, destination image has become a multifaceted concept by considering both the attributes of a destination as well as the sum of beliefs and impressions a tourist has [8]. Seeing

that official information provided by destination marketing organisations (DMOs) no longer has absolute control over image creation [5], DMOs are suggested to be aware of tourists' perception of the destination in order to develop quality marketing campaigns [2]. This can be determined through UGC analysis, which enables marketers to view destinations from tourists' perspectives and discover what they are most interested in [9]. Yet, despite the importance of image congruence [10], scholars in the field of destination marketing mainly analyse the image created by tourists [2] or DMOs [11] rather than comparing both contexts at the same time [12].

To close the aforementioned research gaps, this study aims to identify destination image on social media by analysing both UGC and content published through official tourist board channels. With a particular focus on Instagram, one of the many channels heavily used by (young) tourists [3], this study adopts the destination Saalbaach–Hintertgelm in the Alpine region of Austria as its research context. Specifically, through the use of netnography supported by machine learning approaches, this paper evaluates whether tourists' image of the destination corresponds to the image the DMO attempts to promote. Meanwhile, this study also examines how UGC can be used to plan and develop social media marketing activities for DMOs. Shaping destination image is vital for official institutions in order to attract tourists, consumers, events, and investors [2]. This study advances methodological approaches by using machine learning techniques to shed light on the differences between projected and perceived destination image on Instagram. By outlining the textual and visual content analysis, this research contributes to tourism marketers optimising social media storytelling and marketing strategies.

2 Literature Review

The ubiquity of communication technologies and social media has changed users' attitudes and behaviours, and provides everyone with an opportunity to generate online content. Social media platforms such as Instagram, Facebook, and Snapchat involve common instances of UGC in tourism, where users can create their own content in the form of texts, images, comments, or messages [10]. In the tourism industry, UGC not only reflects the preferences, beliefs, and emotions of tourists regarding their travel experience [13], but it also shapes the image of a destination. As tourists actively look for inspiration and explore other users' experiences, the association of images delivered through pictures or texts on social networks plays an important role in influencing visitor satisfaction and future behaviour [14].

Due to globalisation and increasingly fierce competition, various branding strategies are now being developed in most destinations [15]. One way to position a destination better is to adapt to the development of online communication tools. More specifically, seeing that social media has weakened the traditional role of DMOs as a leading source of information for visitors [16], marketers nowadays are inclined to include social platforms in their marketing activities. In doing so, DMOs can co-create content with tourists so as to maintain competitiveness and gain online visibility [17, 18]. The significance of DMOs' social platforms is evidenced by the fact that it is embedded in tourist activities' planning processes [19]. The delivered content can support visitors during their travel [18], thereby reinforcing the need for DMOs to optimise social media marketing strategies and to face high competition in the tourism industry [20].

Amongst the various available channels, Instagram has not only been embraced by tourists as a trendy platform [4] but is also well-liked by marketers to create compelling marketing strategies [11, 21]. Characterised as a highly visual platform, approximately 1 billion monthly active users and 95 million photos shared per day on Instagram were recorded, as of 2020 [22]. In tourism marketing, the implication of online photography is to shape a positive perception of a particular destination. Moreover, this platform offers a space where the projected and perceived destination image are intertwined. The UGC as an agent of perceived destination image formation is a key factor in the destination choice process. Thus, it is crucial to consider the effect of UGC on the destination image when setting up marketing strategies.

A number of studies focus on comparing the destination image positioned by official sources with the destination image perceived by users of various kinds of social media, by applying content analysis. For example, the studies conducted by Stepchenkov and Jean [23] and Tussyadiah [24] compared images gathered from the DMO website and Flickr, while Song and Kim [25] contrasted the image of Guangzhou, positioned by the DMO on Twitter, with its image on Pinterest. The relevance of the comparison between the promoted destination image and the destination image revealed from the UGC has been proved by Jiménez-Barreto et al. [6] and Chang J-H, Wang S-H [26]. These studies confirmed that congruence between the projected and perceived destination images decreases the possible deviation of expectation from reality, thus affecting brand credibility, tourist satisfaction, and visit intentions.

Despite the fact that the destination image has been the subject of debate since the last century [27], content analysis for destination image marketing insights is fairly novel. The current study complements the body of work on this topic by applying content analysis combined with the use of machine learning.

3 Methodology

To explore destination image presented by DMOs and tourists on Instagram, this study applied netnography as a research method. Additionally, the Alpine resort Saalbach-Hinterglemm in Austria was chosen as the research context. The following section outlines the data collection and analysis procedure.

3.1 Data Collection

Data was collected from public posts shared on Instagram using *Phantombuster*, an automated data crawling software. Figure 1 outlines the data collection process. For the collection of UGC, posts captioned with the hashtag #saalbachhinterglemm were extracted. Although the destination Saalbach-Hinterglemm has a notable summer and winter season, this study was narrowed down to include solely the posts from the 2019/2020 winter season so as to compare the posts published by users and the DMO within a defined time frame. In addition, only posts written in English were considered. The language recognition was performed in Python using the *langdetect* module.

Next, *Phantombuster* was used to obtain publicly available information about Instagram users who published the collected set of posts. This step was to filter out

business accounts, whose posts might have been of commercial nature. The filtering process included the removal of profiles with the words “*saalbach*”, “*hinterglemm*”, “*leogang*”, and “*fieberbrunn*” in the profile name or the bio, and the removal of profiles with an enlisted business email. Because the neighbouring villages Leogang and Fieberbrunn are parts of the same ski resort, those keywords were included. Ultimately, the filtering process resulted in a final set of 1,448 posts. A similar procedure was performed to obtain the Instagram posts published by the DMO in which a total of 2,091 posts shared via the official Tourist Board Saalbach-Hinterglemm account (@saalbach_com) were retrieved. Likewise, the posts were filtered to include the winter season and posts written in English, reaching a final number of 85 posts.

Fig. 1. Data collection process for UGC (left side) and DMO (right side) Instagram posts.

3.2 Data Analysis

For further analysis, both the DMO’s and the users’ Instagram posts were split into two elements (*images* and *textual description*), and the data was organised into four data-sets: (1) DMO image annotations, (2) UGC image annotations, (3) DMO textual description, and (4) UGC textual description. The textual description refers to the caption of a post. To analyse pictorial content, Google Vision API was used to retrieve textual annotations of the images.

The annotations and the textual description were analysed with *Orange 3*, an open source machine learning software that enables textual data to be converted into features (i.e., vectors) [28]. In this research, the textual description and annotations of the images were treated as documents. As such, document embedding, which generates a vector for the document by embedding the words in the document [29], was applied using the pre-trained *fastText* model [31]. K-means clustering was then applied to group similar data points (vectorised annotations or vectorised textual descriptions) into clusters [32]. This method in particular was chosen to examine whether the posts could be divided into distinct clusters according to their content.

When applying the k-means algorithm, silhouette scores were calculated to identify an optimal number of clusters and to assure the reliability of the content analysis results. After obtaining the clusters, t-SNE dimensionality reduction was used for cluster visualisation in a scatter plot. The scatter plot thus presents the size and layout of the clusters in addition to which DMO posts overlap with the ones published by tourists, and, more importantly, where the DMO lacks posting coverage. The entire process was performed in the same manner for each of the four datasets mentioned above.

Subsequently, content analysis was carried out to identify emerging themes amongst the posts. A classical NLP pipeline [33] with lowercasing, removing stop-words, lemmatizing etc. was applied to pre-process the corpus. It included naming and categorising all the obtained clusters for both DMO and UGC annotations and textual descriptions based on TF-IDF (term frequency–inverse document frequency) weighting. Although state-of-the art NLP approaches such as BERT are available for text representation, studies show that for simple classification and clustering tasks conventional methods such as TF-IDF provide equivalent results [34]. Specifically, TF-IDF quantifies a word in the documents that implies the significance of a word to a document in the corpus. The results of each cluster were visualised with word clouds to gain a better understanding of data interpretation. Finally, the cluster categories were compared to find similarities and differences between the DMO and UGC Instagram posts. In this way, it was possible to assess the extent to which the DMO presentation on social media matched those of the users' destination image.

4 Results

4.1 Comparison of the DMO and UGC Image Annotations

The results suggest 8 clusters for the DMO image annotation and 3 clusters for the UGC annotation according to the silhouette scoring. Each of the 8 identified DMO clusters were named and categorised based on TF-IDF (i.e., words contributing to a cluster the most) as the following: *Mountainous winter landscape (5 clusters)*; *Winter sports (1 cluster)*, and *People and events (2 clusters)* (see Table 1). However, the clusters vary in size; clusters 1, 2, and 3 are more extensive than other clusters. Thus, the primary number of images represents the *winter mountain setting and the slopes*, whereas a smaller number of images portray *a person or a group engaged in winter activities*. Therefore, it can be concluded that the DMO concentrates mostly on creating a *winter mountain ambience*.

The same procedure was conducted for UGC annotations. Although UGC images' sample size is larger, the content seems to be more homogeneous. Thus, only 3 clusters were obtained. The clusters were named as follows: *People enjoying winter sports*; *Winter sports*; *Mountain landscape* (see Table 1). Compared to the amount of nature represented on the DMO images, the UGC images feature mainly *people*.

Table 1. Categorisation of clusters for DMO and UGC annotations.

Cluster	Words with the highest TF-IDF	Name	Category
<i>DMO image annotations</i>			
1	Snow Winter Sky Mountainous Landforms Mountain Geological Phenomenon Freezing Slope Mountain Range Glacial Landform	Mountainous landscape	Mountainous winter landscape
2	Snow Sky Winter Nature Geological Phenomenon Tree Cloud Freezing Atmospheric phenomenon mountain	Winter atmosphere	Mountainous winter landscape
3	Snow Winter Mountain Mountainous landforms Piste Hill station Geological phenomenon Slope Ridge Atmospheric phenomenon	Winter slopes	Mountainous winter landscape
4	Cable car Snow Cable car Winter Transport Geological phenomenon Sky Slope Hill station Vehicle	Cable car	Mountainous winter landscape
7	Sky Blue Pink Purple Cloud Red Winter Snow Violet Evening	Magical winter colours	Mountainous winter landscape
5	Skier Winter sport Recreation Slalom skiing Speed skiing Skiing Ski Ski Equipment Sports equipment Para-alpine skiing	Ski equipment	Winter sports
6	Crowd People Performance Rock concert Sky Concert Light Music venue Event Stage	Events / Crowd of people	People and events
8	Red Crowd Font Event Recreation Graphic design Team Art	Promotional posters	People and events
<i>UGC image annotations</i>			
1	Cool Friendship Selfie Fun Snapshot Black hair Photography Music venue Night Party	People enjoying winter sports, happy faces, ski wear	People and events
2	Skier Snow Freestyle skiing Sports Skiing Ski Winter sport Recreation Winter Sports equipment	Winter sports	Winter sports
3	Snow Mountainous landforms Mountain Winter Sky Mountain range Alps Hill station Cloud Recreation	Mountain landscape (nature, ski resort and infrastructure)	Mountainous winter landscape

Fig. 2. Scatter plot of DMO and UGC overlaying images.

Next, this study visualises cluster layout/overlays (see Fig. 2) to which the scatter plot revealed 4 clusters. The cluster marked in red refers to the DMO image annotations, whereas the other 3 clusters reflect the UGC annotations. The plot indicates that the red dots representing the DMO posts overlap across the 3 UGC clusters, suggesting that the photos from the DMO match pictures posted by tourists. Yet, because several DMO photos in the orange and the green cluster do not overlay with UGC, further analysis was conducted to see which photos posted by tourists are not covered by DMO.

Cluster 4 (orange) represents the UGC content of *People at the ski resort*. Since the area involving cluster 4 does not overlay with cluster 2 (red colour), this was analysed further. The findings show that these photos refer to *leisure, entertainment, and people*, with the most prominent annotations being *selfie, eyewear, helmet, smile, equipment, drink, beverage, clothing*, etc. In other words, this sub-cluster represents the photos of people in their ski clothing taking pictures during their refreshment break at the restaurants and ski-huts on the slopes (see Fig. 3).

Cluster 3 (green) relates to *winter sports*, with photos depicting people during their skiing activities or engaging in other winter sports. The analysis of the DMO photos has similar categories (*Winter sports; Ski equipment*), meaning that the DMO posts also encompass this category. This is confirmed by the overlaying cluster 2 (DMO) and cluster 3 (UGC). However, the scatter plot implies that the photos in this category are represented to a far lesser extent by the DMO posts than the UGC posts.

Cluster 1 (blue) represents the UGC posts that overlay the most with those from the DMO (see Fig. 4). These photos represent the *mountain landscape* and show mostly mountainous panoramas and skiing resorts in a winter setting. The sub-clusters with no overlaying DMO posts are mostly photos of the *Alpine village* or the *property and accommodation*, especially during the *night hours*, as well as *snowboarding and selfies*, or photos of the *people on the slopes in the skiing equipment* doing *winter sports*.

Fig. 3. Examples of UGC images not overlaying with DMO images.

Fig. 4. Examples of overlaying UGC and DMO images.

5 Comparison of the DMO and UGC Textual Image Description

The comparison of DMO and UGC textual image description was conducted in the same manner as described for DMO and UGC annotations. Overall, key topics for the DMO include *winter* and *snow*, the promotion of *Salzburgerland* and *Skicircus* areas, the slogan ‘*Home of lässig*’, and the events *FIS Alpine World Cup* in Saalbach and the *Freeride World Tour*. UGC has a broader topic of *a winter wonderland and the mountains*, *snowboarding* and *skiing activities*, and a seemingly well-accepted slogan of the ski resort ‘*Home of lässig*’. Overall, the results reveal a 5-cluster solution for the DMO and a 2-cluster solution for UGC. Similar to image annotations, there is a lower number of clusters for UGC textual content than DMO’s, implying that UGC is more homogeneous and random, whereas the DMO posts are rather structured and planned.

The following categories for the DMO clusters were revealed: *The view from the local mountaintops*, *Nice conditions & invitation to come*, *Promotion of the FIS World Cup and the Freeride World Tour*, *A perfect day* (see Table 2). Cluster 2 (*Nice conditions & invitation to come*) is the largest and represents most of the DMO’s content when it comes to textual descriptions. Cluster 3 contains a single post with no significant difference in the content; thus, it was assigned to cluster 2.

The two clusters from the UGC textual descriptions are approximately equal in size with the following categories: *Appreciation of nature and the winter activities during the winter holidays at the destination* and *Fun with friends and family* (see Table 2). Similar to the analysis with the image annotations, the DMO textual descriptions highlight nature and landscape, while UGC focuses more so on activities and people.

Table 2. Categorisation of clusters for DMO and UGC textual description.

Cluster	Content example	Cluster name
DMO textual description		
1	Today's view from the Schattberg down to Saalbach #saalbach #homeoflässig	The view from the local mountaintops
2	"Simply unbelievable what the @freerideworldtour athletes showed at yesterday's competitions in the @skicircus! We have some highlights for you. 📸 #saalbach #homeoflässig #skicircus #fieberbrunn #fwt20 #freerideworldtour 📷 fwt ddaher/jbernard"	Nice conditions, invitation to come, featuring a part of the ski resort; promotion of the destination and the events
3	The Audi Fis Ski World Cup in Saalbach Hinterglemm is on. 🏂🏂🏂 We wish all the best for the racers! 🌸🏂 #saalbach #worldcupsaalbach #homeoflässig #fisalpine	Promotion of the FIS World Cup and the Freeride World Tour
4	morning rides 🌄 the perfect start into a beautiful day on the slopes #homeoflässig #saalbach #hinterglemm #skicircus @skicircus	A perfect day
UGC textual description		
1	Happiness is first tracks in fresh snow 🌨️🏂 #travel #happiness #saalbachhinterglemm #wintervacay #ski #travel diary #travelgram #saalbach #austriaAT #skislife #skyphotography #saalbach_com #saalbachhinterglemmleogangfieberbrunn #snow #winterwonderland #travelphotography #tagsforlikes #instadaily #instalike #photooftheday #naturelovers #photography📷 #skicircussaalbachhinterglemmleogangfieberbrunn	Appreciation of nature and the winter activities during the winter holidays at the destination
2	"Back at the slopes of #saalbachhinterglemm. Sunny weather and good company. 🌨️🏔️🌞❤️ #lovethemountains #skiing #fun #outsideisfree #austria 📷"	Fun with friends and family

6 Discussion

This study aims to compare the extent to which the marketed destination image corresponds to tourist experiences on Instagram. Specifically, UGC suggests topics such as *fun*, *social interaction*, *casual environment*, *outdoor activities*, and *winter sports*. These themes indicate that tourists perceive the resort as a relaxing and casual destination. In comparison, some other ski resorts build an image of a high-end resort, party destination, or family resort.

This study presents congruency between the projected and perceived destination image. Hence, this research affirms the importance of tourists' destination brand image, as mentioned in previous literature [6, 10, 12]. If tourist experiences correspond to the stories delivered by DMO, the brand credibility increases and consequently, user intentions to visit, revisit, or recommend the destination also increase [6]. Moreover, tourists create an emotional bond with a destination according to its personality by choosing the brands or destinations that fit their own style [18]. Destination personality is usually described using human characteristics based on the brand experience, such as *cool* or *exciting* [35].

This research reveals tourists' acceptance of the destination's logo *Home of lässig* [Home of *cool*]. The critical aspect of the DMO's social media activities is communicating the values that determine the destination's personality and thus facilitating this emotional bond with the visitors [30]. In this case study, the communication of the destination's personality can be seen in the DMO's activity and posts. Moreover, the positive response of the users to such communication can be witnessed. Thus, this research confirms the impact of destination's personality communication so that visitors can identify with a destination.

Furthermore, the comparison of the DMO with users' posts reveals that the DMO generally delivers mostly *nature* and *landscape*-related content, whereas tourists tend to include both *nature* and *people* in their posts. The images for both UGC and DMO could be categorised into three themes: *winter mountain atmosphere*, *winter sports*, *people*. However, the majority of the DMO posts presented the *slopes* and the *snowy mountains* in the first category. A great deal of UGC posts relates to images of *socialising*, be that either selfies, people during winter activities, or people at a restaurant, bar, or in the street. Such content could be interpreted the following way: tourists come to the resort not only to enjoy winter sports but to also experience the immersion into a warm and cosy environment; to enjoy social activities with friends and family, take selfies, enjoy contemporary accommodation facilities, and visit trendy restaurants where they can talk about various topics and try delicious dishes. Undoubtedly, the main reason to visit a ski resort is to engage in winter sports, but without these add-ons, customers would be missing out on a peak experience [36].

7 Conclusion

This work provides deeper insights into destination image creation and user behaviour on social media and contributes to understand the effect of social media on DMO marketing strategy development. According to existing literature, social media marketing efficiency has been measured by user involvement: their interaction, influence, and intimacy [6]. DMOs most commonly measure the return on investment of social media effectiveness by counting the number of 'followers', 'likes', and the rate at which those numbers increase [1, 6]. Typically, netnographic research provides no insights on how the brand positioning strategy should be conducted. Thus, this study incorporates a qualitative analysis instead of the measurements mentioned above, thereby offering an alternative approach to the destination brand image assessment. This attempts to provide an in-depth insight into consumer behaviour on social media.

The findings suggest values and beliefs embedded in the posts instead of the quantifiable interacting aspects. In that case, market research, such as a visitor survey combined with a netnographic study, might be helpful.

Furthermore, this study provides several implications for DMOs by analysing similarities and differences between the Instagram posts created by tourists and the DMO. Although the projected image highly matches tourist experiences, not all the UGC posts' themes are covered by marketers, and vice versa. Such insights indicate opportunities for the improvement of a DMO's marketing strategy regarding their storytelling. A DMO could utilise the study's findings and adjust their marketing strategy by promoting the services and content appearing in the visitors' posts. For instance, an image of a cup of coffee amidst a winter scenery with an attractive caption could influence a prospective visitor by creating anticipation of fulfilling this desire [9].

Including and highlighting additional activities the destination has to offer aside from primary ski activities would be a strategic decision regarding the DMO's marketing activities promote the destination. For example, an additional offer may refer to ski huts, local dishes or activities such as night tobogganing.

Further managerial implications include promoting properties on the DMOs social media channels. The importance of a professional marketing strategy lies in the fact that DMO's social media activities influence the destination image and the intention to visit [7]. Essentially, this research presents deeper insights into tourist experiences at the destination and confirms their impact on adding value to the destination image.

However, this research is, naturally, not without its limitations. First, the analysis was not incorporated through the most commonly used performance indicators (e.g., user engagement), nor did it provide quantifiable data (e.g., the exact percentage to which the perceived user image corresponds to the projected destination image). For future research, we encourage an assessment of user engagement in regard to DMO and UGC matching content. Similarly, a quantitative measurement of destination image perception and intention to visit regarding content congruence is recommended. Saalbach-Hinterglemm has a clear, one-dimensional profile as a ski destination. For more diverse destinations, future studies could perform multilingual text analysis utilizing BERT in order to provide deeper insights. Despite its exploratory nature, this study offers valuable insights into the role of UGC on destination brand image.

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