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Why do we love the high line? A case study of understanding long-term user experiences of urban greenways

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Abstract

The High Line park (HLP) in New York City is one of the most successful contemporary greenway parks, inspiring urban planners, designers, artists, and administrators worldwide. This study provides a comprehensive understanding of user experiences in a long-term time frame (2011–2018) through the lens of online reviews. Using a mixed-methods approach, we conducted Latent Dirichlet Allocation (LDA) topic modeling to quantitatively identify the key topics that represent 34,060 reviews and 30,285 users, followed by qualitative analysis to inductively interpret the LDA topics. The results identified experiential, programmatic and physical elements of the HLP that are meaningful to users. Three primary components were found that make HLP successful according to users: spectacular visual and activity-related experiences, the historical transformation and cultural exploration, and the added value from park services ranging from amenities to on-site living performance. The article helps inform future decision-making and planning & design practices for future greenway projects.

Keywords Urban greenway, The High Line, Online review, Topic modelling, User experience

1 Introduction

1.1 Urban greenways and the High Line Park

Urban greenways are linear parks that are built on vacant lands or properties of railway lines, power lines, or edges of water bodies to create linkages between city neighbourhoods and amenities (Paneerchelvam et al., 2020; Watson, 2003). Walking paths, bike trails, gardens, and agricultural facilities are often designed as a part of greenways to accommodate various recreational activities. Some areas also develop greenways to connect natural habitats and mitigate urban biodiversity loss and fragmentation. With an increasing number of greenway

projects in the U.S. and around the world (Akpınar, 2016), studies have found the benefits of greenways include more physical activities, increased interactions with nature, and more local job growth (Dallat et al., 2014).

One of the representative examples of urban greenways is the High Line Park (HLP) in New York City (NYC), USA. Built on a historic and elevated railroad track, HLP (Fig. 1) is a 1.45-mile-long greenway park located on Manhattan's West Side. Users can walk and enjoy different views of the city from the park. There are gardens, seating areas, viewing decks, art displays, and food vendors to offer various recreational activities for visitors. Although the park opened to the public somewhat recently in 2009, it has become one of the most popular destinations in NYC. Tripadvisor.com has ranked HLP as the ninth most popular attraction of the city ahead of many historical locations such as the Grand Central Terminal and Times Square (Tripadvisor, 2021). Because of its success, HLP is among the most influential urban

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Fig. 1 Location of The High Line in Manhattan, NYC

development projects in the U.S. and has received significant recognition by the public and design professionals through multiple awards (Dagenais, 2018; General Design, 2010). It also serves as a worldwide inspiration for cities like Philadelphia, Chicago, Miami, and London, which also desire to build similar projects (Greene, 2018). Despite the significant recognition, there is also controversy surrounding the HLP. This disparity in particular often focuses on urban social equity, where the HLP is purported to accelerate unevenly developed public spaces that lower income neighbourhoods don't have close access to. Loughran (2014) contends that the HLP represents "an effort by city governments and elite private interests to leverage parks for profit" (p. 49).

1.2 Post-occupancy evaluation and user experiences

To maximize the benefits of greenway parks, it is important to gain knowledge on how people value and experience the parks and to recognise the factors affecting their visiting behaviours (Gifford, 2016). This could lead to a better understanding of the human–environment relationship to ensure key park qualities that promote more usage. Currently, researchers and professionals are using post-occupancy evaluation (POE) to investigate the uses, experiences, satisfactions, psychological perceptions and sociability of a built environment from the perspective of users (Mehta, 2014). For many years, POE has been an important part in the public architecture field used for assessing housing, hospitality, health, and dining to help improve user satisfaction, react to user demands, and lower the invest risks (Cooper, 2001; Zuo et al., 2011). Some public space projects such as gardens, squares, plazas, and streets have also been studied through POE (Lygum et al., 2019; Mehta, 2014). However, the challenges of conducting POE for larger urban design or landscape architecture projects such as HLP can be extremely difficult (Cooper Marcus, 2008). There are risks related to intrusiveness, reactivity, oversimplification, and inconsistency (Gifford, 2016; Scrimshaw & Gleason, 1992). Typical observation and survey methods are also constrained by their high labour and time costs (Donahue et al., 2018; Song et al., 2022a). Sim et al. (2020) recently examined the user experiences of HLP through field observations and surveys. However, the data collection period only lasted for two weekdays and two weekend days. Other existing literature rarely gathers a large dataset for this purpose, nor are researchers conducting POE to study the user experiences of urban greenways.

1.3 Social media research in landscape architecture and urban planning

Recently, researchers have tested the potential of using social media and other big data datasets to overcome

some of the limitations of traditional methodologies (Fernandez et al., 2022; Song et al., n.d.). The photos, text, and metadata including time and coordinates of social media posts provide a wealth of knowledge about user behaviours, emotions, and attitudes to the park (Wilkins et al., 2020). Many studies have used social media to estimate park visitations or usage (Sessions et al., 2016; Song et al., 2022b). There is also empirical evidence on the correlation between social media postings and real site visitation (Fisher et al., 2018; Tenkanen et al., 2017). Place perception, sense of place, and landscape design quality and effectiveness are also among topics that have been studied using social media (Song & Zhang, 2020; Zhang & Zhou, 2018). However, few studies have focused on the user experiences of urban greenways such as HLP which have become an important part of urban green spaces.

This study utilizes online reviews from Tripadvisor.com to evaluate user experiences of HLP visitors over a long-term time frame. We study landscape perceptions and sense of place through the lens of language (Wartmann & Purves, 2018). By integrating a mixed-methods approach, we aim to understand the following: 1) what attracts users to the park? 2) what are the users' emotional ties to the park? We identified a comprehensive list of user experience constructs in the HLP. Significant use patterns and influences of HLP (both anticipated and unanticipated) are discussed along with suggestions on future planning, design, and management practices.

2 Methodology

2.1 Data collection and processing

Tripadvisor is currently the most popular travel guidance platform in the world with 884 M reviews and opinions and 463 M monthly visitors (Tripadvisor, 2021). It is widely used as a data source in tourism studies (Taecharunroj & Mathayomchan, 2019) and has also been used in recent urban design studies (Song et al., 2021). This study collected 34,060 Tripadvisor reviews of The High Line as our main dataset representing the user experiences and opinions of the park. All reviews were in the English language and were from the NYC attraction page "The High Line" under the category "Parks, Scenic Walking Areas." Our reviews cover a long-term time frame from July 2011 to June 2018 with 30,285 site user participants (Fig. 2). It is noteworthy that HLP's phase 3 was opened to the public in September 2014, which may explain a sharp increase of review numbers in 2015. The majority of reviews were positive with 93% of reviews rated 4 (positive) and 5 (very positive). Only 1.4% of reviews were rated 1 (very negative) and 2 (negative). Reviews shorter than 5 words were excluded in this study.

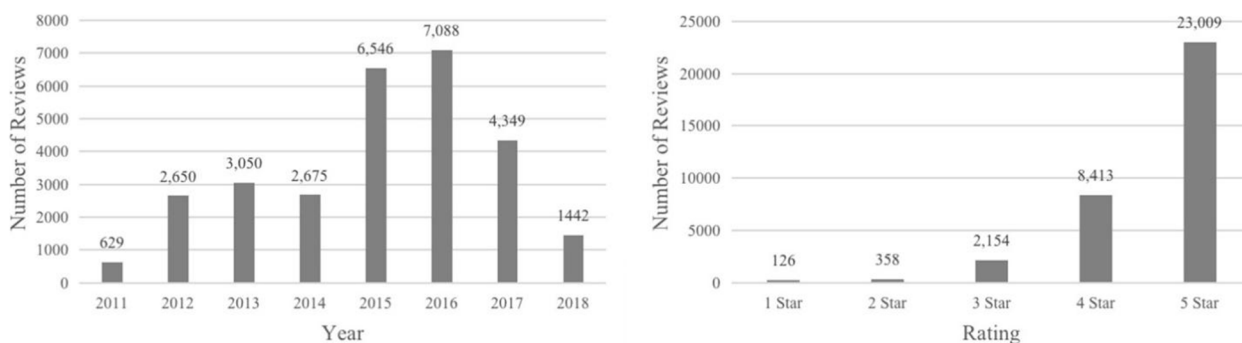


Fig. 2 Yearly reviews numbers (left) and rating distribution (right) of The High Line (reviews for both 2011 and 2018 are counted for only half of a year)

2.2 Topic modelling

Our data includes a large amount of textual information created by the HLP users with 1,941,612 total words. Due to the large quantity of reviews, it would be difficult to gain an encompassing initial understanding of the data or to thoroughly review the information available through traditional qualitative methods to identify the major site experiences. A structured approach was needed to help ensure the comparability of grounded and inductive interpretations. Therefore, we used a topic modelling approach, Latent Dirichlet Allocation (LDA), to quantitatively reduce all reviews into different topics and the pertinent information under them.

LDA is a generative statistical model that fits each document with a distribution of underlying topics and each topic with a distribution of underlying topic terms. It is widely used to discover the hidden structures of reviews, comments, or open-ended answers (Guo et al., 2017). We opted for LDA because it excels in analysing vast amounts of data and provides straightforward insights into the underlying patterns of review languages. Since Tripadvisor users typically compose longer reviews compared to platforms like Twitter, which often feature shorter texts, LDA is particularly suitable for this use case. As the hypothetical example illustrates in Fig. 3, the LDA results are composed of different topics which consist of different LDA terms. The LDA terms in a topic have higher probability to have co-occurrence relationships in a review. Each LDA term has a term weight, and a higher term weight signifies the LDA term is a more pertinent indicator of the topic meaning. What’s more, LDA can also calculate the topic weights for all reviews based on how pertinent the topic is with the meaning of the review. In Fig. 3, Topic #2 dominates Review #1, Topic #1 dominates Review #2, and Topic #1 and Topic #3 are both highly connected with Review #3.

Before any topic modelling work, all textual data were first transformed into appropriate bag-of-words

representations. Each review was represented by a list of lowercase words through a process called Tokenization. Numbers, non-English words, punctuations, and single characters were excluded. 127 stopwords (Bird et al., 2009) such as “am”, “it”, “the”, “is”, “in” were deleted. We also performed stemming and lemmatization to our corpus to turn similar words into single form, for example, “dogs” to “dog”, “likes” to “like”, and “saw” to “see.”

An LDA model needs to specify its topic numbers before running for topics and LDA terms. We use a Cv Coherence value which provides a quantitative evaluation of whether there is a high level of statistical similarity shown in the corpus of the LDA terms in a topic (Röder et al., 2015). As Fig. 4 shows, Cv Coherence values for topic numbers 2 to 29 were calculated three separate times. The average Cv Coherence (orange line) rose from 2 topics and peaked at 15 topics. Therefore, 15 topics (Cv Coherence score 0.522) were selected for our final LDA modelling from which we kept the top 40 LDA terms for further analysis.

2.3 Topic interpretation

After LDA analysis, we followed a content analysis workflow (Fig. 5) to interpret the meaning of each topic and to shape our topic descriptions. Given the large amount of LDA terms, understanding LDA topics is considered a challenging task (Song et al., 2021). There are concerns on the ambiguities from overlapping meanings of our topics as each topic often consist of multiple concepts. Another major threat is imposing researchers’ own pre-conceptions about the HLP instead of understanding based on the perspectives of site users. To address these issues, we implemented four controls:

1. Before creating topic interpretations, we fully understood the semantic context of each LDA term by reading sentences with the LDA terms from the top 100 reviews of each topic.

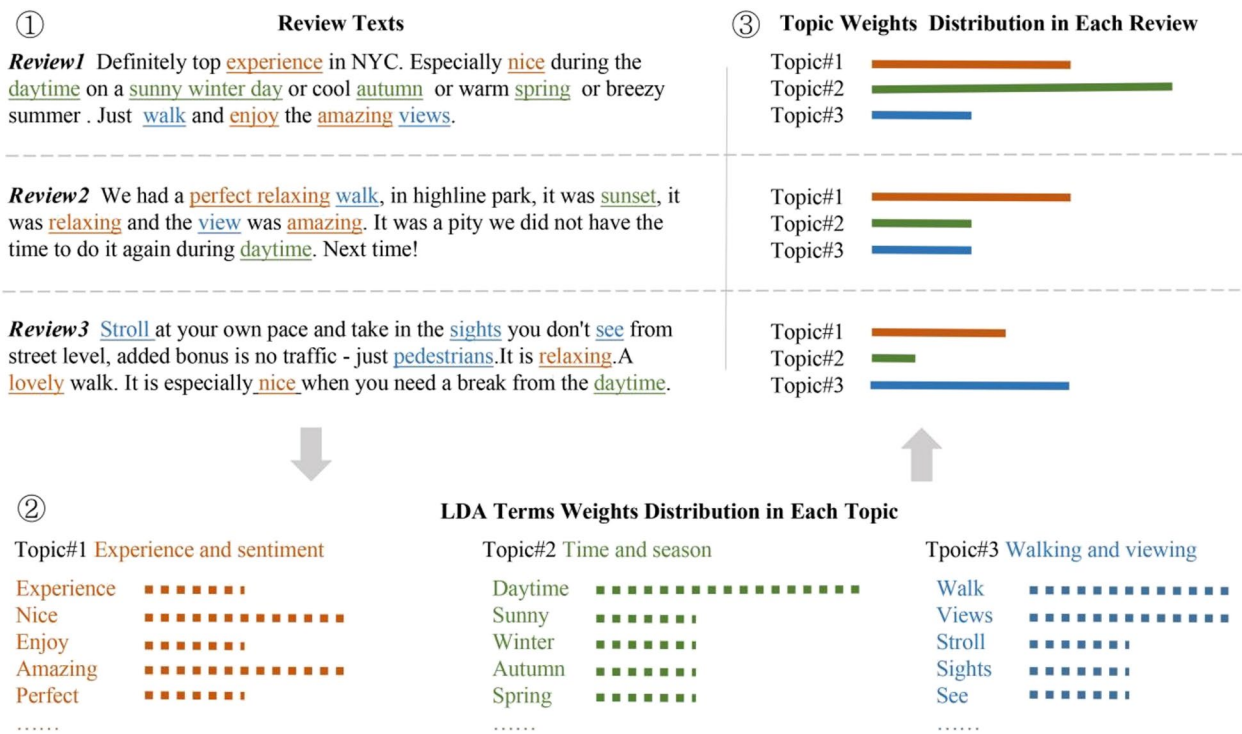


Fig. 3 LDA topic modelling illustration

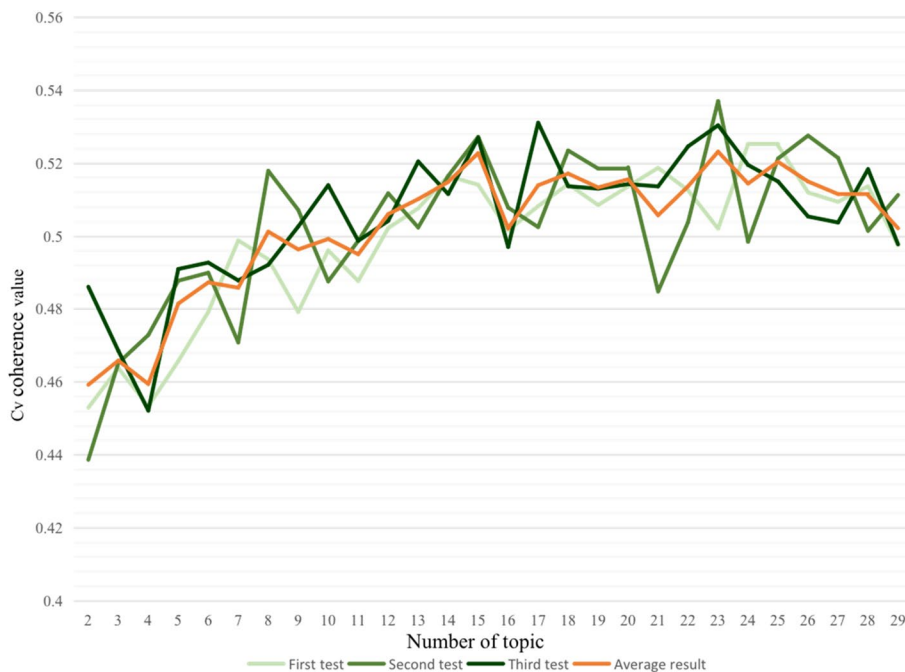


Fig. 4 Determination of the number of topics based on the Cv coherence value

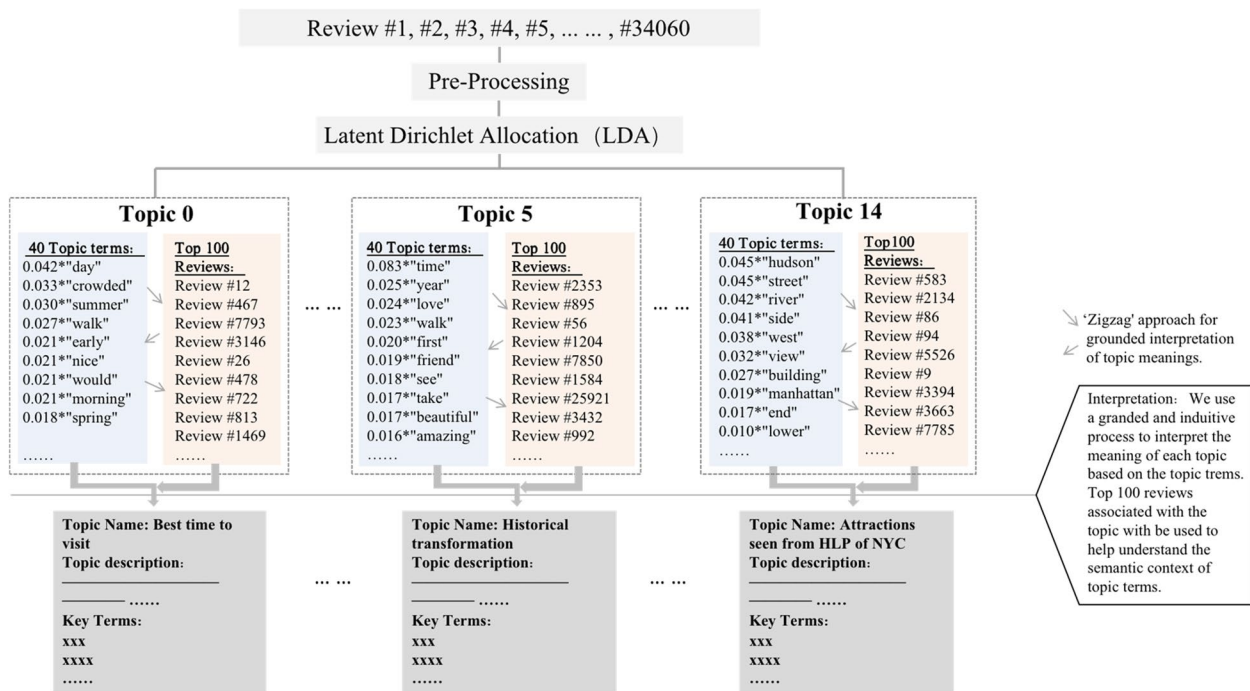


Fig. 5 Flowchart of our mixed method including LDA modeling and qualitative interpretation

2. We prioritized LDA terms with high LDA term weights when creating topic interpretations.
3. A ‘zigzag’ approach was used. One researcher gave the first interpretation based on meanings of LDA terms and the top 30 reviews. The researcher then read the next top 30 reviews to confirm the previous interpretation, clear uncertainties, and make modifications. Then the researcher went to the next 30 reviews until a stage where the researcher felt confident that he or she gathered enough information to conclude.
4. All researchers who have visited the HLP participated in the topic interpretation process to alleviate individual bias. Interpretation is conducted individually first, then all authors met and discussed the differences and similarities of their interpretations before concluding final results. To better understand the reviews, visitors’ uploaded pictures from Tripadvisor.com were also reviewed, which helped refresh authors’ memories about the HLP.

2.4 Temporal patterns of topic salience

Knowing the topic popularities or how often each topic was mentioned in the dataset helped us identify the central themes of the HLP. We used Topic Salience S_i to measure topic popularity (Eq. 1). A higher Topic Salience

means the topic has a greater possibility to have higher topic weights for a review in our datasets.

$$S_i = \sum_{j=0}^N (W_{ij})/N \tag{1}$$

where S_i is the salience of Topic $i=0,1,\dots,14$; W_{ij} is weight of topic i for review $j=1,\dots,N=34,060$;

Given the important influence of seasonality on the HLP landscape and the park visiting experience, we also calculate the S_i based on different months for all topics to understand the monthly temporal patterns on the topic popularities. For better representation, we kept only the full year data between 2012 to 2017. Tripadvisor asks users to differentiate the time of posting the review and time of site visitation to more clearly illustrate the timing of their reviews. Figure 6 shows the distributions of differences between posting time and visit time for the HLP. We see the majority of reviews (76.71%) were posted within 20 days of the site visits, indicating timely feedback from users as well as more accurate accounts of experiences. This ensured the high accuracy of our accounts to represent the shared experience of HLP.

3 Results

3.1 Topic descriptions

Our topic modelling results are presented in Table 1 including topic name, category, description, key LDA

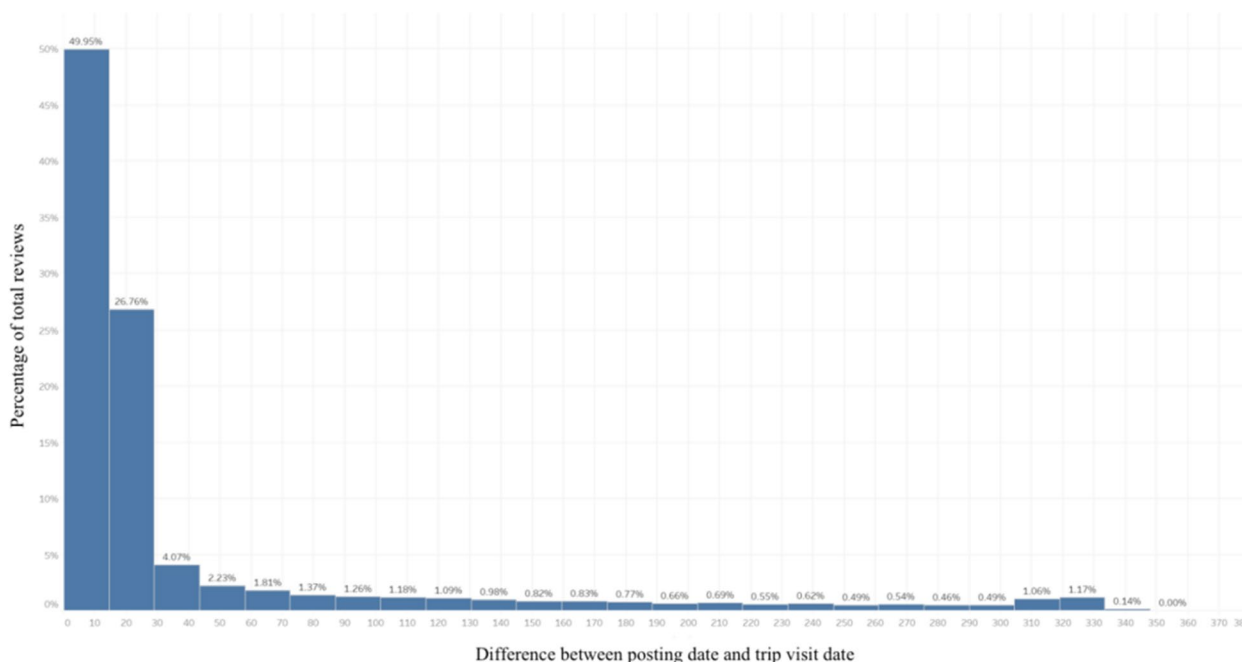


Fig. 6 Distribution of differences between posting date and trip visit date

terms, and review examples. Only the highlighted words in the review examples are related to their corresponding topics. It is normal that one review has meanings from multiple topics. Among 15 topics, T0 (Best time to visit), T1 (Attachment and satisfaction), T2 (Away from traffic), T4 (General perceptions), T8 (Walking and viewing) and T12 (Activities) are related to user experiences which demonstrate users’ attitudes, emotions and behaviours associated with the park visit. T3 (Accessibility and guidance), T6 (Park features), and T9 (Planning and design) are topics with reviews that specifically comment on how the park was designed and planned. T5 (Historical transformation) and T11 (Vernacular culture and locals) talk about the historical and cultural background of the site. T7 (Location and nearby attractions) and T14 (Attractions seen from HLP of NYC) mention the significant locations, surrounding amenities, and physical features such as a subway, restaurants, markets, and the rivers. T10 (Well maintained) and T13 (Park services and amenities) address park management concerns such as landscaping, facility maintenance, food accommodation services, and art display programs. The variety of significant topics coming out of LDA modelling reveals how the HLP can be perceived and viewed from different angles. Besides, those topics might have minor overlap with each other due to the shared elements throughout the nature of the park and visitors’ perceptions. For example, Topic 8 (Walking and viewing) specifically highlights the “walk and view experience” of the park, using key terms like

“walk”, “view”, “see”, and “walked”. In contrast, Topic 12 (Activities) emphasizes the range of activities that visitors can enjoy at the park, such as “walking”, “relaxing”, “resting”, and “having lunch”.

3.2 Topic salience and temporal patterns

To identify significant factors that draw visitors to the park, we use the data representation platform Tableau to visualize the overall salience value of each topic and the magnitude of the differences among them (Fig. 7). The darker the color and larger the size of the rectangular form, the greater the topic salience. Following the two most popular topics T8 (Walking and viewing) and T7 (Location and nearby attractions) with a high salience value around 0.10, T12 (Activities), T6 (Park features), T0 (Best time to visit), T5 (Historical transformation), and T4 (General perceptions) show similar popularities with salience values around 0.08. Then T2 (Away from traffic), T1 (Attachment and satisfaction), T9 (Planning and design), T11 (Vernacular culture and locals), T14 (Attractions seen from HLP of NYC), are the next tier with salience values between 0.04 to 0.07. Finally, T13 (Park Services and amenities), T3 (Accessibility and guidance), and T10 (Well maintained) were the least salient groups with relatively low mention in our review corpus. The highest salience value from T8 (Walking and viewing) is around 5 times that of the lowest T10 (Well maintained). Compared to a previous study (Song et al., 2021), our topics show less span between their popularities.

Table 1 The 15 modelled topics and their descriptions

Topic name	Description	Key LDA terms	Review examples
Best time to visit (Topic 0)	This topic is primarily about the ideal timing to visit The High Line. People tend to choose warm months during the spring or summer while the plants are growing well. Times for excellent views such as sunset are mentioned. Comments also highlight when the busy times are such as on the weekends or during the summertime	day, summer, early, morning, spring, winter, weekend, time, cold, sunny, weather, afternoon, Sunday, warm, Saturday	Especially nice during the week on a sunny winter day or cool autumn day or warm spring day or breezy summer day It's best to visit in spring or in summer when the flowers are blooming. Might be crowded with tourists though, but worth seeing
Attachment and satisfaction (Topic 1)	This topic focuses on the feelings and subjective reactions of site users' visits to the park. The users expressed their satisfaction and sentiment about the park. It is mostly an enjoyable and worthwhile trip for them. Most visitors think they will come back again and recommend it to those who have never come. Most visitors think the park is beautiful	love, friend, beautiful, amazing, great, family, enjoy, perfect, awesome	We had a perfect relaxing walk, in highline park ... it was relaxing and the view was amazing Must GO twice because it is as beautiful during the day or night ... you will enjoy it! Simply amazed at the breathtaking scene. Share it with a loved one ...
Away from traffic (Topic 2)	This topic is about the impression that users are walking on The High Line close to the streets but also away from them. It serves as a respite from the city's hustle and bustle and busy traffic on the streets, making people feel relaxed. This park works as an oasis in the city that provides a space for walking or strolling to get a pleasant experience	Away, street, walk, traffic, hustle, way, view, stroll, Manhattan, escape, peaceful, quiet, oasis, noise	Stroll at your own pace and take in the sights you don't see from street level, added bonus is no traffic —just pedestrians Walking along The High Line is relaxing... you need a break from the hustle and bustle of the city A little oasis in the middle of the city—a lovely walk . Step away from the crazy of the city and walk above it
Accessibility and guidance (Topic 3)	The topic is related to comments about the process of navigating the park. Guides and tours or maps can provide useful information such as the historical context and exciting stories. The HLP has excellent accessibility. There are many entrances and exits to use, but there are also elevators at some entrances	Tour, elevator, access, stair, trial, walking, guide, easy, accessible, free, path, exit, stroller, wheelchair, location, bike, entrance, check, available, climb, map	We did a guided walking tour with FreeTours On Foot. Our guide ... was amazing! There is easy access off of The High Line. There is also elevator access
General perceptions (Topic 4)	The topic includes some general expressions with few specific indications. Users describe wide-ranging but common descriptors for their perceptions of place. Some visitors with high expectations were disappointed when visiting the park due to a poor environment, and vice versa	time, see, walk, people, think, area, trip, good, glad, day, say, going, know, thought, look	Walked most of it, quite busy at the time . We, sadly were a bit disappointed with the walk . Plenty of people about but not a lot to see or do at the time we were there I definitely would have stayed longer if I had the time and plan on going back!
Historical transformation (Topic 5)	This topic primarily illustrates the historical awareness of users. Many visitors think it is a very creative idea to transform the old railway tracks into a public park that combines history with functions. The elevated park provides a new perspective (above street level) to see spectacular views of the city	old, track, elevated, railway, rail, train, railroad, walkway, disused, abandoned, converted, idea, turned, see, mile, built, way, former, path, transform, street, area	A beautiful way to walk and see historic parts of Manhattan it's an old railway that's been converted to a garden and walkway An old elevated railway line that has been converted into a linear park high above the city streets What a great way to utilize old railways !! A wonderful walkway with beautiful flowers and interesting use of left-over rails

Table 1 (continued)

Topic name	Description	Key LDA terms	Review examples
Park features (Topic 6)	The topic includes park features and interesting decorative designs in different locations such as plants, seating, sculpture, and art installation. Users like the variety of these site elements and features	walk, way, art, well, interesting, area, point, route, work, plant, seating, sculpture, various, planting, installation	Walk through the plants and trees planted along the route The whole length taking in the art exhibitions , the sculptures , the greenery, the view and the architecture. Art installations were interesting and lots of viewing galleries and seating
Location and nearby attractions (Topic 7)	The topic describes that the park has an excellent location. It is very close to Chelsea Market, the Meatpacking District, and Whitney Museum. There are many restaurants around the park to choose from where people can find their favorite food and drink. Most visitors thoroughly enjoy the great walk and beautiful views provided by the park	Chelsea, market, district, meatpacking, lunch, Whitney, restaurant, view, museum, area, stop, south, north	Breakfast in the meatpacking district—then see the new Whitney Museum . Walk The High Line to Chelsea art galleries (24th, 25 th , 26 th , etc.) Take in the sights around the Chelsea Market Then wander down through the meatpacking district , shopping and into the Chelsea's Market for lunch . Yum!
Walking and viewing (Topic 8)	The topic focuses on the action of walking and viewing, as well as the beautiful scenes and different perspectives offered by the park. The users stroll and take pictures which leads to relaxation	walk, view, see, nice, walking, beautiful, perspective, enjoyed, lovely, unique, interesting, walked, wonderful	Take your time and enjoy the views and also how cool this structure is Lot of fun walking up high, nice views and amazing plants. Great way to see New York This is a great way to explore the city with a different perspective . It was lovely
Planning and design (Topic 9)	This topic includes comments about opinions related to the value of the park to urban planning and city development. It encompasses The High Line's overall contribution to the well-being of people	space, urban, green, design, oasis, idea, public, area, landscape, creative, concrete, architecture, history, industrial, unused, Manhattan, unique, project	if you have studied urban sociology, public policy, urban studies, public space usage... this is a must see in New York. Read the history before you go and you will be mesmerized Highline is nature meets city truly unique use of old-world resources for, green use of urban living! I would guess, on the "Promenade Planteee" in Paris but designed in a more interesting style
Well maintained (Topic 10)	The topic primarily illustrates the high level of maintenance of the park. Most visitors think the landscaping and planting have been beautifully planned and well-maintained. The concept is full of vision and determination, which is perceived as a terrific use of an old railway line. The design and maintenance of the site makes the park a must-see spot in New York	well, beautiful, designed, landscaped, project, maintained, nicely, kept, executed, planned, thought, Paris, volunteer, vision, promenade, Lego, planted	The landscaping and planting have been done so well and obviously is well maintained . I was pleased to hear that more development of The High Line is planned The Highline is beautifully kept without a trace of litter. This is notable and admirable because visitors were eating lunch, or having a cup of coffee when we visited...
Vernacular culture and locals (Topic 11)	This topic focuses on the suggestions from the local population. Some locals think the park is too crowded and that too many visitors leave no room for locals on The High Line. Yet, they highly recommended the park to others	people, tourist, local, experience, visitor, attraction, neighborhood, best, changing, season, love, native, architecture, offer, fun	Too many visitors . They are all having too much fun . please go do something else so there is room for us locals on The High Line It has now become a tradition to go for a predinner walk along the Highline when we have business visitors from out of town. For many it is the only non-boardroom experience

Table 1 (continued)

Topic name	Description	Key LDA terms	Review examples
Activities (Topic 12)	The topic focuses on activities in the park, characterizing it as a place for more passive undertakings such as walking, strolling, taking a picture, reading on the benches, having lunch under the sun, sightseeing the city, and relaxing	sit, walk, enjoy, view, take, bench, watch, relax, plenty, stroll, flower, stop, rest, plant, sun, watching, chair, tree, walking, lounge, lunch	walk and enjoy the outdoors. There are some nice views of the water and some flowers along the walkway. There are some nice spots to stop and take photos There are little nooks and crannies you can sit down in to just read a book, eat your lunch or just enjoy the sunshine. The proliferation of greenery along the walk is great, as is the view
Park services and amenities (Topic 13)	This topic describes amenities offered by the park. There are many vendors in the park selling snacks and ice cream. The park is near restaurants and souvenir stores, and people can purchase food to enjoy while walking around the park. The restrooms are clean and the water features and views are attractive. The users provide two primary suggestions to other visitors: put on a pair of comfortable shoes and bring some water	food, water, vendor, drink, ice, cream, coffee, snack, stall, buy, shade, selling, shop, fountain, bring, grab, shoe, eat, bar	There were three areas with kiosks selling gifts/souvenirs, plus there were musicians and water /popsicle/ snack vendors along the way. There is also a playing area water feature for little kids to splash in Superb views and vendors selling ice cream , pop-sicles and drinks are very welcome on a hot day
Attractions seen from HLP of NYC (Topic 14)	The topic describes the variety of sights you can see on the HLP. The visitors can see the Statue of Liberty, Hudson River, Empire Building, and New Jersey from the park. The park is also located near the subway. This topic provides some advice on the travel routes for visitors	Hudson, river, side, west, Manhattan, lower, yard, north, south, liberty, avenue, Gansevoort, Empire, section, Jersey, view	Nice walk where you can see some of the famous sights like Empire state building , Statue of Liberty (in the far distance) and Hudson River If you want a view on the west side of Manhattan , overlooking the Hudson River towards New Jersey .

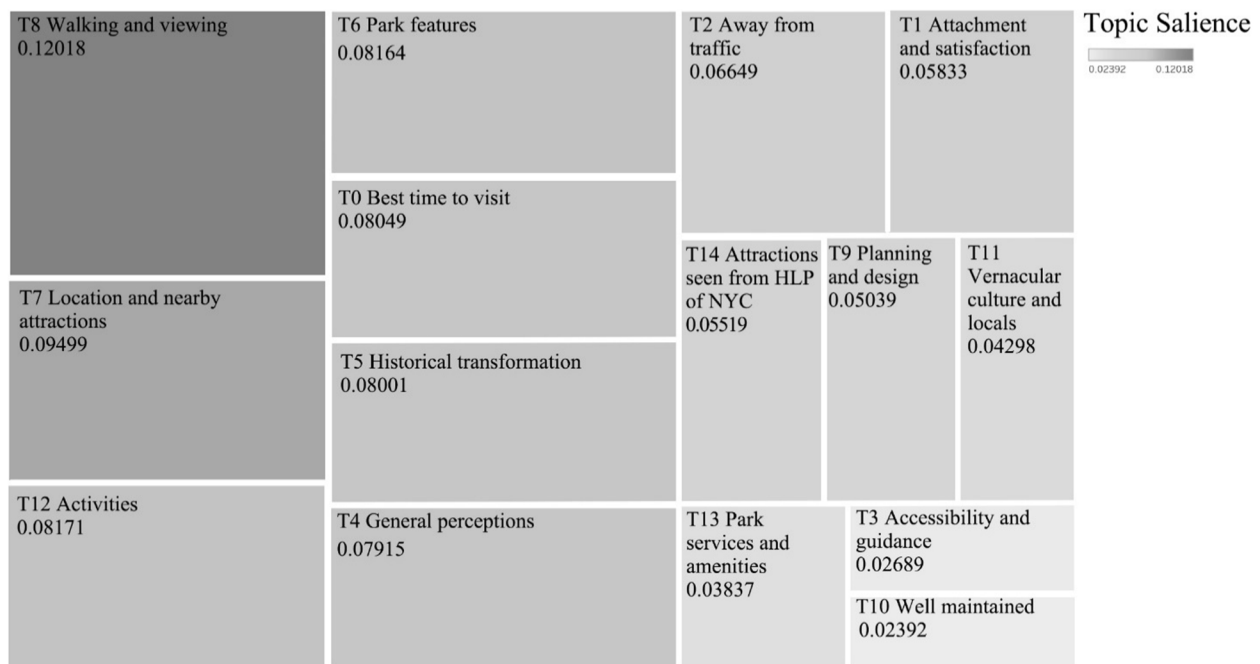


Fig. 7 Visualization of topic salience

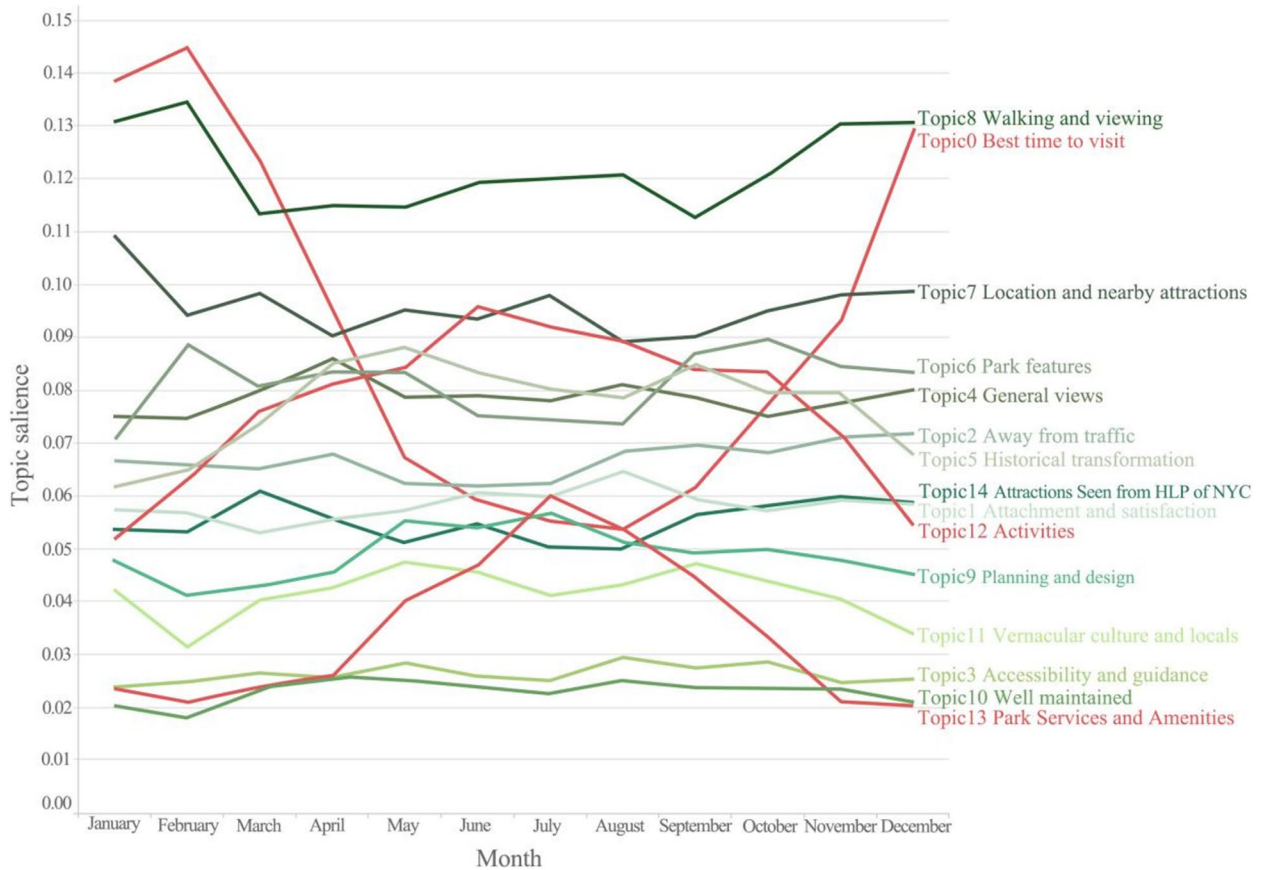


Fig. 8 The temporal patterns of topic salience values

The monthly temporal patterns of salience values of each topic are shown in Fig. 8. Two different patterns of temporal salience values are identified, fluctuating between seasons and showing stability across seasons. The fluctuating patterns (red) include topics related to visiting time, activities in the park, or facility use in the park; while the stable patterns are more pertinent to topics like city landscape viewing, culture and localities, or park planning and design. For example, T0 (Best time to visit) presents a big U curve, with the colder seasons between November and March receiving a much higher topic salience and the relatively warmer or hot seasons between April and October showing a much lower topic salience. This finding seems rather counterintuitive, so we re-read the top 100 reviews and determined that visitors usually mentioned the inclement weather when they visited the HLP in cold seasons, and optimistically imagined that the landscape would be much better in warmer Spring and Summer days. For instance, "...All the plants were dead when we went in January. It's a nice walk though and I imagine in warmer months it would be lovely..." (Review#23536); "We visited The High Line on a cold day, I could see the attraction but I really think this is something only enjoyable in the spring or summer months." (Review#1363). The fluctuating patterns also include T13 (Park services and amenities) and T12 (Activities), where the salience values are much higher in warm seasons and lower in winter seasons, as in warm seasons people can conduct more activities and better use the park services.

On the contrary, other topics' salience remains stable across seasons (green), especially for topics pertaining to city attractions, city traffic, park accessibility, and culture and locals. T7 (Location and nearby attractions), which relates primarily to the nearby shops and markets, shows that they are always busy and attractive in downtown Manhattan no matter whether in winter or summer. That is why the topic salience is largely stable with a higher value throughout the year. In a similar vein, the topic salience values of T2 (Away from traffic), T9 (Planning and design), T11 (Vernacular cultures and locals), T3 (Accessibility and guidance), and T10 (Well maintained) are also stable. It is noteworthy that during the winter seasons, despite visitors not having the same exciting park experience as in Spring or Summer, for instance, during December through February, T8 (Walking and viewing) gains a relatively lower value compared with the rest of the year, they understand that this is largely associated with the weather and climate conditions. Accordingly, T1 (Attachment and satisfaction) remains stable year-round as well indicating that the HLP is popular regardless of the season. This is substantiated by the fact that 93% of reviews are positive in visitors' ratings.

4 Discussion

By integrating a mixed-methods approach combining LDA topic modelling and qualitative analysis, our research provides generalizations of HLP experiences grounded from a large user group. For the first time, we revealed a comprehensive and integrated picture of what the shared long-term experiences, meanings, and events of the HLP look like. Our study utilized a methodology that was unique in comparison to other studies, as we incorporated large amounts of user-generated data for large urban sites such as HLP, which are typically challenging to investigate using traditional approaches. We collected data from Tripadvisor reviews, which allowed us to gain insight into users' experiences and preferences by analyzing their open-ended responses. Through this process, we were able to identify important topics that emerged and examine their meanings. We utilized a combination of qualitative (inductive) methods and LDA, which is a mix of machine learning and human interpretation. This approach helped to minimize the risk of oversimplification often associated with purely quantitative, top-down approaches. Our 15 resulting topics identified the perceptions, opinions, and perceived environmental factors regarding the HLP. These topics revealed the users' cognitive, affective, and evaluative perspectives on HLP (Yin, 1999). We also quantify the salience of each topic and their temporal patterns to further enhance our understandings. All of these endeavours can help inform why HLP is a beloved greenway park and provide implications for future planning and design practices.

4.1 General comments

Our results confirm that the HLP is a successful urban greenway park that provides year-round rich and satisfactory experiences for site users. Clearly, with eight million visitors per year (Matthews, 2019), the HLP (Lin et al., n.d.) is a lovely attraction and offered tremendous public benefits to NYC on public health, social well-being, and economic vitality like many other parks explored in previous case studies (Larson et al., 2016; Lin et al., n.d.; Park & Kim, 2019). Since most people give higher than four-star ratings (Fig. 2), it is not surprising that terms like 'love', 'beautiful', 'amazing', and 'enjoy' in T1 (Attachment and satisfaction) were widely seen in our reviews and mentioned consistently throughout the year (Fig. 8). T2 (Away from traffic) indicates a sense of respite and restoration from the park and is also a significant topic in a previous study on the nearby Bryant Park (Song et al., 2021). Stress reduction and comforting activities on HLP are mentioned in T12 (Activities), such as sitting, strolling, sunbathing, eating, plant watching, etc., and are much needed for people living in one of the busiest city

(NYC) in the world. Walking and viewing (T8) are considered as simple and basic activity types but they are still most significant topic in our results. Park experiential and programming interventions should still focus on improving the quality for both walking environments and views to encourage usage.

4.2 Historical transformation

City revitalization projects like HLP have the potential to weave local stories and community pride into the landscape. However, a preservation vision does not come to people's minds automatically. The HLP made efforts to preserve NYC's history and culture, both physically and in the minds of park visitors. The abandoned rail is a living history which is realized through project planner and designers' efforts. When the construction started in 2004, the beds, soil, plants and rails from the original High Line were lifted (David & Hammond, 2011). Each rail was marked with a GPS coordinate and put back exactly in its original position. To keep the wilderness of the rail landscape, as well as to keep the natural landscape, the plants were also carefully selected in a 100-mile radius. This is another way to maintain the vernacular landscape and culture. The horticultural designer tried to choose plants that could survive in all seasons. The complex combination of weather microclimates reflects the original conditions of the HLP, and the selected plants mirror those naturally occurring plant communities.

As result, many visitors recognized the historical preservation efforts of the park and expressed their appreciation of the HLP transformation. Our reviews show that to 'convert' the track to a park is a 'brilliant' idea of urban planning overall (T9 Planning and design). Terms like 'innovation', 'brilliant', and 'creative' were mentioned thousands of times in our corpus, for example, "...Fans of urban planning will especially enjoy this innovative urban reuse of an abandoned elevated railway..." (Review #33271), and "The High Line is an example of what imagination, determination and cooperation can achieve against all odds. To experience that in New York City is nothing short of brilliant!" (Review #32925). The fact that NYC could make the HLP happen and open free to the public is recognized as a powerful vision and big achievement of the city. The positive sentiments towards the NYC government stemming from the HLP reveal the project through a different and significantly more positive lens than previous studies that criticize its deteriorating effects on urban gentrification (Lang & Rothenberg, 2017; Loughran, 2014). This underlines the varying perspectives between HLP users and sociological experts. The HLP's creation of 'negative externalities' on social equity issues must be weighed alongside the many beneficial effects to its eight million annual users. We suggest

a holistic view that weighs the cost and benefits of city revitalization projects be considered in future similar project developments.

4.3 Locations and designs

The HLP has unique advantages associated with its location, elevation, and linear form. First, the HLP lies in downtown Manhattan with rich urban landscapes, ranging from skyscrapers to the hustle and bustle of traffic. T7 (Location and nearby attractions) has the second highest salient score of 0.09499). Great landmarks such as the Empire State Building, Statue of Liberty, and Hudson River constitute a distinct topic of T14 (Attractions seen from HLP of NYC), in which people expressed their enjoyment to see those famous sights. Were it not in a metropolitan downtown, the project may not be so successful. For instance, there are other elevated greenway projects such as 606 in Chicago that do not have great city views and cannot draw as much attention as the HLP. Second, while location is critical, the HLP's linear shape is another enabling factor that allows visitors to walk through 23 blocks and watch various surrounding city scenes. Finally, the HLP's 30-foot elevation enables visitors to see these landscapes with a bird's-eye view and also broadens the horizontal view with less blockage. Landmarks like the Chelsea Market, Meatpacking District, and Whitney Museum are frequently mentioned in our reviews. Future greenway planning practices may seek these opportunities for high impact projects.

Designers did a great job providing customized seating features, walk paths, planting communities, and sculpture/public art installations (Fig. 9). Not all views are appealing and walking on the mile-long the narrow track could be tedious. The landscape design carefully uses planting screens to block undesirable views and set up mini seating plazas when there are surrounding views to take advantage of. Especially those thoughtful features enrich the walking experiences of the HLP and were praised by users in T6 (Park features), which is also a highly popular topic (Fig. 7) (Sim et al., 2020). These design elements are more than decorative or aesthetic measures; they effectively affected park users' visual and activity experiences (Lin et al., 2021).

4.4 The importance of park management

Public parks are usually owned and managed by the local government. However, given the limited budget and staff shortage, the government is not always the best agent to do so. Park management contracting-out proves an effective way to improve efficiency (Pincetl, 2003). In some states, when governments cannot afford to keep state parks open, they collaborate with the private sector to manage the parks through either public-private



Seating features



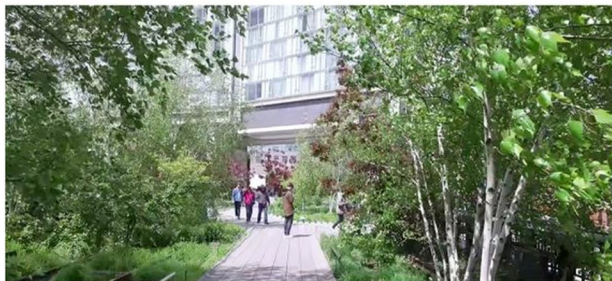
Sculpture / Public art installation



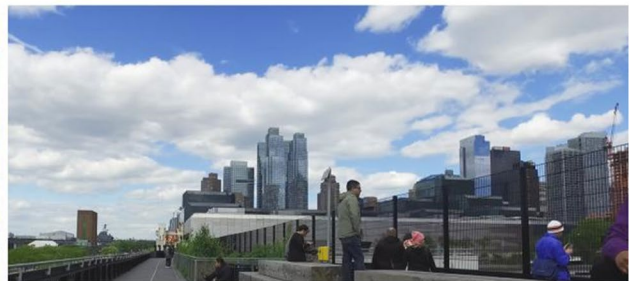
Planting communities



Walk paths



Planting screens



Mini seating plazas

Fig. 9 Design feature of the HLP in the YouTube video by Wind Walk Travel (Source: <https://www.youtube.com/watch?v=jy4m41pbOJE>)

partnerships or co-productions (Gilroy et al., 2013). Such strategies also work for city parks. For the HLP, the non-profit Friends of The High Line partnered with the New York City Department of Parks & Recreation and raised almost 100% of the park’s annual budget through donations and the city government does not have to worry about paying for the park’s management and maintenance (Lang & Rothenberg, 2017).

Park management plays a critical role to ensure the park is in a good physical status to well-represent the initial design philosophy, and to provide good park services to accommodate public needs. The Friends of High Line established strict rules to keep the park clean and safe. For instance, vendors must empty their waste bin at the end of each night, and “uniformed park employees regularly empty the park’s recycling bins” (Loughran, 2014, p. 62). Food vendors need to obtain a vending license

through a strict approval process; the Friends of The High Line meet vendor employees and taste all the food samples (ibid), which ensures the food quality and safety for visitors. These measures prove to be effective and confirmed by reviewers, for instance, “The High Line staff do a great job of keeping everything clean and safe” (Review #17930). As shown in T10 (Well maintained) (Fig. 8), the park maintenance work is recognized by users throughout the year. “I walked the one-mile ‘trail’ the day after a 5-inch snow which had been cleared from the path by the friendly, competent staff. The rest rooms were open on this wintery day...” (Review #26849).

In addition to the existing art installations, the Friends of High Line also carefully plan the year-round free performances for visitors (Loughran, 2014). Musicians, painters and artists are invited to present their work with various forms in the park, which further reinforces the

park's artistic brand and popularity. T6 (Park features) including art installations and sculptures has high popularity (salience score 0.08164) and is mentioned throughout the year (Fig. 8), for example, "...Lots of neat live performances and art displays along the way..." (Review #30637), and "In the summer, there are often free musical or other performances one can enjoy..." (Review #32767). This high level of park programming management further enhances the HLP's reputation as an attractive must-see in NYC.

5 Conclusion and limitations

The urban greenway is an important development theme in urban planning. However, given the perceivable tremendous investment, local government's financial stringency, and uncertainties associated with projects' economic, environmental, or social outcomes, such an undertaking can be overwhelming for city decision-makers. The HLP serves as one of the most successful urban greenway and revitalization projects and has been patterned after worldwide. Through the lens of language, this research uses a large dataset from online reviews to understand visitors' emotional tie with the park and why the HLP continuously attracts millions of users annually. We conclude that visitors' appreciation of the park regardless of season is linked with the park's history, design, and management. The historical transformation aspect of the HLP is a highly recognized concept by visitors as a brilliant idea to convert a railway track to a park. Pleasant walking and viewing experiences allow visitors to escape from the busy city life, thanks to the park's prominent design features, and the unique location and physical characteristics. Finally, excellent park management and services ranging from amenities to onsite living performances are also a big part of the sustained success of the HLP. It would be interesting for future research to compare the HLP with other projects which have mimicked the HLP redevelopment scheme to see if there are differences and commonalities.

This study is subject to several limitations. First, our analysis focuses only on the most significant meanings of the 15 LDA topics. There are also associated secondary and tertiary meanings or niche concepts under each topic. Meanwhile, some topic terms are listed in multiple topics. This could lead to overlapping meanings and ambiguities of our interpretation results even though our qualitative analysis has tried to highlight the most differentiating concepts. In future studies, methodological breakthroughs are needed to clearly illustrate and visualize the inter- and intra-relations of our LDA results. Second, the demographics of Tripadvisor users may not fully represent the eight million annual HLP visitors (Matthews, 2019). Potential selection bias still exists

(Schipperijn et al., 2010). Local residents and travellers may view the park differently, and non-English-speaking reviews were not covered in our study. Thirdly, our temporal patterns are also subject to the impact of the promotional activities or operations of Tripadvisor as a private company. Higher review numbers in certain months or years may be not only because of HLP's intrinsic qualities but also the user recruitment activities by Tripadvisor sales team. Nevertheless, this paper provides empirical knowledge on urban greenways and may shed light for decisionmakers in other cities working on projects of the kind, serving as an extensive assessment of this popular urban space through the lens of the site user.

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Code availability

Not applicable.

Authors' contributions

All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by Yang Song, Ruiqi Yang, Hongmei Lu, Jessica Fernandez, and Tong Wang. The first draft of the manuscript was written by Yang Song and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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Competing interests

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