Heathrow Usage Patterns

Data Analytics to Support Heathrow Development Strategy

Heathrow Airport becomes a new type of Central Business District, representing London as a global hub. It is in line with the global trend that makes transportation hubs business centers that require "inhabited" urban milieu around themselves, rather than only a "transit" one.

The future of Heathrow will likely depend upon its ability to restructure itself from a hub of activities supporting "passing by" passengers to an "anchor", where people arriving and departing from the area may stay, live and entertain (e.g., airports in the centre of Las Vegas and San Diego, St Pancras railway hub in London, etc.)

Launching the third runway as well as developing surrounding areas unlocks tremendous opportunities for Heathrow. In the coming years, it has the potential to double passenger traffic, boost the local economy and create up to 40K new jobs. However, to unleash the full potential of that expansion and make it successful, it is important to assure Heathrow’s smooth transition to a thriving urban environment with diverse business, commercial, housing, and leisure infrastructure.

Understanding patterns of people’s behavior and mobility in the area, monitoring local economic performance and estimating their overall impact on neighborhood and business satisfaction is a way to generate meaningful insights for further actions.

In this respect, in support of the planned commercial strategies, urban design/planning activities, and community engagement/cultural programming, Habidatum’s analytics platform Chronotope filled with mobile phone data provided by Vodafone UK / Citi Logik\(^1\), helped understand the airport area's current and potential audience, its performance and influence.

Airport major user groups and their activity patterns

The main focus of the study was Heathrow user groups analysis within the interest area (fig. 1) – those who spend most of their time on the campus as well as passengers, residents of the neighboring areas, and regular commuters passing by Heathrow. The mobility patterns of the selected groups were studied through their movements: origins and destinations of trips as well as time spent in the area. 5 distinct groups of users were identified:

1. **Commuters in transit** (trips traveling via Heathrow but not seen stopping): 0 to 1 hour per day on the airport campus;
2. **Passengers**: 1 to 4 hours per day on the airport campus;
3. **Community residents**: 6 to 12 hours per day within 5km of the airport campus between 18:00 and 06:00;
4. **Community workers**: 6 to 12 hours per day within 5km of the airport campus between 06:00 and 18:00;
5. **Team Heathrow and Local businesses** on Heathrow campus: up to 12 hours per day on the airport campus.

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\(^1\) Movement data collected for each day of a 4-week period (Jan 11 – Feb 7, 2016) and aggregated by LSOA (London population areas) and Heathrow development zones.
Main questions the report aims to answer:

*Which are the main target audiences that would benefit from the development of the surrounding areas? What should the infrastructure development be primarily focused on?*

Each user group has a distinct activity pattern throughout the day. Commuters, community residents and workers show typical distributions, with the average working day beginning and end times (fig. 2-4).

![User groups' daily activity patterns](image)

1. Commuters in transit
2. Community residents
3. Community workers

Fig. 2-4. User groups’ daily activity patterns. Red – trips origins, blue – trips destinations.
A different pattern is observed within the Passengers and Heathrow team user groups. Likely related to the flights' schedule – Passengers leave in the morning and arrive in the evening. The distribution for the Heathrow team can be explained by shift work – with three distinct activity peaks (fig. 5-6).

![Fig. 5-6. User groups activity patterns. Red – trips origins, blue – trips destinations.](image)

The temporal activity of airport users throughout the day provides an understanding of how the Heathrow area is utilized and who are the main beneficiaries of its future redevelopment. Usually, those who live close to the site may be subject to a lot of disadvantages – new construction alongside transport routes affect the routine practices of the local community residents. Can that become an issue in this case?

Figure 7 shows Chronotope Cube space-time visualization of community residents’ trips origins and destinations between 6 and 9 PM around Heathrow Airport. The green gradient highlights zones with origins, while purple indicates areas where both origins and destinations overlap. The following pattern can be observed: a large number of Heathrow local community works close to the airport or, on average, within 5-10 km from it.

![Fig. 7. Heathrow community residents’ Origin/Destination spatio-temporal pattern (6-9 PM).](image)
A quick look at the visualization leads us to a hypothesis that the Heathrow team may partly be the local residents as well—considering those living close to the airport. Analyzing the spatial concentrations of trip origins at 7 AM, we highlighted, presumably, their home locations. Apart from the vivid magenta zones at Heathrow and nearby Stanwell (most likely a result of the shift end for those who are at the campus), the other locations with trip origins at 7 AM are to the north of the airport in the towns of Hatfield (1) Virginia Water (2) Bagshot Village (3) and villages of Taplow and Dorney (4).

![Heathrow team’s Origins spatial pattern at 7 AM from low (yellow) to high (magenta).](image)

*Even though the Passengers is predominantly the key target audience of the airport, the future development should not forget of local Residents and Workers. Commuters also generate heavy traffic, but mostly in the peak hours and just in particular zones.*

**Airport opportunity zones analysis**

In addition to the analysis of Heathrow users’ activity patterns at a macro level, we explored how people use the airport and how much time is spent in its various areas. Figure 9 has an overview of Heathrow interest zones, including:

- **A** – Central terminal area
- **B, C** – High commercial density areas, hotels
- **D** – Hatton Cross area
- **E, F** – Future development zones (close to transit, on the crossroads)
- **H** – Future development zone (logistics and cargo services)
The most numerous user class dominating in every zone is *Passengers* – they come to the airport area via train station or by car (high concentrations at the motorways), spend a lot of time in the central terminal, and some stay at hotels and use business facilities in the adjacent commercial areas.

Zone E – one of the areas selected for the future development – shows the maximum for this user group, from 6K to 8K per hour. Moreover, its transit location at the crossroads can potentially attract more audience when the zone is developed and filled with commerce (fig. 10).
Unlike Passengers, Commuters in transit have 2 transit peaks and dominate zones E, H, and D – Hatton Cross train station (fig. 11).

![Fig. 11. Commuters’ in transit activity patterns in the airport interest zones.](image)

Also, we tried to find some particular hours of each group’s presence in the area. Do they intersect in the Heathrow interest zones?

The Chronotope Cube space-time visualization shows the user classes of Community residents and Passengers (data is filtered to the highest concentrations, >1K users per zone per hour). Residents are in red color while blue indicates areas where residents and passengers intersect. These classes are present in almost all of the interest areas – except that there are no passengers in E zone late at night, while residents dominate in F zone (has to be related to transit).

![Fig. 12. Community residents vs. Passengers user groups.](image)
On the contrary, the Heathrow team and Community residents show a different distribution across the zones (the Heathrow team are in purple color while green indicates areas where residents and Heathrow team intersect). Concentrations of both classes are stable during the whole day in the zones A and E; the western part of the A zone has residents’ dominance with the inconstant Heathrow team’s temporal patterns – just three small peaks during the day (the same as in D zone to the east). Zone H has no Heathrow team class distributions at all.

![Fig. 13. Heathrow team vs. Community residents user groups.](image)

As may be seen, the proposed development zones differ in their audiences – the E area has a relatively big number of users of all groups, while in F zone there is a dominance of Community residents and Workers. What development direction should be taken as a solution? It may be important to make F more oriented to the locals while to focus on diversifying E zone: different types of functions and services for different audiences, as well as groups’ coordination in space and time, to prevent overcrowding and possible conflicts.

Conclusions

Heathrow, planning in the near future to receive up to 130 million passengers per year, intending to have up to 40,000 new jobs, including 10,000 apprenticeships at Heathrow is certainly moving to become an airport city and a make a step forward to improve its qualities as a major UK transport hub.

Therefore, understanding its users and visitors become crucial fact in meeting these targets – what role the airport plays in people’s daily routines, how long do they commute to get there, what are the busiest times, etc.
Chronotope Cube filled with relevant analytical measures helps deliver actionable insights on Heathrow and audience, resulting in defining and characterizing preferable areas for future development.

*The analysis was prepared by Habidatum in cooperation with Benoy and Heathrow*
ANNEX 1. Habidatum Introduction and solution details

Habidatum is a software and data analytics company. We assist policymakers and businesses in understanding the hyper-dynamic urban environment through advanced analytics of diverse data sources driven by machine learning and interactive visualization.

Habidatum operates as a gateway between the professional communities who require data-driven insights and data carriers.

The company was founded in 2014 by a collaboration between professional urban planners and digital designers. Since 2014, the company has worked in more than 20 cities globally including London, New York, Moscow, Dubai, Singapore, Pune, Denver, and Miami.

HABIDATUM CHRONOTOPE

Habidatum’s flagship solution, Chronotope, is a platform for location data analysis and map + time interactive visualization. Chronotope helps create unique insights through aggregation of metrics from different sources (e.g. telecom, social, financial, and open data), designed to reduce the time from data to decision.

Chronotope™ core components include:

1. Universal Data Store
   Database solution for fast analytics and urban tech applications.

2. Marketplace of Metrics
   Metrics illuminating Audience, Sentiment, Economy, Transport, ready for download, analysis, and visualization.

3. Data Science & Machine Learning
   Algorithms ensuring data fusion to produce metrics, as well as anomaly detection and prediction in space and time simultaneously.

4. Space-Time Data Visualization & GIS Integration
   Visualization app designed for spatio-temporal data analysis. Connectors for popular GIS software. ShapeFile or GeoJSON direct download.

For data carriers, Chronotope serves as an entry point to urban tech markets. It ensures data security and monetization.

For businesses, Chronotope is a versatile decision-making tool with customizable analytical outputs for better planning and operations of projects related to urban regeneration, new infrastructure, accessibility, mobility, policy, and governance. It enriches the decision making with novel data made affordable, accessible and manageable.

For real estate market and property management, Chronotope provides advanced metrics on people’s activity and behavioral patterns that help businesses properly match demand for certain types of functions, buildings, and design. To keep pace with the constant social and market change and adapt to it, Habidatum transforms contemporary urban planning strategies into data-driven adaptive policies, that help generate savings, profits, and opportunities.