

Impacts

- Investigates trends in delivery data to explore reasons behind the extent of failed deliveries.
- Demonstrates relationships between delivery failures and product types, residence types and the geography of a customer.
- Insights can be used to inform business and logistics planning to mitigate the negative effects of failed deliveries on customer satisfaction and retention.

Project Background

Appliances Online are an Internet-based retail organisation offering a range of home appliance goods. A key component of such an organisation is to provide its customers with efficient home delivery. Yet, between 2013 and 2015, Appliances Online experienced over 135,000 failed product deliveries, accounting for approximately 2.7% of the total number carried out. For a large consumer organisation, this figure was significantly higher than expected and can have potentially negative effects on developing and maintaining an adequate customer base.

Analysing large consumer datasets has become a key basis of competition for retailers, allowing exploration of relationships and patterns that were not previously obtainable. Working in collaboration with Appliances Online, the objective of this research was to investigate trends in their delivery data in order to explore potential reasons behind the extent of failed deliveries.

A number of potential influencing factors were investigated including relationships with specific product categories, spatial effects, residency types and temporal influences on the likelihood of experiencing delivery issues. The work demonstrates how analysis of large consumer datasets may be able to reveal previously undetermined relationships that could be utilised for informing more efficient business and logistics planning.

Data and Methods

The data obtained from Appliances Online described more than 5 million deliveries across Great Britain that occurred between 2013 and 2015. This included a description and classification for over 120 unique product types grouped into 7 broad categories, the depot from which the product originated, the outcome

(whether the delivery was successful or not) and for the failed deliveries the reason of failure (with over 50 available categories). Each instance was recorded with the postcode of the destination and the date of delivery.

Firstly, analyses were conducted to determine potential relationships between product types and the likelihood of a delivery failure using common statistics such as chi-square tests. Secondly, relationships between spatial attributes such as urban and rural delivery outcomes were investigated. To achieve this, data were aggregated to Local Authority District (LAD) level and compared across Great Britain. Data were also acquired regarding the proportion of flats per Output Area from the 2011 Census, to analyse potential effects of residency types. Finally, temporal aspects were examined by using the date of delivery information. Data describing the reasons for delivery failures could be utilised to interpret problematic factors in different scenarios.

Key Findings

Three key findings arose from the analysis. The first suggested a higher likelihood of failed deliveries for certain types of products, related specifically to the product size. Figure 1 highlights the frequency of deliveries and failures across the seven broad product categories, indicating differences across product types. Analyses at the lower product level revealed that the American style refrigerators had the strongest positive relationship with a failed delivery.

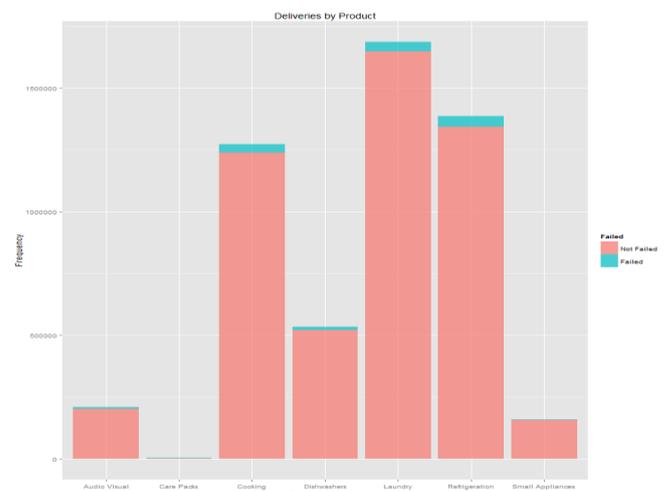


Figure 1. Failed deliveries by product category.

The researchers suggest this may be attributed to their shape and size, making it difficult to physically get the item into the accommodation. Furthermore, a strong negative relationship was

found between failed deliveries and small appliances, such as laundry products.

Results from the spatial analyses suggested there may be an effect of urban and rural conditions for failed deliveries, with potentially differing causes for each. Figure 2a shows the total number of deliveries per LAD in Great Britain, and Figure 2b the percentage of failed deliveries per LAD, therefore controlling for the volume of deliveries carried out per area.

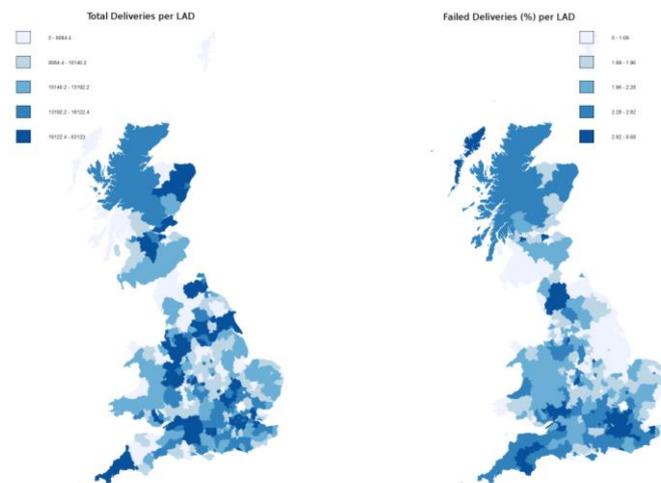


Figure 2. Deliveries across Great Britain demonstrating a) total number of deliveries per LAD and, b) percentage of failed deliveries per LAD.

The results suggested that there were a greater proportion of failed deliveries in the metropolitan area of London and in the south of England and Wales (i.e. around Bristol and Cardiff), whereas in the east of England the proportion of failed deliveries was relatively low. The researchers suggest that this may be due to travel restrictions or traffic congestion in metropolitan areas often making a delivery problematic.

On the other hand, rural areas such as Scotland and the south west of England also demonstrated a higher likelihood of failed deliveries. Analysing the reasons for failures suggested that these may be caused by conditions of the road network, the size of the road network and weather conditions.

Analysis of accommodation types suggested that delivery was more likely to fail in areas with a higher percentage of flats. Reasons for these failures suggested these were due to incorrect addresses, no access to the property, the product was refused, or it was too late.

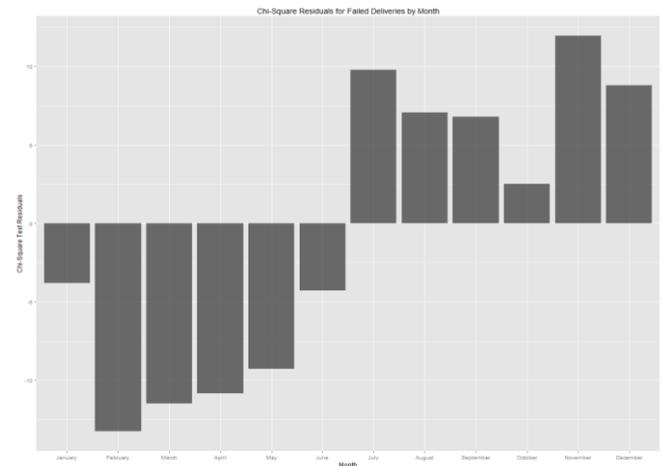


Figure 3. Chi-square residuals for failed deliveries by month.

Finally, temporal analyses suggested a much higher likelihood of a delivery failure during the second half of the year (see Figure 3). The researchers suggest that this finding should be investigated further, potentially requiring additional data in order to examine potential temporal effects on a finer scale.

These insights can potentially be used by Appliances Online and other organisations to inform business and logistics planning. For example, identifying these relationships highlights specific problems that may need addressing to ensure faster and more efficient methods of delivery. In this case, strategy may focus on larger products, specific residential types and anticipation of likely issues based on the geography of that residence. Taking appropriate measures may help to mitigate the negative effects of failed deliveries on customer satisfaction and retention.

Future Directions

In addition to the continuing work on this project, the researchers aim to further utilise the Appliances Online data to develop indicators of Internet usage and behaviour that may be used by organisations to develop bespoke geo-demographic classifications.