# An application of statistical and spatial analysis techniques to engineer callout data from a UK telecommunications company

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## Project Background

This research aims to understand patterns in engineer callouts for a telecommunications & media company. The research analyses data concerned with the frequency and nature of engineer callouts during the year 2016, within Bristol, Bath, Bradford and Newcastle. It combines engineer callout data with geodemographic data in order to assess whether different social groups are more or less likely to experience issues with internet services. The research also presents an original enquiry into the effect of weather temperature on internet services as measured by engineer callouts. Analysis focuses on customer-caused spliced cable callouts testing a hypothesis from an engineer interviewed during a company 'ride-out' day.

## Data and Methods

To investigate geodemographic trends, a number of statistical tests were conducted. Chi-square test results indicate whether the distribution of engineer callouts by geodemographic groups are random and a binary logistic regression produces odds ratios quantifying how much more or less likely ACORN and Internet User Classification (IUC) groups are to experience engineer callouts than selected reference groups. Bivariate linear regression and Pearson's R tests detail the strength and direction of trends between engineer callout data and explanatory variables such as 'final mile' distance and weather temperature.

Mapping and spatial analysis methods were carried out using ESRI ArcGIS software. Dasymetric mapping techniques visualise engineer callout data by shading building footprints, instead of administrative area polygons, to better reflect the geography of urban areas, customers and population density. Global and local spatial autocorrelation statistics analyse whether the data showed statistically significant geographic clustering of percentage change in customer-caused spliced cables between cold and hot days at the postcode sector level.

## Key Findings

'Chargeable visit' engineer callouts are coded when nobody is present at the property upon the engineer's arrival or when the problem is caused by faulty customer equipment. These callouts are more likely amongst younger, more e-engaged neighbourhoods. 'Clarification of service' callouts, indicating a customer has falsely reported a fault due to a misunderstanding of their service, are more likely amongst older-age groups. However, socio-economics amongst older age groups is also influential, with higher socio-economic groups having proportionally less callouts.

This research identified a positive and statistically significant relationship between the average 'final mile' distance and engineer callouts, although the regression models indicated that it only explains roughly 4% of the variance. Mean daily weather temperature also exhibited a similar influence on television-related and internet-related callouts. However, weather temperature was found to explain 22% of the variation in customer-caused spliced cables. Studying the percentage change between cold and hot days across space revealed that built-up semi-periphery areas have the greatest increases in callouts on hot days.
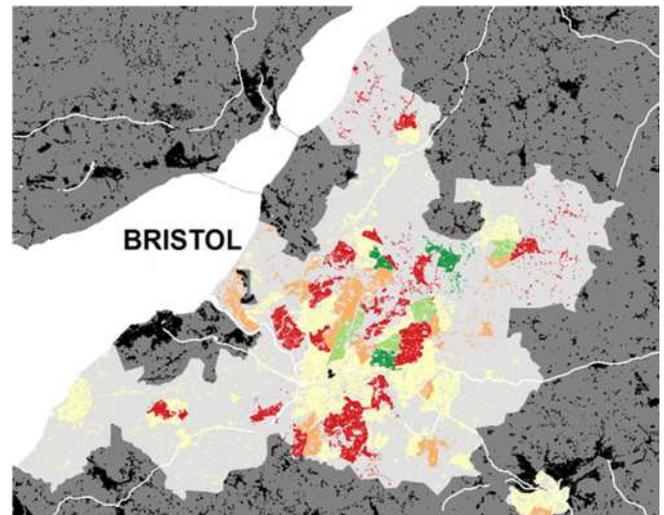


*Figure 1. Percentage absolute change in customer-caused spliced cable callouts in Bristol (Red = increase, Green = decrease)*

## Value of the Research

While the population is becoming more E-engaged, this research has demonstrated that there are still variances in miscommunications and understandings of telecommunications technology between different age groups and also different socio-economic age groups. This has subsequently led to geographic trends in engineer callouts within cities. This insight can therefore support telecommunications providers and local governments by enabling them to communicate more effectively with consumers with particular geodemographic characteristics to improve service delivery and reduce barriers to internet access.