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A Taxonomy of Data and Software Tools for Geo-Spatial Analysis of Town and City Centre Retail Space

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Introduction

One of the characteristics of a healthy town centre is the presence of a vibrant retail offer and low vacancy rates. Not all town centres are dominated by retail outlets, however, the importance of retailing to the socio-economic wellbeing of town centres (places and people) and national developments cannot be overemphasized (Dixon, 2007; Oshea, 2017). Despite the increasing consumer preference for online retailing, market share of in-store (bricks & mortar) retailing is still well above 70% (ONS, 2017). In other words, shoppers still like to visit shops, they just don't necessarily carry out transactions at the till. Although the nature of retailing continues to change, retail outlets and town and city centres alike, remain reliant on the footfall and spending characteristics of shoppers. Key to understanding this situation, is discerning, and then interpreting, the various existing data sets and software tools that can be used to measure and analyse retail space performance.

This article sheds light on this situation by exploring existing datasets in the UK – its final output is a taxonomy of retail relevant data and software packages. This output can be used as a reference for anyone considering measuring and analysing performance of town and city centre retail spaces using geo-spatial techniques.

Relevance of Data Taxonomy to Retail and Town Centres Stakeholders

Organisations such as the Association of Town and Cities Management (ATCM) and the town centre retail led Business Improvement Districts (BIDs) are responsible for setting out visions, strategies and action plans with a view to making decisions to enhance socio-economic vitality of town centres. In order to achieve this, various types of data must be considered in order to inform strategy and to set realistic goals.

As technology advances, big data organisations users (such as, Google, Amazon, Uber and Microsoft) have adopted Application Programming Interfaces (APIs) for building application software - to integrate real time datasets, from many sources, to better inform final data/website users (IBM Research, 2016; 2017). However, such vast applications are inadequate for retail and town centre stakeholders because they require local market data that is not captured in the subroutines of big data company' APIs. Nor when captured, is data habitually tailored towards the purpose of enhancing retail space performance. Consequently, the main challenge for retail and town centre stakeholders is the ability to deduce meaningful information from the variety of datasets available for practicable applications. As such, a logical framework (i.e. the data taxonomy) that captures local retail datasets are useful for strategic retail centre decision making. The ability to hold data in usable formats and structure is key to making deductive outputs from the multiple and variegated available datasets (Local Data Company, 2017).

Data for Geo-Spatial Analysis of Town and City Centre Retail Spaces

The datasets in this article have been considered and broadly categorised into aspatial and spatial datasets. Herein, the aspatial datasets are nonspatial data for measuring and analysing performance of retail spaces within town and city centres. While, the spatial datasets are digital maps including thematic and vector layers that can be used as base maps for geo-spatial analysis of town and city centre retail spaces. The data for this purpose includes:

- i. Rental Value,
- ii. Consumer footfall,
- iii. Retail Turnover (Sales),
- iv. Retail outlet address and location,
- v. Retail outlet vacancy/ occupancy data,
- vi. Consumer' spending data,
- vii. Consumer dwelling time, and
- viii. Spatial connecting links (Digital maps).

Table 1 below presents an overview of the sources and characteristics of the datasets. It is important to note that the identified pros and cons of data sources are established based on

applicability of data in geo-spatial analysis of town and city centres, and not for any other purposes to which the providers may hold the data.

Table 1: Sources and Characteristics of Required Datasets

S/No	Sources	Data Supplied	Characteristics	
			Pros	Cons
1	VOA ¹	Rental Value, Addresses and locations of retail outlets	Data is comprehensive and covers both England and Wales. Data is available as open source. Data contains UPRN ² that enables integration of other dataset in a database.	Data covers all rateable hereditaments, hence, non-rateable retail premises are exempted. Data requires additional conversion tool(s) in order to georeferenced addresses into Eastings and Northings for geo-spatial analysis. Additional tasks are required in sorting retail premises from other commercial property.
2	Experian Goad Datasets	Rent, Address of retail premises and Vacancy dataset	Data are supplied (in usable formats, quantities and qualities) as demand by the users. Data is available for both internal (shopping centres) and external (highstreets and city centre) analyses.	Data are highly safeguarded.
3	Local Councils	Footfall, Vacancy/ occupancy data, Addresses of retail outlets	Open data source	Heterogeneity in data holding. i.e. not all local councils holds the same datasets.
4	Local Data Company (LDC)	Footfall, Retail Addresses, Vacancy data, Consumers' dwelling time, Consumer spending data.	Data is available for both internal (shopping centres) and external (highstreets and city centre) analyses.	Data is highly safeguarded
5	Thompson Directory (Thomson local)	Retail Addresses	Available both in print and online Suitable for retail address verification and database update	Data supplied are limited to search engines, hence, cannot be directly utilised in geo-spatial modelling of retail performance.
6	ONS ³	Consumer Spending data, retail sales,	Open data source	Data are available as analysed outputs and cannot be utilised in geo-spatial assessments.
7	Commercial Real Estate Agents and Data Company.	Rents, Address of retail premises	Data are very detailed	Data are not comprehensive and may not cover the entire city or town centre
8	Spring Board	Consumers' footfall, Consumers' dwelling time	Data availability is for both internal (shopping centres) and external (highstreets and city centre) levels.	Data are highly safeguarded
9	PMRS ³	Footfall	Data are available and up-to-date for a number of city and town centres	Data not available for all town and city centres. Not available in the public domain
11	OS Map ⁴	OS MasterMap, OS MasterMap ITN, OS TopoMaps,	Data is readily available in both print and online Data is useful as spatial connecting links for configuration analysis Data useful as base map for geo-spatial modelling.	Further verification including field data validation is necessary.
12	GeoFabrik	Open Street Map	Data is available in public domain Data is suitable for spatial modelling validation	Data supplied in thematic format requires addition spatial tools to convert into vector layer
13	Natural Earth	Natural Earth Maps	Data supplied contain corresponding attribute variables	Data file is large and not suitable for town and city centre analysis

VOA¹ - Valuation Office Agency; ONS³ - Office for National Statistics; PMRS³ - Pedestrian Market Research Service; OS Map⁴ - Ordnance Survey Map

Software Tools for Geo-Spatial Analysis of Retail Space Performance

Spatial software tools are required in order to measure the performance of town and city centre retail spaces, using geo-spatial analysis techniques. Software packages that are useful in conducting geo-spatial analysis on spatial and aspatial datasets have been considered, and categorised based on availability of the software tools. Hence, software packages have been categorised as:

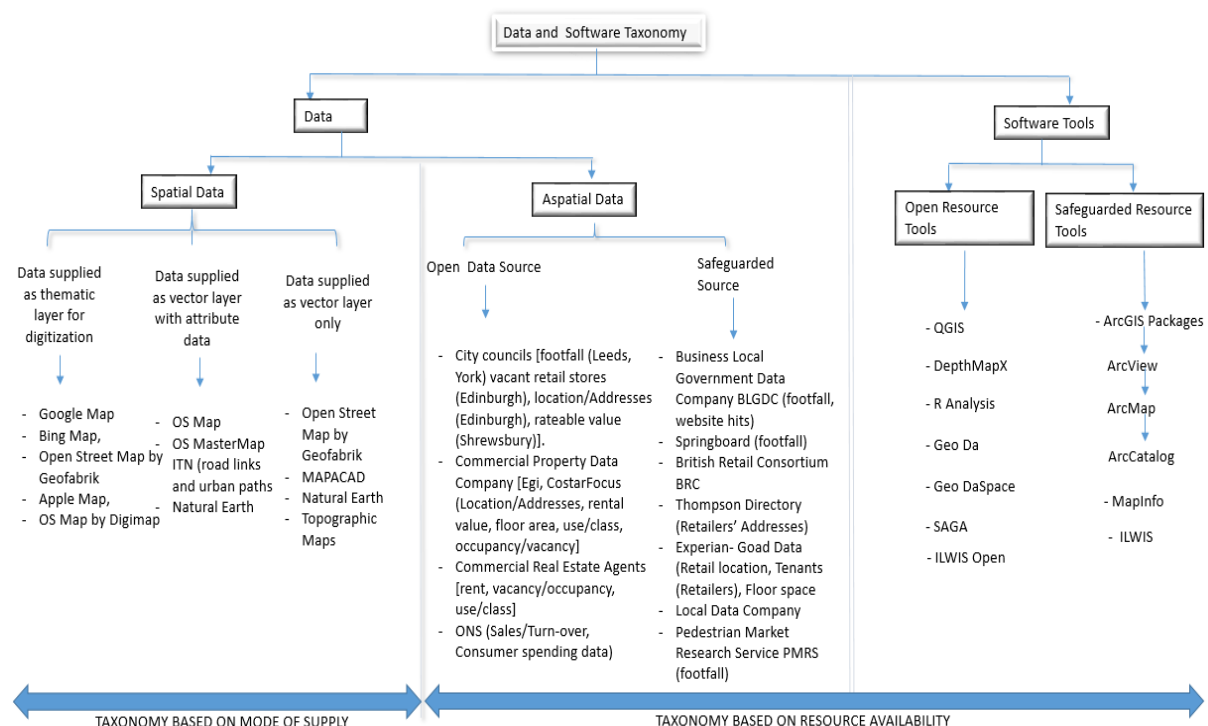
- i. Open resource tools, and
- ii. Safeguarded resource tools.

The open resource tools are those that are available in the public domain, and do not require users to obtain authorisation before having access. While, the safeguarded resource tools are restricted, and require users to obtain authorisation (typically license based and at significant cost) before having access to such tools. Examples of useful software tools for geo-spatial

analysis of retail performance include, but are not limited to - QGIS, ArcGIS, R Analysis, DepthMapx, Geo Da, SAGA and Geo Da Space.

Categorisation of Data and Software Tools

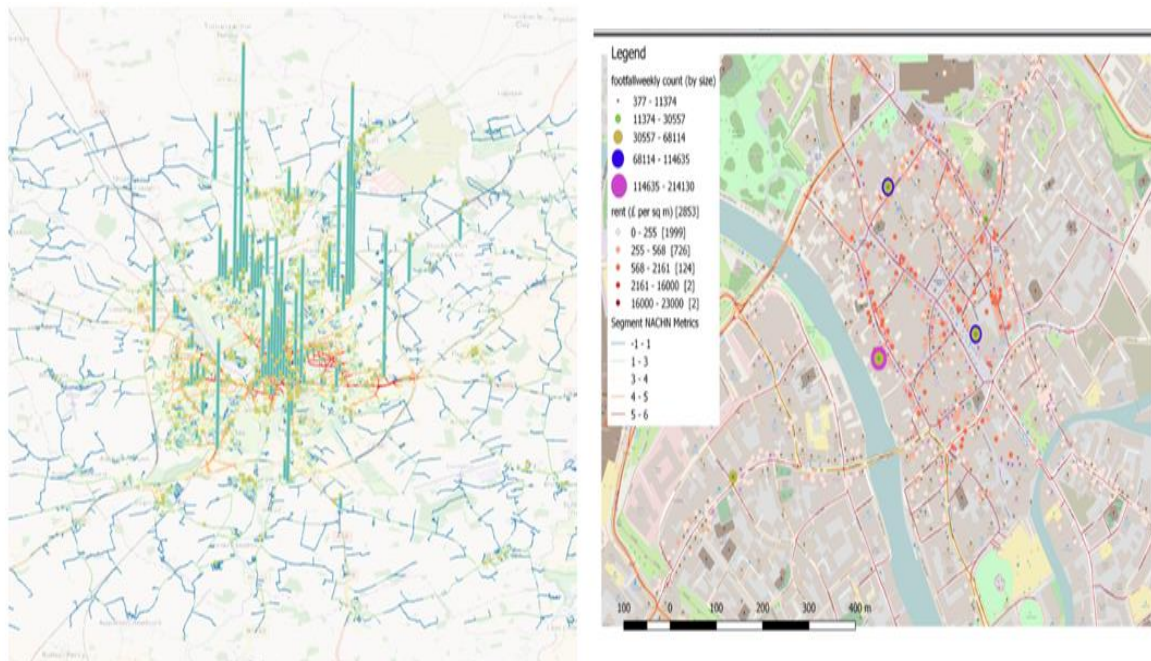
Figure 1 below reveals the taxonomy of data and software resource tools.



It categorises the required aspatial data and software tools based on availability of resource. The aspatial data and software tools have been categorised into open and safeguarded data, and open and safeguarded tools respectively. It is important to note that, few spatial data resources are safeguarded resources. Hence, spatial data have been categorised based on mode of supply. Figure 1 reveals that spatial data is typically supplied as thematic layers, vector layers, or vector layers with corresponding attributes. Examples of all categorises have been provided in the taxonomy chart above.

Figure 2 below presents examples of spatial output models of retail space performance, using open data (VOA's rental value and City of York footfall data) and open resource tools (QGIS and DepthMapX). The output can be replicated for any city or town centre in the UK.

Figure 2: Retail Space Performance Model of City of York Using Open Data Source.



Conclusion

Local market data is a crucial ingredient in making reliable decisions on town and city centre retail spaces. A structured data taxonomy will enable town and city centre retail stakeholders (such as, retailers, local authorities, property investors and developers) to make more use of available, but traditionally unexploited datasets. Decisions geared towards enhancing performance of town and city centre retail space must consider measuring and analysing relevant datasets, before setting realistic plans. Hence, spatial output models using geo-spatial techniques will aid in better understanding town and city centre retail space - since they present measured and analysed datasets in visual representations. This is useful to town and city centre decision makers when considering developing and/or investing in town and city centre retail spaces. A retail performance model is also useful to local planners when making decisions on spatial distribution of resources in the event of town and city governance.

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