Valuing service and retail structures in core areas of cities

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1. Introduction

Contemporary, rapid changes in cities create the need to evaluate and protect its existing structure. Many elements are analysed and evaluated. Built structure, urban and architectural heritage, historical landmarks, scarcity of environmental assets are all very precious. But what is also natural to the centre itself are its functional features. One of them is retailing. Over time services have been exposed to many pressures. New shopping centres built outside cities aided sprawl, and this sprawl created demand to build new centres. Apart from that more of the public space and social activity has moved to virtual space – communication over distance sometimes seems easier than in close proximity. In this case "traditional" urban activity is also an asset of the city core. What stimulates that are vibrant high streets. Over time retail formats are also changing. Competition from virtual space is competitive to traditional brick and mortar outlets, these also adapt and change to face new demands. All these create new circumstances to plan new retail and service networks and look differently at their role in cities.

The article describes the methodology for identifying, surveying and evaluating existing city centre's service and retail structure – using a specially designed Android phone application developed by the author. By recording information about spatial location of services that is combined with basic information about their types a database is created. This method also introduces an innovative smartphone application that aids surveying, which is also described in the article. Based on this data an assessment of the core structure can be made that illustrates the spatial distribution of different outlets.

2. Statistical retailing data

In Poland, the main institution responsible for collecting statistical data is Central Statistical Office (Główny Urząd Statystyczny – GUS). It is a governmental organisation that is surveying, analysing and publishing various data. Most of this data is publicly available.

In terms of retailing some data is collected on national and regional level. According to the official Central Statistical Office definition a shop is a "permanent retail trade point, with a designated space with shop window and interior accessible for clients". This can be a single entity or one of many outlets of one retailer. When a part of a larger space is rented by a smaller merchant – it is also treated as a unique service point.

Apart from that there are two other classifications. The first one is their industry type (or prevailing type of industry in total sales) and their sales area. According to Central Statistical Office (GUS), shops are divided into basic business/industry classes:

- with major share of fast moving consumer goods (FMCG),
- department stores with broad range of products,
- specialised shops,
- factory shops (incl. factory warehouses and outlets),
- pharmacies and petrol stations,
- markets and mobile sales points.

When classifying according to sales area there are two basic groups. The first group are shops with prevailing FMCG sales. These are hypermarkets (above 2 500 sq m sales area),

supermarkets (400-2 499 sq m) , general shops 120-399 sq m) and other shops (below 119 sq m). The second group are shops with broad and diverse product range. These are department shops (above 2 000 sq m) and merchants' shops (600-2 000 sq m).

According to GUS shops are also divided by the prevailing range of goods sold. This could be:

1. grocery,
2. fruit and vegetables,
3. butcher's,
4. fishmonger's,
5. bakeries,
6. liquor shops,
7. cosmetics and toiletries,
8. textile,
9. clothing,
10. shoes and leather,
11. furniture and lighting,
12. radio, television and household appliances,
13. stationery and book shops,
14. mechanical vehicles,
15. other shops.

The official data Central Statistical Office (GUS) does not allow for detailed analysis of retail network. This is mainly because the data is available only in aggregated form, meaning that there are only total numbers for the whole viovidship area, which in Poland is the equivalent of state in other countries. None of this is georeferenced. There is more detailed data, but that is available only for purchase. Data is also stored in other registers, but these use different codes (e.g. PKD 2004, PKD 2007 – Polish National Codes for Business), depending on the time they were collected. And the link to spatial location is through the registration address of the business, not the sales venue.

The above classifications show, how they can be diverse and differ between each other, depending who is surveying and what is the main concern of data collection. As the main interest of the spatial analysis is in retail, the basic analysis collected classes are narrowed down. In the methodology described in this article the surveyed data is classified in division to main types. These are grouped in 30 main classes, and then break down into subclasses that total for 103 categories. Then these are aggregated for basic analysis into 12 main types as follows:

A. food – shops with food shops, including specialised shops (e.g. meat shops, baker's, liquor shops),
B. fashion – shops with clothing, cloths, fabrics, lingerie, etc.,
C. multimedia, press, books, gifts – shops in the multimedia section, press books, gifts, including computers, phones and television,
D. health and beauty – shops with health care products, beauty, including cleansers and pharmacy,
E. accessories, jewellery, watches – shops with accessories, jewellery, watches and luxury items,
F. sport and recreation (shops) – shops with items for sport and recreation,
G. shoes and leather – shops with shoes and leather,
H. interior design – shops with interior design items, decorations, household items and appliances and furniture,

I. gastronomy – restaurants, bars, cafes, pubs and food vendors,

J. services typical of shopping centres – services that usually can be found in shopping centres, such as flower shops, post offices, telecommunication shops, travel agents, insurance, finance, real estate etc.,
K. services not typical of shopping centres – a major part of services that are not usually found in shopping centres (often or at the moment) such as: petrol stations, warehouses, second-hand, hotels, agencies, construction companies, renovation companies, transportation companies, offices specialising in services for business (lawyers' offices, accountancy, design companies, interpreters, advertising etc.), cultural, associations, museums, theatres, entertainment, gambling, car sale, educational system and others,

X. not classified, vacant – vacant spaces, refurbished spaces, unknown or unclassified operations.

The first part is often used by shopping centres managers to divide their shop listings into basic classes. Therefore it is easier to use this data for comparison and also analysis of city centres. Most of the retailers (A-H) generate pedestrian activity, the same with gastronomy (I). Services are divided into those that are usually found in shopping centres (J) and those that are not (K). The latter with vacant outlets (X) do not add much to the attractiveness and walkability of city centre. Other services (K) are important, but their existence in large numbers along pedestrian areas means that it is not in best shape.

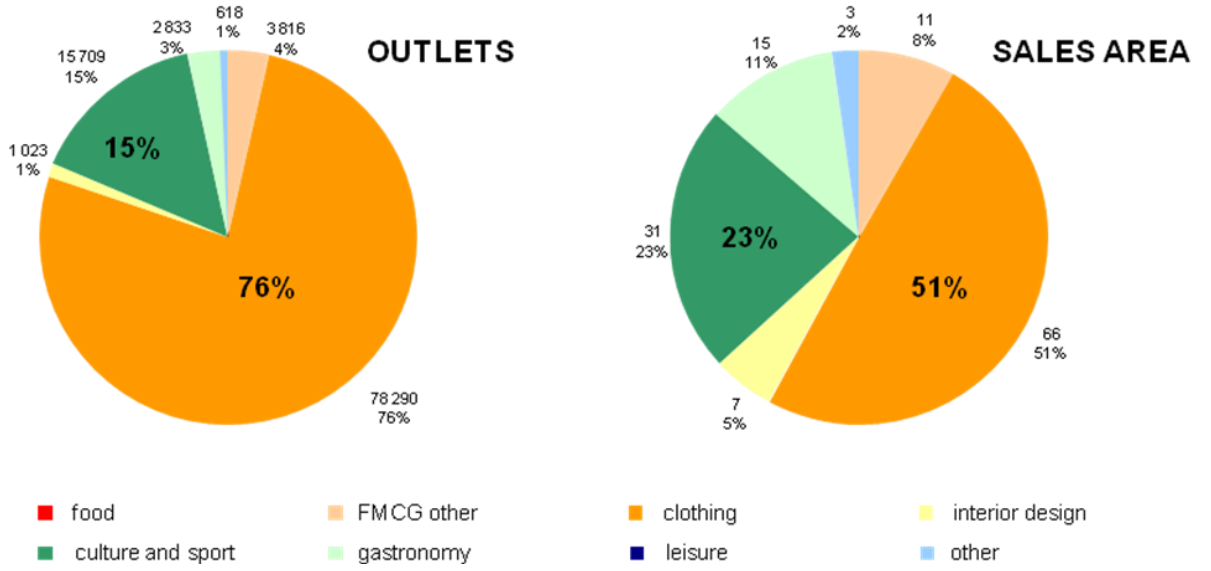

Figure 1: Number of outlets vs. sales area in Bullring Shopping Centre in Birmingham, source: Bullring data, own analysis

The main issue, concerning the methodology, is that collecting data based on the number of shopping outlets, not their sales area might be misleading and inaccurate for the retail impact or change analysis. In terms of retailing, the most important factor is sales area of an outlet. When surveying only the amount of services this figure is not taken into account. But in reality it is the most important factor/weight of such impact. To illustrate this problem above is a comparison of the number of outlets to the sales area in Bullring Shopping Centre in Birmingham, based on the centre's official data. The most visible difference is in clothing shops attributes. More than the half (51%) of all sales area are clothing outlets, while their share total number is more than three quarters (76% and 78 290 sq m). As for the other types, the rule is opposite – the share in number exceeds the share area. For example 23% of all outlets is connected with culture and sport (31 shops), while the total share in area is only 15% (15 709 sq. m). There difference is more visible in case of FMCG non-food items

(8% of the number to 4% of the area), while the biggest disproportion is in interior design items (8% of the number to 1% of the area) as well as gastronomy (11% to 3%). This means that the latter have small sizes, but are quite large in number.

3. Android application

In order to simplify the surveying procedure a special smartphone application has been developed. It allows the surveyor to record identified outlets in the field using their mobile device. We were looking for a simple solution that would aid the available and free tools for data analysis.

The application has been conceived by the author and written by an application developer – Paweł Fierek. It works on all Android devices (smartphones and tablets) that have 2.3 or higher version of the operating system. Other requirements are – GPS functionality of the device, camera for taking photos and internet connectivity. Although making phone calls is not necessary, it is advised that the device is constantly connected to internet by mobile network (needs a SIM card with a data plan).

The surveying procedure is quite simple. First the surveyor has to set up the app for work. They input the user name (text string) and user ID (3-digit number). The user name will later allow for easier identification who was collecting the data. It does not have to be unique, though it is advised. User ID will later be used to assign individual ID of surveyed places, therefore it has to be unique among all surveyors working in one place. Another field in the settings screen is for defining an object (building, centre etc.). It may be a nick name or short name that will later be used to assign surveyed outlet to a certain object. Later, when analysing the data it is easy to extract points located for example in given shopping centre.

Figure 2: Main application screen

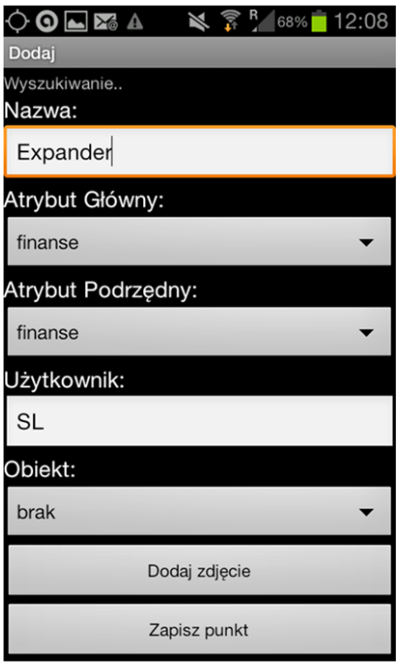

Figure 3: Application – adding new point input screen

Work in the field means repeating input steps for all points. The surveyor inputs the name of the outlet (or a short version of the name). Then chooses the main attribute (id1) from a predefined list of 30 main classes. After choosing this another attribute has to be chosen (id2). It is a subcategory for the main one, that usually gives a further choice of outlet's specialisation from a list of usually 3-6 classes (up to 12). They are also taken from a predefined list. On this input screen user name is displayed, but cannot be edited. There is also a drop down list of objects to choose from (by default it is set to "none"). These are predefined by user in the settings section.

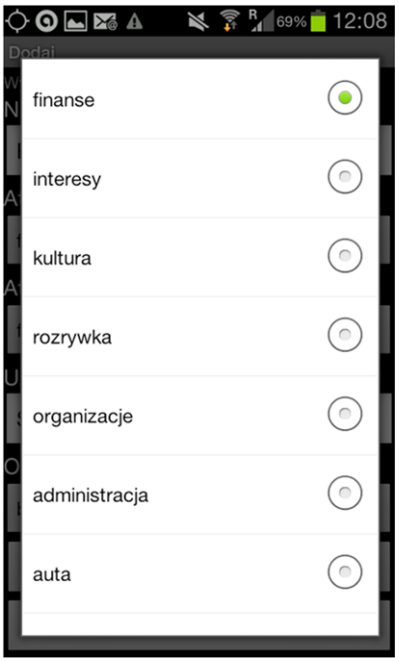

Figure 4: Application – choosing main attribute (id1)

Next, the surveyor takes a photo of the outlet's shop front, window or building. It is not obligatory, but highly recommended. Storing the image will make it possible to check the input data after the has been finished. Later on it may also be useful for comparing how the place has changed – when there is another survey performed. The image is stored separately on the device. It is advised to turn on the geotagging option in the device photo application, so the images are georeferenced automatically.

Last stage consists of locating the surveyed point on map. By default Google Street Map is displayed with a current GPS location of the surveyor. It can be switched to display the satellite image, if necessary. Though most mobile devices are quite accurate on the (especially these equipped with A-GPS), there might be some errors. When such need occurs the surveyor can manually relocate the placemark on the map. It is also advised to check in GIS software prior to field work, how the satellite image is overlaid on a specific working map. Usually the image is an aeroplane image taken from an angle, meaning that the bases and roofs of buildings are not in the same place. Usually the image is aligned by base. With that the surveyor is aware where to place the placemarks to be most accurate.

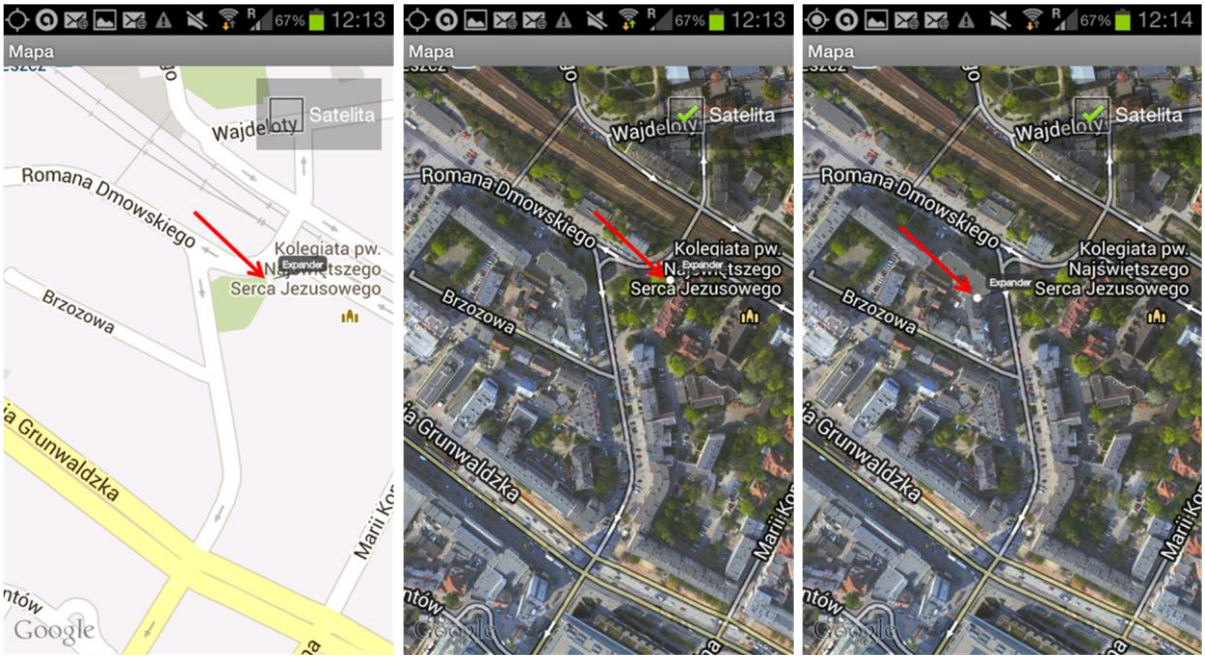

Figure 5: Application displaying and correcting point location
(left – google maps, middle – google satellite, right – manually corrected location)

Later the point is saved and the procedure is repeated for all the outlets in the analysed area.

The data stored by the application is as follows:

- Point ID – unique, consisting of 3-digit user ID with following 5-digits, being consecutive numbers for each point; this field is assigned automatically.
- Name – manually entered outlet name.
- Main attribute – stored as ID number, based on surveyor's choice from the list.
- Secondary attribute – as above, but referring to the secondary sub-class.
- Main attribute – automatic, descriptive text string of main attribute for easier reference.
- Secondary attribute – as above, but for the secondary sub-class.
- Object name – a text string from a chosen list, based on the choice of surveyor (or "none").
- User name – automatic field for the user name.
- Date and time – automatic time stamp of the survey.

- Latitude and longitude – these are based on the device GPS values or manually relocated point while inputting.

In order to analyse the data in GIS it has to be imported into the software. There are many commercial as well as free programmes for GIS. This application has been tested with QuantumGIS, which is an open source, free tool. In the app's settings menu there is an option to save all stored data to a file in the device memory. A unique comma separated values file format (CSV) is created. This can be easily imported into GIS. For latitude and longitude WGS 84 (EPSG:4326) is used as a coordinate system. Points may be also again manually relocated, if there is such need to adjust them to the map.

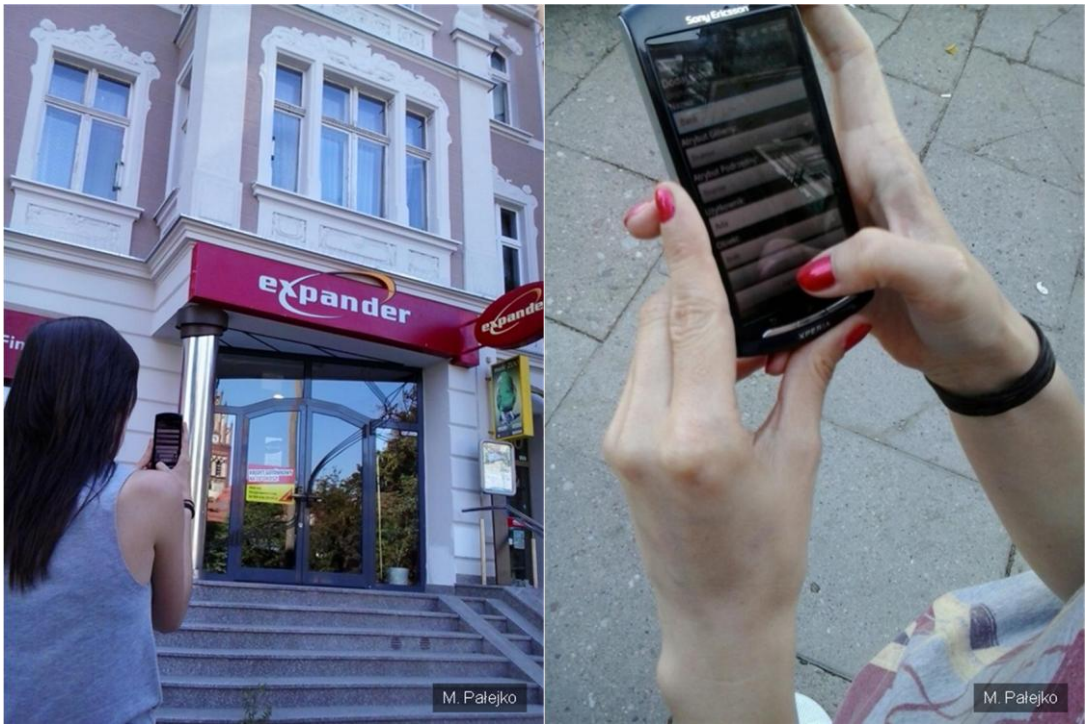

Figure 6: Application – field work, taking images and inputting

Photo images of the surveyed point are stored on the device while working and can be downloaded manually. Their filenames correspond with individual point ID's. When needed these images can be geotagged again using EXIF tools, especially when the original points have been readjusted in GIS software.

4. Main issues

The main issue of this method concerns the type of information surveyed. Each outlet is identified as a point, without any information about its sales area. It is not a limitation of the app, but rather the abilities to judge that in the field. Shop owners are not keen to provide that information. Assessment or approximation would not be a reliable source of information for further analysis. But given that impact is weighted by scale, not only occurrence of an outlet, this has to be taken into account when analysing the data.

Another is that there needs to be specific person who would be collecting data – a surveyor. This means that the data collection and analysis needs to be performed on purpose, and requires engagement of people. But operating the application is very simple, though some basic training is needed – especially regarding assigning to classes. The variety of types allows for better retail network analysis, but in some cases may be misleading to the surveyor.

In terms of the hardware there is a noticeable limit of battery life. Using GPS and having the screen illuminated most of the time results in quick battery depletion. Most of smartphones will allow for 4-5 hours of field work. This can be enhanced by changing battery during survey. Also using tablets with longer operating lifetime, although these are less practical for the survey due to their physical dimensions.

Last issue concerns the legal matters of collecting the data in the field. According to Polish law one is allowed to take photos standing in a street that is public. But entering private land and taking there photos needs approval from the owner. And such is the case of most shopping centres. These have set regulations that do not allow taking photos without a written permit. Owners and managers of individual shops and shopping centres often do not agree to any surveying of their outlets. In such cases the survey has to base on publicly available data – such as plans and shop listings.

5. Example of analysis

Below is a description of an exemplary listing of services points in two Polish cities – Elbląg (from 2012, around 125 000 inhabitants) and Gdynia (from 2008, around 250 000 inhabitants). These show how retailing is structured in downtowns and how it changes when looking at broader areas, such as downtown (meaning a larger part of the city, including the strict centre) ant the total number of the analysed city part (that includes other districts).

Figure 7: Part of Elbląg downtown – surveyed service points

Service points were surveyed in Elbląg with the use of the Android application. Above is an image showing their locations on map, with different colours meaning different classes. Main shopping streets are becoming visible where the density of points is larger. The data was then used to mark these areas on the map and also analyse the composition of the stock and statistics.

Below is the table containing the aggregated data for both cities.

Table 1: Number of service points in Elbląg and Gdynia

Retail outlet		Number of points/outlets							
		Elbląg						*Gdynia*	
Type	Description	TOTAL		Downtown		Centre		*Downtown*	
A	Food	**311**	**13%**	142	11%	41	6%	*261*	*10%*
B	Fashion	**326**	**14%**	130	10%	70	10%	*250*	*10%*
C	Multimedia, press, books, presents	**146**	**6%**	93	7%	45	6%	*185*	*7%*
D	Health and beauty	**85**	**4%**	45	3%	15	2%	*89*	*3%*
E	Accessories, jewellery, watches	**31**	**1%**	18	1%	15	2%	*65*	*3%*
F	Sport and recreation (shops)	**10**	**0%**	8	1%	6	1%	*14*	*1%*
G	Shoes and leather	**56**	**2%**	14	1%	9	1%	*63*	*2%*
H	Interior design	**105**	**4%**	50	4%	17	2%	*96*	*4%*
I	Gastronomy	**99**	**4%**	73	6%	54	8%	*148*	*6%*
J	Services typical of shopping centres	**215**	**9%**	154	12%	109	15%	*389*	*15%*
K	Services not typical of shopping centres	**767**	**32%**	480	37%	273	39%	*909*	*36%*
X	Not classified, vacant	**241**	**10%**	87	7%	51	7%	*85*	*3%*
TOTAL		**2 392**	**100%**	**1 294**	**100%**	**705**	**100%**	***2 554***	***100%***

In Elbląg there are 2 392 service points, half of them in the downtown area (1 294) and one third in the centre (705). In Gdynia the number of outlets in the downtown is twice as much as in Elbląg, but the city is also larger (two times more inhabitants). In Elbląg the largest class of retail outlets are fashion shops – 326 (14%), then food (311 and 13%). But the dominant in number are services that are not typical of shopping centres – these total for 767 and one third (32%) of all. 241 outlets (10%) are not classified or vacant.

When narrowing down from the total analysed area to the centre of Elbląg there are some observations to be made. When the area becomes smaller and more central the share of

food shops is also falling – from 13% total, through 11% in downtown to 6% in centre. And the opposite rule is for gastronomy that is increasing from 4%, through 6% to 8%. Similarly services also grow in their share – both those typical of shopping centres (9% – 12% – 15%) and those not typical of shopping centres (32% – 37% – 39%).

When comparing only the downtown areas of Elbląg and Gdynia there are similarities between them in the share of different types. Typically a downtown area would consist in 10% of food and 10% of fashion shops. Then there would be 7% of multimedia, press and book shops and 6% of gastronomy places. Other retailers' share would be below 5%. In terms of services there were 12-15% of services typical of shopping centres. The largest group (36-37%) would be services not typical of shopping centres. This is mainly because these central areas serve also as business districts rather than purely main shopping and leisure streets.

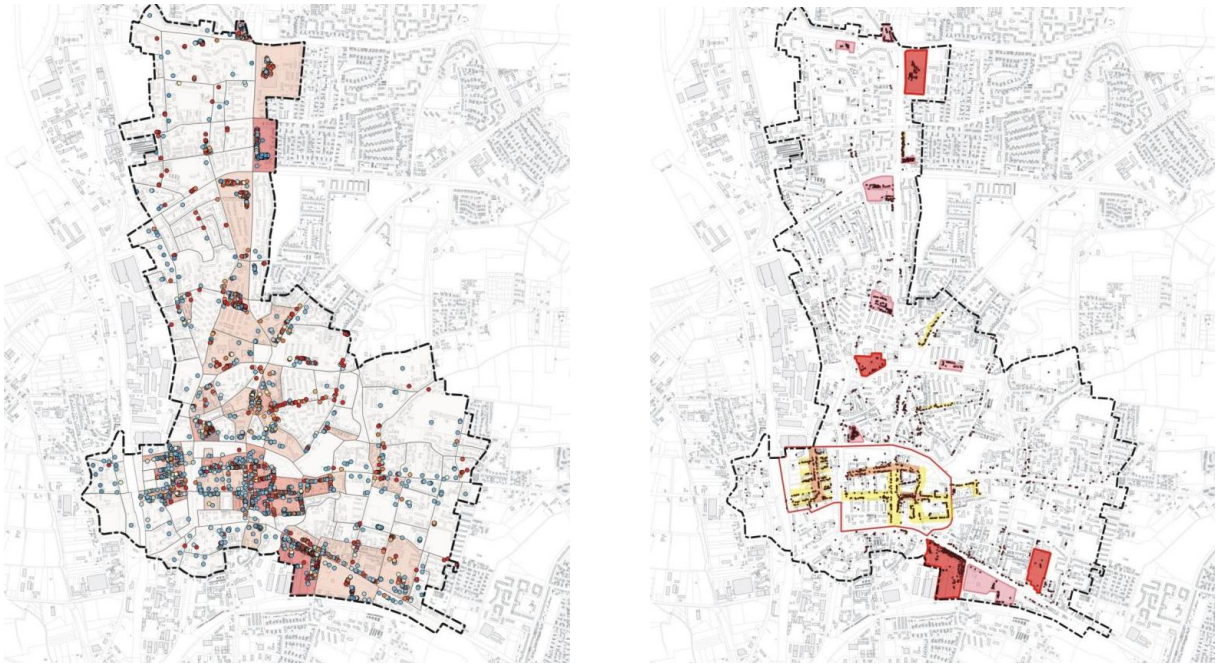

Figure 8: Elbląg – retail and service analysis

6. Comments

The application is easy to operate, also for unskilled surveyors. There is no special hardware necessary, as most of people own cell phones and many already have Android smartphones. Therefore it is a universal tool for data collection on services and retail location. Almost anyone can be engaged in surveying.

It is quick and accurate. It takes less than one minute for an experienced surveyor to enter one outlet into the database. Depending on the density of services and proximity to another surveyed place it takes on average 2-3 minutes per one outlet. The data is reliable and precise, as it is collected by a trained person and the application allows for validation of the location on map and also manual relocation, if needed. There are reference photos for reference if there should be a need to check the data in the future.

Although the current version is in Polish, the classes of services are universal for surveying worldwide. Using common classification for all surveys allows for comparability of the data between different cities and countries. It does not immediately relate to official census and record classes, that are specific in each country.

7. Planned future development

There are some improvements to the application already planned. First of all the collected data should be stored on a server or in the cloud, which would simplify the access to the database. It would also allow instant access to the full database without the need to import parts of surveyed. This would be helpful especially in case of surveying large areas, where more surveyors are working at one time.

Another development planned is to make possible comparison with previous, surveyed states. In such case the application would display suggestions for the surveyed place, based on the data from previous data collection. This would allow the user to simply confirm that the outlet is the same as previously or enter new data for a place that has changed. With this it will be possible also to easily identify places that have not changed their use – at the moment they are surveyed, not afterwards while analysing in GIS.

Apart from that the application will be translated into English to make it applicable internationally. Currently the application is only available in Android version. If there is such need it will be developed for iOS and other operating systems. Classes are stored in a separate file, which makes them editable and it is possible to change them. In such case the application can be used for other purposes. It is possible to survey other spatial occurrences, as long as the classification does not require more complex division than into two classes – main and subcategories.

It may be useful to be able to make possible importing customised maps or underlays from separate files – such as AutoCAD dwg/dxf formats or shp references to shapefiles. This would help working in areas where immediate reference to a preset data is necessary. Or it would make working offline possible, when the preloaded map would be footprints of builildngs – therefore saving the data transfer needed to operate the application.