Using methods for collecting data in the benefit of the local community

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Abstract

In this paper we are highlighting the benefits of creating and using forms for collecting data, through new applications possibilities regarding the main changes that can occur in the urban environment and suporting the local community.
These forms can be accessed from mobile devices and the reported results can be analyzed using a desktop application. The users are able to send their location linked with attribute data.
This approach can be successfullyused in a working team or can be disseminated for interested community members, as a crowdsource possibility. Crowdsourcing is evolving as a distributed way for solving different problems.The beneficiaries could be town halls or institutions with a key role in urban planning and utility companies.

Keywords

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Introduction

Esri has a number of apps you can use to collect data in the field. They all offer a form to fill in and all connect to ArcGIS. Taking into account the characteristics of each application, for more complex forms a better choice will be Survey123.
Survey123 is a mobile multi-platform application for field data collection based on surveys designed and shared online using a smartphone or tablet.The application allows designing of dedicated surveys, field data collection and analysis.
There is a real-time connectivity between the mobile platform and GIS server. [1] The real-time access to the data, should improve the response time of the authorities, to act for the community based on information received from the citizens.
Survey123 for ArcGIS is a simple and intuitive form-centric data gathering solution that makes creating, sharing, and analyzing surveys possible in just three easy steps:
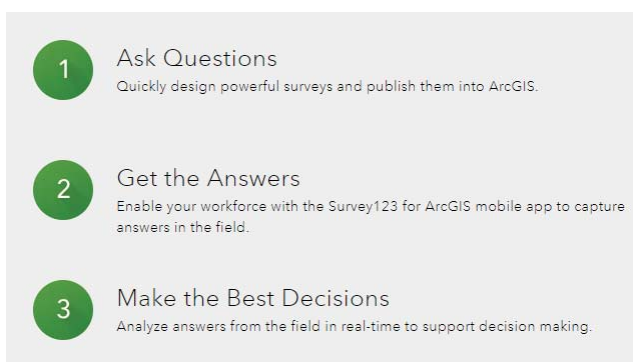

Fig. 1: How it works [2]

To help you to author your forms, Survey123 for ArcGIS includes a desktop tool called Survey123 Connect which works side by side with your XLSForm authoring tool for creating XLS files. Survey123 Connect lets you preview your XLSForm files as you author or edit them and also publishes your forms into ArcGIS Online and Portal for ArcGIS and creates feature services based on your form specification for data collection.

Each Excel workbook usually has two worksheets: survey and choices. The worksheets have a set of mandatory columns that must be present for the form to work. [3]

Creating this form and taking into consideration the main problems encountered at local gouverment level: sewerage, buildings, pit, urban furniture, pollution, green spaces, transport this can be reported in a short time from the moment of notification via Survey123's users.

2. Problem

The society is increasingly interested how can collect data by VGI means. Volunteered geographic information is the harnessing of tools to create, assemble, and disseminate geographic data provided voluntarily by individuals, through VGA costs are reduced and the problems are emphasized.

The basic concern of city-town planning is the internal form, structure, function and appearance of urban areas. Physical aspects such as buildings, roads, land use, etc., play an important role in urban planning, at the same time social, economic and technological forces should also be considered while planning so that a healthy environment is created in the city/town. Apart from this problem, some factors as lack of staff and low budget also complicate the task of planning. [4]

3. Resolving the Problem

Esri solutions that can be used to collect VGI data require a centralized database, publishing geospatial data through Web services [5] and facilitate the use of these services in various applications. According to [6], in figure 1 is highlighted a comparative study between Survey123, Collector and GeoForm. If are needed complex forms a better choice will be Survey123.

Fig. 2 – Comparative Study for Esri Collecting Data Software [6]

It is important that all users work on the same database, a unique database, unrelated of who entered information into the database.

Acceptance of WebGIS [7] solves the problem of information sharing:
- in organizations
- by third-party organizations or citizens.

MS Office environment can be used for collected data mining, using a dedicated plug-in, called Maps for Office.

Microsoft Excel can be used by the users to perform geospatial analyzes like heatmap, clustering, symbolization and sharing maps in ArcGIS Online.

Crowdsourcing can be categorised using three main elements associated with eight characteristics [8] as shown in figure 3.
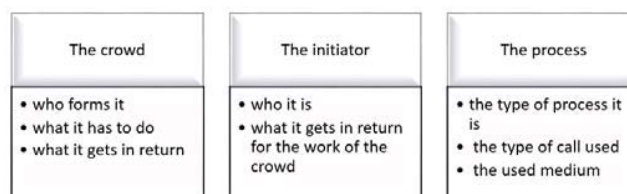

Fig. 3 – Main Characteristics of Crowdsourcing (adapted from[8])

Our proposal is to use crowdsourcing methods to provide data on changes that occur in urban areas. We chose to develop an application useful for data collection that highlights changes of the buildings - authorized or not.

This kind of applications could be implemented for example by mayors in order to identify:
- sewerage;
- buildings;
- pit;
- urban furniture;
- pollution;
- green spaces;
- transport;

The survey is dedicated for the above mentioned purpose, all fields having defined by choosing the appropriate data types. [9] (figure 4,5,6)

After publishing the survey, it is a warn that once a survey is published, it cannot be changed, because of the feature services. [10] The feature services are generated during the process of publication, and editing of existing feature services can be complex or, in some cases, entirely impossible. When a survey is published, is created the linked feature service to represent the form. The form is saved as an item in ArcGIS Online or Portal for ArcGIS (figure 7). The designed survey is available and can be sent to the other users for online collecting data and for downloading and using in the Survey123 field app. [11]

In figure 7 is shown the view of online data. Can be noticed location data associated with each problem reported.

	A	B	C
1	type	name	label
2	date	Data	The moment of notification
3	time	Incidenttime	Incident time
4	select_one IncidentTyp	IncidentType	Incident type
5	select_one ProblemTyp	ProblemType1	Problem type
6	select_one ProblemTyp	ProblemType2	Problem type
7	select_one ProblemTyp	ProblemType3	Details
8			
9	select_one Dimension	Dimension	Pit size
10	select_one Signalizatio	Signalization	Pit
11			
12	select_one ProblemTyp	ProblemType4	Problem type
13	select_one ProblemTyp	ProblemType5	Pollution
14			
15	select_one Area	Area	Green space area
16	select_one ProblemTyp	ProblemType6	Green space is affected by
17			
18	select_one ProblemTyp	ProblemType7	Transport
19	select_one Public	Public	Type
20	select_one Private	Private	Type
21	select_multiple Bus	Bus	Problem
22	select_multiple Tram	Tram	Problem
23	select_multiple Train	Train	Problem

Fig. 4 – Designed Fields

	A	B	C
1	list_name	name	label
2	IncidentType	Sewerage	Sewerage
3	IncidentType	Buildings	Buildings
4	IncidentType	Pit	Pit
5	IncidentType	UrbanFurniture	Urban Furniture
6	IncidentType	Pollution	Pollution
7	IncidentType	GreenSpaces	Green Spaces
8	IncidentType	Transport	Transport
9			
10	ProblemType1	CrackedPipe	Cracked pipe
11	ProblemType1	SewerageDroppings	Sewerage droppings
12	ProblemType1	SewerageClogged	Sewerage clogged
13	ProblemType1	MissingDuctCover	Missing duct cover
14	ProblemType1	Others	Others
15			
16	ProblemType2	IllegalBuildings	Ilegal buildings
17	ProblemType2	IllegalChanges/Extensions	Illegal changes/extensions
18	ProblemType2	BuildingsUnderSeismicRisk	Buildings under seismic risk
19	ProblemType2	DamagedBuildings	Damaged buildings
20	ProblemType2	Reinforcement	Reinforcement
21	ProblemType2	Others	Others
22			
23	ProblemType3	Dimension	Dimension
24	ProblemType3	Signalization	Signalization
25			
26	Dimension	Small	Small
27	Dimension	Big	Big
28	Signalization	Yes	Marked
29	Signalization	No	Unmarked

Fig. 5 – Domains for Fields

|	A	B	C
1	list_name	name	label
32	ProblemType4	LightingPoles	Lighting poles
33	ProblemType4	TrafficSigns	Traffic signs
34	ProblemType4	ParkBenches	Park benches
35	ProblemType4	Gazebos	Gazebos
36	ProblemType4	Playgrounds	Playgrounds
37	ProblemType4	HistoricalMonuments	Historical monuments
38	ProblemType4	ArtesianFountains	Artesian fountains
39	ProblemType4	Others	Others
40			
41	ProblemType5	Air	Air
42	ProblemType5	Water	Water
43	ProblemType5	Ground	Ground
44			
45	ProblemType6	Deforestation	Deforestation
46	ProblemType6	HarmfulInsects	Harmful insects
47	ProblemType6	DestroyedVegetation	Destroyed vegetation
48	ProblemType6	Others	Others
49			
50	Area	Square	Square
51	Area	Park	Park
52	Area	ForestPark	Forest park
53	Area	CemeteryPlanting	Cemetery planting
54	Area	AnotherGreenArea	Another green area
55			
56	ProblemType7	Public	Public
57	ProblemType7	Private	Private

Fig. 6 – Domains for Fields(cont)
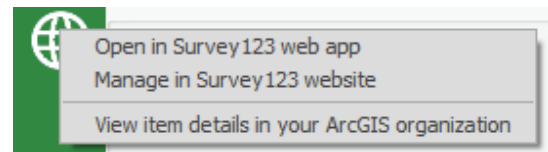
Fig. 7 – ArcGIS Online or Portal for ArcGIS

The form created presents the main problems occured in urban or rural areas.

In this example, as a citizen of Bucharest you observ a problem in your city like a lake from a park polluted. The easiest way to report this probles is to download the aplication Survey123 and complete the form created. It is important that these data (loaded in the database) to be disclosed to the City Hall. [12] (figure 8)
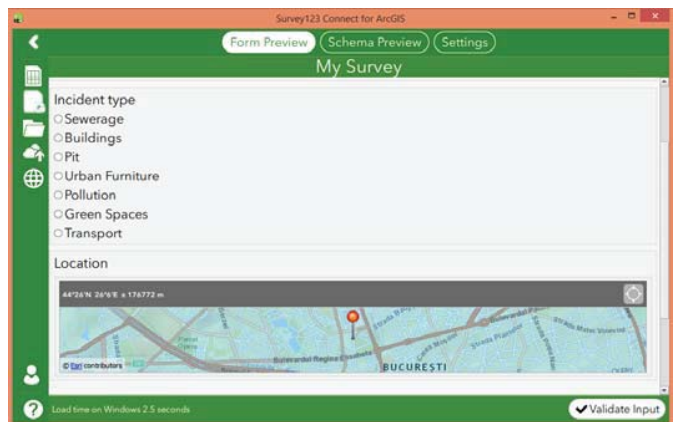
Fig. 8 – Main problems in urban area

The form presents aspects like the moment of notification and incident time witch are setted for that moment, but also you can change them.

For exemple, if you choose the incident type pollution, it has three main branches: air, water and ground. After choosing one of them you can also add details, insert or take a picture and share location of the incident. (figure 9)
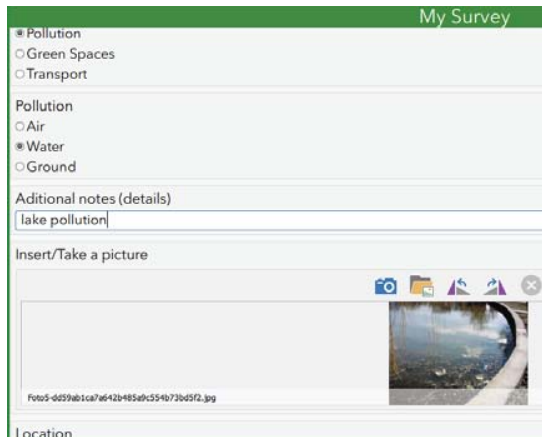

Fig. 9 – Lake pollution

Using the platform ArcGIS Online, the urban planning departament has acces to a updated real-time map, based on the data submitted by citizens, the urban planning departament's leadership will be able to send punctually its employees in the field. (figure 10)

The real-time map has the properties that when you acces the point from the map is it possible to view a full report about incident. (figure 11)
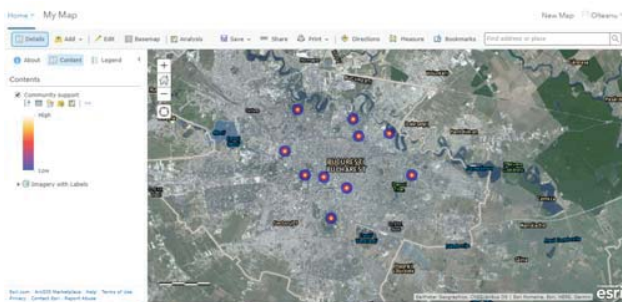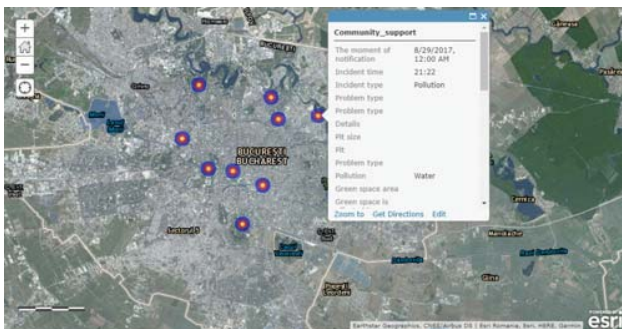

Fig. 10 – Map planning

Fig. 11 – Raport incident

In fact, citizens can provide their crowdsourced data through a number of traditional ways, including paper. In present mobile phones are progressively proving to be a good choice. According to [13], mobile phones have made a bigger difference to the lives of more people, more quickly, than any previous communications technology, spreading the fastest and being the easiest and cheapest to adopt.

4. Conclusions

Due to low financial resources and lack of staff, problems arising both in urban and rural areas are rarely noticed and solved. In conclusion, if citizens have access to the internet in populated areas (eg parks, public institutions, etc.), crowdsourcing methods would be the best and most affordable solution for real-time reporting of incidents.

Tehnically, implementing this type of solutions would be the best nowadays, because is accesible and it is a good conection between citizens,

city hall and the one who can take actions in tackling problems in urban places.

On the other hand a small desavantage would be the fact that older people are not so friendly with this kind of solutions.

The main advantages are:

- cheap solution;
- friendly interface;
- easy steps;
- major impact;
- direct involvement of people in solving problem fast;
- the aplication can be used online or offline (when you are online you can send the finished forms; when you are offline the completed forms can be saved as sketches);
- minimal training is needed;
- built-in reporting capabilities;

Disadvantages:

- require you to have an ArcGIS Online organisation account or a Portal for ArcGIS installed on your server;
- the server with the map created is loading slowly;

References

[1] http://www.marketwatch.ro/articol/15418/Conferinta_Utilizatorilor_EsriTrimble_si_Harris-Exelis_2016/

[2] https://survey123.arcgis.com/

[3] http://doc.arcgis.com/en/survey123/desktop/create-surveys/xlsformessentials.htm

[4] Puja Mondal,
3 Main Problems Faced in Urban Planning, http://www.yourarticlelibrary.com/problems/3-main-problems-faced-in-urban-planning/4695/

[5] ***, The ArcGIS® Book, 10 Big Ideas about Applying Geography to Your World, Esri Press Redlands, California, 2015

[6] https://geonet.esri.com/groups/survey123/blog/2015/09/04/survey123-collector-and-geoform-a-quick-comparison

[7] Badescu, Gabriel; Stefan, Ovidiu; Hotea, Vasile, Making web accesible applications by using gis open source systems for the management of environment protection projects, Book Series: Proceedings of the International Conference ModTech Pages: 67-70 Published: 2010

[8] Clouston, Andrew David - Crowdsourcing the Cadastre: The Applicability of Crowdsourced Geospatial Information to the New Zealand Cadastre, http://hdl.handle.net/10063/4234, MsC Thesis, Victoria University of Wellington, 2015

[9] Badea, A C, Badea, G, Vasilca, D, Semen, C., Advantages of the European Knowledge of Real Estate Regulations and Data, 16th International Multidisciplinary Scientific GeoConference SGEM 2016, www.sgem.org, SGEM2016 Conference Proceedings, ISBN 978-619-7105-59-9 / ISSN 1314-2704, June 28 - July 6, 2016, Book2 Vol. 2, 53-60 pp, DOI: 10.5593/SGEM2016/B22/S09.008

[10] Badea, A C, Badea, G, The Advantages of Creating Compound GIS Functions for Automated Workflow, Pages 943 – 949, 13th International Multidisciplinary Scientific Geoconference SGEM 2013, 16-22 June, 2013, Conference Proceedings, volume I, Section Cartography and GIS, ISBN 978-954-91818-9-0, ISSN 1314-2704, DOI:10.5593/SGEM2013/BB2.V1/S11.043

[11] Vasile, Cristian, Conferința utilizatorilor Esri, Trimble și Harris-Excelis 2015, Market Watch Nr. 179/15 octombrie - 15 noiembrie 2015, http://www.marketwatch.ro/download_pdf.php?idr=2200;

[12] Badea, G, Badea, A C, The importance of the project management in GIS, Buletinul științific al Universității de Nord din Baia Mare, 2009, ISSN 1582 - 0548, pp. 151-155

McLaren, Robin - Crowdsourcing Support of Land Administration – A Partnership Approach, FIG Working Week 2012, Knowing to manage the territory, protect the environment, evaluate the cultural heritage, TS03B - Volunteered Geographic Information, 5482, Rome, Italy, 6-10 May 2012, https://www.fig.net/resources/proceedings/fig_proceedings/fig2012/papers/ts03b/TS03B_mclaren_5482.pdf;