ImproveMyCity - An Open Source Platform for Direct Citizen-government Communication

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ABSTRACT

ImproveMyCity is an open source platform that enables residents to directly report to their public administration local issues about their neighborhood such as discarded trash bins, faulty street lights, broken tiles on sidewalks, illegal advertising boards, etc. The reported issues are automatically transmitted to the appropriate office in public administration so as to schedule their settlement. Reporting is feasible both through a web- and a smartphone-based front-end that adopt a map-based visualization, which makes reporting a user-friendly and intriguing process. The management and routing of incoming issues is performed through a back-end infrastructure that serves as an integrated management system with easy to use interfaces. Apart from reporting a new issue, both front-ends allow the citizens to add comments or vote on existing issues, which adds a social dimension on the collected content. Finally, the platform makes also provision for informing the citizens about the progress status of the reported issue and in this way facilitate the establishment of a two-way dialogue between the citizen and public administration.

Categories and Subject Descriptors

D.2.2 [**Software Engineering**]: Design Tools and Techniques; H.3.5 [**Information Systems**]: Information Storage and Retrieval; Online Information Services

Keywords

eParticipation, eGovernment, issue reporting, urban maintenance, open source

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1. OVERVIEW

In modern societies there is a growing requirement for public administrations to directly communicate with their citizens, view the existing problems from their perspective and re-act to their needs. In meeting this requirement, modern technologies has turned into a particularly valuable instrument that, apart from being a rich source of information, is also an integral part of our daily activities. Based on the above and driven by the intriguing concept that every citizen can act as the living sensor of his city, we have developed the ImproveMyCity platform. Our platform provides, on the one hand, user-friendly interfaces for the citizens to directly report issues about their city such as potholes, illegal trash dumping, faulty street lights and broken tiles on sidewalks, and on the other hand the necessary back-end infrastructure and interfaces for public servants to keep track of the reported issues, schedule their settlement and provide feedback about the progress status. Although a number of systems for citizen-government communication are already present, none of them is offered as open source allowing the interested parties to build on top of an existing infrastructure, extent it with new functionalities, or even think of new paradigms to gain insights based on the collected information. This was our motive for developing ImproveMyCity, which is the first integrated solution for citizen-government communication that is made available as open source.

The ImproveMyCity platform is structured as a client-server application and is implemented as an extension of the Joomla framework. The platform consists of a web-based portal for allowing citizens to report issues from their desktop PC, a smartphone application for android devices that allows citizens to do the same process through their mobile phone and a back-end infrastructure for allowing the governmental agencies to easily handle the reported issues. The source code is available in GitHub both for the web-based front-end and the back-end infrastructure [2], as well as for the mobile front-end [5]. All source codes are provided with detailed user guides explaining how to download and install the applications and are licensed under the GNU Affero General Public License [1].

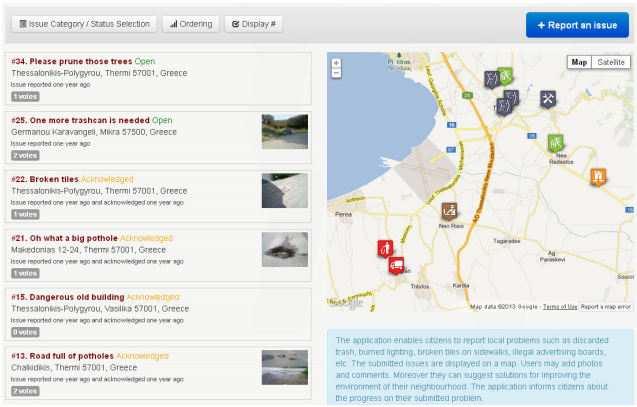

Figure 1: Map- and List-based view of the issues. The image is best viewed in color and with magnification.

2. DESCRIPTION

The ImproveMyCity platform consists of three main components: a) The web-based front-end for reporting issues through a desktop PC, b) The smartphone-based front-end for reporting issues through a mobile phone, and c) the back-end infrastructure and related interfaces for administering the incoming issues. Through these components the ImproveMyCity platform implements a variety of functionalities that are employed with the purpose to establish a two-way dialogue between the municipality and its citizens. In the following we describe the most important of these functionalities.

2.1 Web-based front-end

Both the web- and smartphone-based front-ends incorporate the functionalities described below. However, the smartphone-based front-end incorporates also a number of additional functionalities that are described in Section 2.2.

Map-based view of the issues: The reported issues are displayed on the city's map using a different icon for each issue category. The user can navigate himself using the standard map-based functionalities and acquire more information about a certain issue by clicking on the corresponding icon (see Figure 1).

List-based view of the issues: The reported issues can be also displayed in a list-based view. This view enables the interface to provide the user with the most important information about each issue such as: the title, the address, its progress status, the days passed from the submission date and the number of positive votes (see Figure 1).

Issue-based view: Upon clicking an icon or a list entry the issue-based view appears. This view presents in a separate page detailed information about the selected issue such as: title, category, address, name of the citizen who submitted the issue, the date of submission, a photo, description, user comments, location on the map, and the number of votes.

Filtering: Users can filter the issues that appear in both the map- and list-based view. The displayed issues can be filtered by: a) the issue category, b) the progress status, c) vote-based ranking, and d) submission-date ranking.

New issue reporting: The user can submit a new issue by: a) providing a short title, b) selecting the issue category among a predefined set of categories and sub-categories that have been determined by the municipality, c) determine the exact location of the problem by moving a marker on the city map (or provide a written address by hand), d) attach an image that describes the problem (this is optional), and f) provide the full description of the issue.

Commenting: Through the "Issue-based" view registered users can comment on issues submitted by other users, or answer to the comments made for their own issues by forming a discussion thread.

Voting: Through the "Issue-based" view registered users can provide a positive vote on issues they consider significant, allowing the municipality to prioritize the reported problems.

Feedback: The commenting functionality can be also used by the employees of the municipality to provide written feedback about the reported issues.

Progress status: The citizens are informed about the progress status of their requests by email, as well as through a progress status bar that appears in the "List-based" and "Issue-based" views. Initially the status of each issue is "Open". Once the municipality becomes aware of the issue and the citizen's report is forwarded to the appropriate department the status changes to "Acknowledged". Finally, the status becomes "Closed" when the issue is resolved.

2.2 Mobile-based front-end

The goal of the mobile-based front-end is to complement the web-based functionality by allowing citizens to report issues while they are on the move. The ImproveMyCity mobile application is fully interconnected with the web version, i.e. actions taken from the mobile application are visible through the web portal and vise-versa. It fully incorporates the functionalities described in Section 2.1, with the addition of a few extract features that are made possible due to the sensors embedded in all smartphones. More specifically, the additional functionalities include:

Automatic location extraction: Using the GPS sensor embedded on the phone and the reverse geocoding functionality offered by Google, the application is able to automatically extract the exact issue location, removing the need for the user to move the marker on the map or to type-in the address (see Figure 2).

Easy photo capturing: Using the built-in camera of the smartphone the application simplifies the process of attaching a photo to the problem description, which is particularly important for assessing the situation and planing the necessary actions for its settlement.

Offline use: The application makes provisions for storing the data locally on the phone and allowing its offline use.

Location-centered services: Knowing the citizen's GPS location when using the application, the mobile-based front-end incorporates functionalities like: i) download only the issues that lie within a specified radius around the phone's current position, so as to avoid unnecessary bandwidth consumption, ii) ignore issues that are reported outside the geographical boundaries of the municipality, so as to avoid junk entries.

2.3 Back-end infrastructure

After their submission, the reported issues should automatically become visible to the employees of the appropriate municipality department based on the issue category.

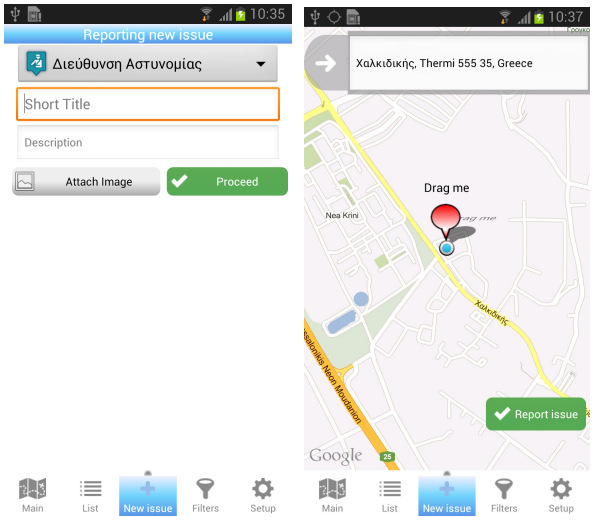

Figure 2: Automatic location extraction in reporting a new issue. The image is best viewed in color and with magnification.

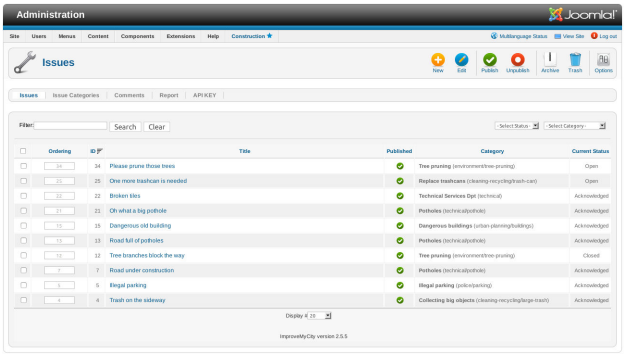

Figure 3: Integrated system for managing incoming issues. The image is best viewed in color and with magnification.

The departments depend on the internal organization of the municipality (e.g. technical service, municipal police, urban planning department, cleaning department, water supply & drainage department, etc.) and should be aligned with the categories presented to the user when submitting a new issue. The task of the designated employees is to initiate the established resolution process, reply to users' comments and change the progress status of the issues accordingly. To facilitate the above the ImproveMyCity platform has implemented the following set of functionalities:

Integrated issue management system: The submitted issues are managed through an integrated environment that is based on Joomla content management system (see Figure 3). This environment provides the necessary interfaces and rights management mechanisms, so as to make feasible the distribution of the management effort to the different departments of the municipality.

Web-based administration: The authorized employees manage the entries through a web form that presents all necessary pieces of information and applicable actions.

User comments management: The application provides a special page for displaying the submitted comments allowing the administrators and city officials to have an overview of the discussions about each issue.

Responsibility distribution: The back-end interface makes the necessary provision so that different municipality employees to be responsible for different categories. Moreover, the application allows the assignment of many accounts per category, so as to split the administration effort in more than one employees.

Easy customization: The back-end interface is fully customizable in terms of user rights, comments, number of categories, notifications on new issues and comments, etc.

Reporting: The application is able to produce reports with statistically aggregated information, so as to help the city officials in assessing the overall performance of the municipality.

3. INTENDED AUDIENCE

In its current form the ImproveMyCity platform mainly addresses the audience of: a) citizens (people who live, work or visit a municipality and who are willing to collaborate with public administration for improving their neighborhood), b) municipality's civil servants (who work in the municipality and who are searching for novel ways to offer better services with reduced cost), and c) city officials like the Mayor and city council members (whose job is to look for the best interest of the municipality and its citizens). Moreover, besides the main user groups there are also some other types of users such as journalists that publish local problems on the media that may also benefit from the establishment of such a platform. Given the above and due to its high degree of modularity and customization, the ImproveMyCity platform can be easily adopted by almost every municipality around the globe, independently of its size and location.

From a scientific perspective, ImproveMyCity encompasses textual descriptions, images, preference in the form of votes, GPS information, demographic data, etc. This content is likely to carry valuable pieces of knowledge such as popular topics, trends, public opinion, etc. In this respect the ImproveMyCity platform may very well serve as the enabling content platform for researchers working in the fields of topic detection, opinion mining and sentiment analysis.

Finally, although the developed platform has been built to facilitate the easy reporting, scheduling and settlement of non-emergent issues for urban maintenance, the workflow management rules and the established communication practices may as well be used to facilitate the optimization of many other processes. For instance, it can be used to optimize every process that requires the collection of information from distributed sensors, the routing of this information to the appropriate end-points, the triggering of certain actions based on the information received and the ability to push information back to the origin using a feedback mechanism. Examples of such processes may derive from the sectors of fleet management, roadside assistance companies, or any other business that relies on the distributed collection of local information through a human network.

4. SOFTWARE AND HARDWARE CONSIDERATIONS

In order to use the ImproveMyCity functionalities there is no need to connect with external sources of information

except the Google Maps API that is used to provide geolocation data and the reverse geocoding service in the case of smartphones. The provided service is open for the citizens of the municipality who can create an account and start submitting issues. All services are available through the World Wide Web (WWW). There is no need for special network infrastructure. Users who use the service from their home computer should have a broadband internet access through an ADSL line. Users who use the service from a smartphone, should use a 3G or Wi-Fi broadband connection. The service doesn't require the deployment of any special hardware. The web-based services can be hosted on the same infrastructure that hosts the website of the municipality, or transferred in a dedicated server if the number of registered users becomes considerably high.

5. CUSTOMIZATION & LOCALIZATION

The ImproveMyCity platform has paid particular attention to make fully customizable all parameters needed to localize the platform for a certain city. In this respect all language-related menus, geo-positioning related parameters and layout options, are accessible through external files that can be easily edited. Similar is the case for the parameters that are needed to synchronize the mobile front-end with the back-end infrastructure.

Particular attention has been placed on language-based localization by initiating and maintaining a crowdsourcing project in Transifex[1]. This project has already resulted in the full translation of the ImproveMyCity language dependent information in nine languages, while there are many more languages that are still under way.

6. INSTALLATION PROCESS

Since the web-based front-end and the back-end infrastructure and interfaces are developed as standard Joomla components, their installation and running is a plain process. Indeed after a few simple steps described in [3], the ImproveMyCity back-end infrastructure and the web-based front-end are ready to be used and administered. Similarly, the mobile front-end requires a few extra steps described in [6], so as to connect with the server and get synchronized with the web-based front-end. If someone would like to change the features of ImproveMyCity, prior knowledge of the Joomla framework API is necessary. Similarly, for modifying the mobile part, knowledge of the Android development tool (ADT) and the Android SDK are necessary.

7. STATISTICS & DEPLOYMENT

The back-end infrastructure along with the web-based front end were made available as a Joomla extension component (available through the official Joomla Extension Directory (JED)) on July 2012. Since then, the ImproveMyCity component has been viewed more than 15000 times and downloaded more than 3800 times. The mobile-based front-end has become publicly available on GitHub on May 2013 and has already started to attract considerable attention from the established community. Both the Joomla extension component and the mobile-based front-end are supported by a Google Groups forum, as well as the "wiki page" and the "Issues tracker" functionality offered by Github, where all communications take place in English. The platform is open for any individual or consortium to use and contribute under the AGLP licence.

The ImproveMyCity platform was originally deployed in the Municipality of Thermi, Greece in April 2012 [4]. One year later more than 500 users have been registered and submitted 585 issues and 1350 comments. The mobile-based front-end has been officially launched by the municipality of Thermi-Greece on December 2012 and has since been installed in more than 190 devices.

8. SUMMARY

Although the idea of engaging citizens into a two-way dialogue with their administration for improving their urban space has been around for some time, e.g. FixMyStreet[2], BuitenBeter[3], ImproveMyCity is the first integrated solution that is made available as open source and covers the full chain of information flow, ranging from the desktop user that reports issues from the leisure of his home and the mobile citizen that reports issues while on the move, all the way to the back-end management system for administering the incoming issues and the reports with aggregated statistics for performance assessment and future planning of resources.

Moreover, the ImproveMyCity platform is characterized by its simple installation process, its extensive customization options and its minimum requirements in terms of additional hardware or external software libraries. This makes it ideal for municipalities that are reluctant to invest any resources, until they are convinced about the benefits of citizen-government collaboration for urban maintenance and improvement.

9. ACKNOWLEDGMENTS

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