

Location based service for urban management

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The design and implementation of a spatially enabled urban management system to monitor service delivery within the City of Johannesburg.

The goal of the project was to put together a spatially enabled urban management monitoring system for the City of Johannesburg (COJ), with the inner city being the pilot project. The business owner of the project is the Directorate: Corporate Geo-Informatics from the City of Johannesburg and the system was developed by Business Connexion.

Background

The city of Johannesburg covers an area of 1 644 km², has approximately 650 000 stands and 1-million households. Furthermore, the vision of the city is to become a world-class African city that meets world best practices in terms of processes, systems and people. The city is committed to service delivery, also in terms of property and planning services.

GIS is an indispensable tool in realising this vision, due to its ability to integrate various sets of information and to perform spatial analysis. GPS adds spatial intelligence to previously non-spatial information and plays an important supplementary role to GIS.

Project trigger

Urban management became a new function of the Development Planning and Urban Management (DP&UM) department in 2007 and it entails the responsibility of monitoring service delivery within the boundaries of the city. Service delivery by the city and its municipal owned entities (MOEs) includes aspects such as repairing water leakages, fixing of potholes, attending to faulty street lights, replacing missing manhole covers, etc. The regional directors are responsible for this function in the city and they have appointed a number of

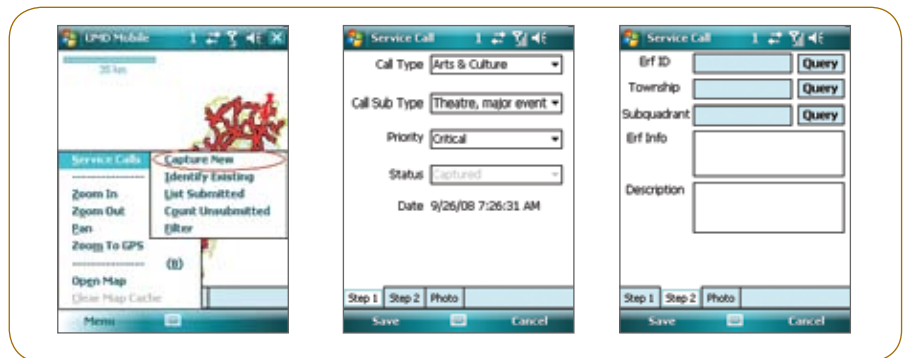


Fig. 1: Sample maps and task lists allowing fieldworkers to complete and track tasks.



Fig. 2: Sample screen dumps of GPS location and tracking.

fieldworkers who are responsible for walking the streets in order to identify and report new problems as well as following up and checking on reported problems. Although this function does not include the fixing of service breakdowns, it entails the monitoring and reporting thereof.

The fieldworkers reported service breakdowns on a paper-based system (log book). They would typically report the calls after a day's work in the field. They would also be sent into the field each day with a list of calls to be verified. It was difficult to attend to queries as the call taker did not have

access to the same information as the fieldworker, and resource allocation was challenging as it was difficult to calculate demands.

Project features

The Urban Management Monitoring System is designed to evaluate the effectiveness of service delivery by use of handheld devices to support their field activities using Windows Mobile Handheld Computers. Fieldworkers have access to property data for the seven regions of the city.

The DP&UM department identified the need for a spatially enabled system

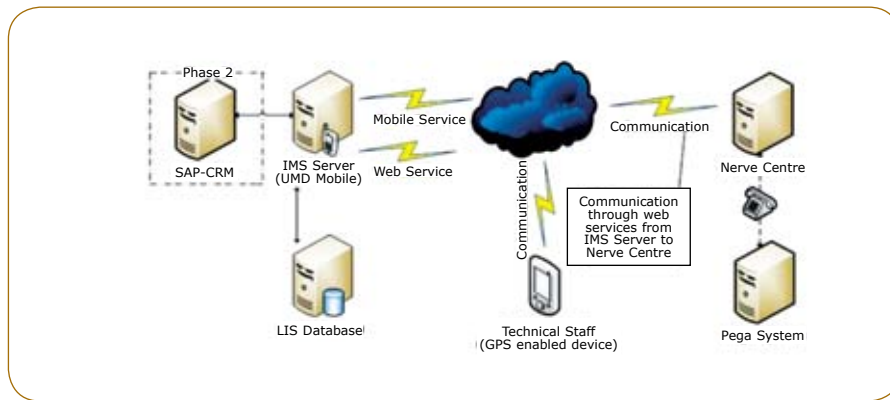


Fig 3: An overview of the system architecture.

that would facilitate urban management monitoring to successfully implement this new program. Cognisance was taken of the SAP CRM solution that addresses the customer interface activities using similar functionality and data. The system was to be developed in such a way that it would be integrated into the SAP CRM solution once the latter was completed. The urban management fieldworkers use handheld devices (HTC TyTN II) to capture spatial information. This provides operational staff (Nerve Centre) with the ability to report, track and manage problems based on real-time information received from active mobile field workers.

The following three key components exist within the overall application:

- Mobile digital map (Fig. 1)
- GPS and location based services (Fig. 2)
- Communication (Nerve Centre and SAP CRM Web services)

The pilot project was developed for the inner city due to Mayoral Inner City Charter Commitments which required the implementation of an information system in the 2007/2008 financial year.

Technical solution

The technical solution was designed with ESRI ArcGIS technology, which is the standard GIS application technology in the GIS department, thus leveraging the existing investment in ArcGIS. ArcGIS Server was deployed and utilised for publishing a mobile map service with the required information for the mobile application.

The mobile application was developed based on the Mobile Web Application Development Framework (ADF) using Microsoft Visual Studio 2005. The application consumes the mobile service via wireless connection and allows

the field workers to capture locations of service calls with the required call details. This information is recorded to the spatial database in real time.

The mobile application is developed for handheld devices using Windows Mobile 6.0 operating system and requires the devices to have 3G or GPRS communication, GPS and camera. When a field worker captures a new service call, it is recorded against the current GPS coordinate, together with the information entered on the capture form (call type, priority, etc). The field worker can also take a photo and submit it with the call.

A management interface was developed for the Nerve Centre, based on the existing ArcIMS platform in the Metro. It allows for the management of recorded calls according to the established management process. It also provides management reports to assist with the identification of hot spots and improved decision making.

Call status can be changed both from the mobile application and from the Nerve Centre interface. Additional photos can be attached, showing progress on the call resolution. A full history record is kept of all activities related to the call and can be examined through the Nerve Centre interface.

Impact

The impact of the system on the business and its customers is outlined below. It is now possible to:

- Capture location-based information for urban management.
- Report, track and manage service delivery problems based on real-time statistics.
- Identify problem hot-spots to plan and allocate necessary resources in time.
- Improve turn-around times due to the spatially enabled system

providing access to detailed property information.

- Improve service delivery as a result of efficient urban management where fieldworkers can proactively identify and report problems.
- City of Johannesburg management will be able to monitor the bigger picture and have a map view for planning purposes e.g. resource planning .
- The system will contribute to and enable the monitoring of delivery of the Inner City Charter Commitments.

Partnerships

Partnerships have been created across the organisation (e.g. regions, office of the chief information officer) as well as the municipal owned entities (MOEs) and GIS service providers.

Lessons learnt

The amount of handholding and user training for the testing and implementation of such an application should not be underestimated and sufficient attention, time and resources should be allocated to these stages of the project.

A project like this is more complex than expected due to factors such as:

- Enterprise Architecture Review Board approval which requires a technical impact assessment (network, infrastructure, etc.) and motivation.
- The range of role players such as GIS service providers, IT service providers, regional directors and various city departments.
- The city has a cellphone contract with a specific service provider with fixed packages which did not make provision for the recommended device or the amount of spatial data.

Technology changes are ongoing and the handheld devices recommended at the start of the project were already outdated at the end of the project. A review of the technology is recommended as part of the project closure.

Future challenges

Future challenges include the rollout of the pilot project to the other six regions, integration with SAP CRM, spatial analysis and modelling for resource planning and other applications such as valuations.

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