Cellphone technology for asset management and its impact on operational efficiency

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This paper outlines solution requirements and mobile technology best practices for the municipal sector, focusing on managing a diverse physical asset portfolio and related services.

Assets can take a variety of forms: financial, physical or intangible. Whatever form assets take, there are generally three guiding features which determine what constitutes an asset – it will have a value, it will provide benefits from its use over the period of its useful life, and is central to the organisation’s business processes.

A business process is a collection of related, structured activities or tasks that produce a specific service or product (serve a particular goal) for a particular customer or customers.

Public sector – in the news

‘Government is focused on accelerated public sector reform. They need to improve the lives of citizens, boost investor confidence and become the catalyst for sustainable success stories in Africa. We are aligned to assisting government to be at the forefront of this reform.’ – Yunus Naidoo, Public Sector Leader – Advisory

Around the world, governments are faced with an increasingly complex array of asset management challenges. At the same time there is an increasing demand for transparency and accountability on public policies.

Asset-intensive organisations within the municipal sector struggle with collecting accurate real-time information about asset performance, workforce status, and field conditions.

The diversity of physical assets and service providers that the municipal sector is faced with is making the task of creating sustainable success even more difficult. Physical assets span over a wide array of asset classes, i.e. vehicle fleets; facilities such as parks, or water/wastewater treatment plants; and linear assets like electrical, road and sewer systems. Aligned with the array of physical asset classes are the dissimilar service providers to be managed.

Despite the accelerated need for a holistic lifecycle physical asset management program within the municipal sector, the prevailing approach continues to rely on paper-based data collection and field communications or multiple standalone systems and spreadsheets.

The resulting business processes are unmanageably complex and inaccurate, making it impossible for management to entrench best practices. Further to this, technical teams and other key asset management resources are prevented from making proactive and cost-effective decisions.

Compliance, safety, and productivity all suffer as a result.

Asset productivity and reliability – the critical element

The overriding objective for most asset intensive industries, such as the municipal sector, is comfortably concluded to be customer satisfaction in most cases. This premise however can be academic in its pursuit, as the customer may be too far removed from the actual objective to drive daily field operational aspects.

With physical assets at the core of asset intensive businesses, the priority pursuit is and will remain to be the delivery of high asset productivity directly linked to uninterrupted service and production.

This in turn, depending on the industry and the end customer, ensures profitability, asset life prolongation, and so forth. For the municipal sector, it means ensuring the community has the foundation upon which to conduct commerce freely and without interruption, and assurance of public safety.

In the next section of the paper we provide an introduction to the PAS 55 standard, advances in the mobile arena, and describe how the convergence of mobility and a well structured physical asset management program can deliver competent governance of critical assets and ultimately world-class service delivery to customers.

PAS 55 – “A way of performing asset management”

It became clear to the Institute of Asset Management (United Kingdom) that there was a crucial need to provide a consistent framework for physical asset management. In a quest to develop risk mitigation strategies and best practices focusing on critical assets, the Institute of Asset Management and the British Standards Institute (BSI) worked together to develop the publicly available specification (PAS) 55-1: 2008: Asset Management, first published in 2004.

PAS 55 is becoming internationally accepted as the industry standard for quality asset management. In a nutshell, the PAS 55 standard acts as a valuable guideline for asset lifecycle management, compliance, and quality control, and is typically relevant to all asset intensive industries.

PAS 55 defines asset management as “systematic and coordinated activities and practices through which an organisation optimally and sustainably manages its assets and asset systems, their associated performance, risks and expenditure’s over their lifecycles for the purpose of achieving its organisational strategic plan”.

![Fig. 1: The typical priorities and concerns evident when integrating and managing assets and asset systems](image-url)
Assets can be identified and subsequently managed at different levels – ranging from discrete assets to complex asset systems or diverse asset portfolios. Fig. 1 shows examples of priorities and concerns that might be evident at the different levels of asset integration and management.

The PAS 55 standard focuses on all asset types, varying from critical physical assets to human assets. The physical assets are divided into the following four classes:
- **Plant and production** (oil, gas, chemicals, pharmaceuticals, food, electronics, power generation),
- **Infrastructure** (railways, highways, telecommunications, water and wastewater, electric and gas distribution),
- **Mobile assets** (military, airlines, trucking, shipping, rail), and
- **Real estate and facilities** (offices, schools, hospitals).

In review of recent mobility surveys done by major technology research organisations such as Gartner and Forrester, the importance of mobile technology in the enterprise context cannot be understated.

**Table 1: Mobility in the context of the enterprise trends.**

<table>
<thead>
<tr>
<th>Analysis and trends</th>
<th>Survey results</th>
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<tbody>
<tr>
<td>Number and type of connected device is dramatically changing</td>
<td><strong>IDC Forecast</strong>&lt;br&gt;18 smart phones and 1.28 mobile workers by 2013. Large enterprises expect to triple their smart phone user base by 2015.</td>
</tr>
<tr>
<td>Mobility is driving the “consumerisation” of IT</td>
<td><strong>Forrester Forecast 2010/2011</strong>&lt;br&gt;46% of large enterprises supporting personal owned devices. Billions of downloads of 500 000 apps from Apple app store.</td>
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<tr>
<td>Increasing demand for enterprise applications</td>
<td><strong>Gartner and Forrester Analyst Calls (Oct 2011)</strong>&lt;br&gt;20% of mobile workers are getting business apps from app stores today. 50% of organisations planning to deploy mobile apps in 12 months.</td>
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</tbody>
</table>

In review of recent mobility surveys done by Accenture, IDC, Forrester and Gartner (see Table 1 for more details), we see that history is repeating itself on the technological front. Mobile devices transitioned from being a secondary-use device to a primary-use device. This transition has presented companies with new possibilities – new platform, new purpose, whether devices are supplied by the organisation or employees make use of their own. Although the mobility era brings an astonishing number of capabilities, it will not be without its challenges and therefore companies need to carefully plan and execute mobile strategies.

The **device and business process evolution**

The mobile industry is at the doorstep of the next big change – this change will comprise a three-force convergence, namely:
- True mobile broadband.
- Mobile devices with similar functionality as computers.
- Software applications to improve on workforce productivity.

Mobile penetration statistics reveal that there are nearly 6-billion mobile phone subscribers and nearly all new phones connect to the web. Also on the “mobile table” is the worldwide adoption of tablets – with strong evidence to indicate that tablet sales will exceed laptop sales by 2015/16. Sales revenue on mobile applications is projected to reach R427-billion by 2016.

Mobile adoption rates are driven extensively by technological advances – ranging from better and more user-friendly mobile operating systems, to receivers and processing units achieving wider network coverage and faster connectivity.

The mobile platform now brings new meaning to the concept of “always-on” – delivering pervasive access with secure cloud based transactional processing.

Another key technological advancement within the mobility arena is versatility. Sensor technology has long surpassed GPS and Bluetooth connectivity to include motion, altitude and vital signs sensing.

Key vendor software development is also focused on device independency – enabling smartphone to wide screen projection without loss in data connectivity (see Figs. 3 and 4).

**Advances in mobile technology – the asset management imperative**

In review of the section above – focused on the evolution of mobility – organisations have realised that the advances in smartphones and other mobile devices are transforming them from channels of convenience to the primary means of communication/
interaction. Mobility will not just connect more of the marketplace to the web, but also offers advantages previously impossible in the physical asset management space. By putting mobility at the heart of their physical asset management processes, companies will better engage with both customers and employees. In order to embrace mobility as a key enabler for asset-intensive physical asset management, mobile solution providers need to address connectivity, security, location and identification, and data orchestration requirements.

Adaptable connectivity

Advanced mobile solutions offer access to business critical data through all modes of communication — ranging from connected, disconnected to intermittent connectivity modes.

A municipal worker or contractor in the field cannot always rely on uninterrupted wireless communications. In many instances uninterrupted communication is simply not possible (e.g. remote locations), not safe or against strict regulation. These remote workers should be able to effectively execute their assigned work orders, operating in disconnected mode, and later receive updates and/or provide feedback when wireless coverage is re-established.

In connected or otherwise referred to as real-time mode, the field worker should be able to enter emergency work orders, request spares, gain access to critical technical objects (e.g. standard operating procedures), record assessment results, and dynamically pass alerts or alarm notifications between the field force and the physical asset management system.

The adaptable connectivity requirement also extends to the disconnected mode of operation, where field workers will synchronise work orders and other critical asset information (while connected) to their mobile devices. All work-performed data (e.g. labour performed details, failure data, etc.) will then be entered locally into the mobile device. The recorded data will then later be synchronised once connectivity is re-established.

Another key requirement within the physical asset management area for the municipal sector is the requirement for across-all-stakeholders collaboration in the field.

Location and identification

Thousands of industries worldwide have successfully employed geospatial information management (GIS) and field force automation (FFA) technologies as value business drivers. During the past five to six years, we have seen a convergence of these technologies primarily focused on improved resource and physical asset management.

Location and identification functionality both automates the collection of information and provides an audit trail.

- Bar codes and RFID tags: Workforce context on approaching physical assets, and workflow facilitation.
- Scanning a bar code or sensing an RFID tag: Referencing the technical object database.
- GPS: Asset and workforce context and route optimisation.

Security

For long, business-specific mobile adoption has been hindered, because of transactional security requirements that could not be met at the time. Advanced asset management mobile solutions are characterised by:

- Support for SSL, HTTPS, and PKI security standards for 802.11 wireless networks.
- Mobile security measures integrate seamlessly into the enterprise application’s security architecture.
- Transactional security requirements are met with bi-directional authentication via digital security certificates and/or passwords.
- Data transmitted bi-directionally, and stored locally is fully encrypted and locked.
- Data and modular access is controlled with user logins and profiles.

Another key driver for security within the physical asset management space and even more so the municipal sector, is the requirement for across-all-stakeholders collaboration in the field.

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Fig. 2: The device and business process evolution.

Fig. 3: One size fits all?
Data orchestration and collaboration

A successful mobile asset management solution can dramatically improve the siloed data and operations approach within the municipal sector. The mobile platform should enable across department/area communication and visibility – ranging from the back office, to the mobile worker, and among mobile workers and contractors.

Data orchestration requirements are met with the mobile platform supporting standardised integration options, business process workflow and data mapping.

Key drivers for asset service organisations

The business challenges and strategic objectives of field service and asset intensive organisations are not mutually exclusive – in fact decision-making factors are often the same with difference only at the degree and emphasis level.

In order to identify the key business drivers for the municipal sector, the first step would be to define the key divisions of work and their related requirements. While this certainly oversimplifies the demands, dynamics and complexity of each division, there are three overarching divisions of work that the municipal sector must manage:

- Customer services work division: Includes everyday field work typically unplanned and completed within a shorter duration.
- Inspection and maintenance work division: Includes field work around managing and maintaining assets during the 'operate' phase of the asset lifecycle.
- Project work division: Includes long-cycle work that must be planned, designed, scheduled and executed over longer periods of time.

Fig. 4 depicts the relationship of key business drivers for asset vs. field service organisations.

The following challenges/business drivers are forcing the municipal sector to take a fresh look and seek mobile solutions that address their unique pressures and priorities:

Low productivity – 30% improvement potential

Many organisations have already automated asset lifecycle back office processes. The associated field work is however still largely dependent on paper-based processes, ineffective communication channels, and limited documentation of industry and asset specific know-how (due to an aging and retiring workforce).

Without the right tools, work orders take longer to close off, productivity suffers and workload balancing becomes an impossible task.

Without a mobile solution focused on physical asset management field activity, overall productivity can suffer by as much as 40%.

Potential benefits to be realised with mobile automation:
- Field workers to gain access to technical objects related to specific work to be performed.
- Work instructions and asset history can be viewed on site.
- Decentralise decision making to field workers on-site.
- Emergency service can be requested immediately for an unexpected outage.
- On site access to operating and fault finding guidelines/procedures.
- Data captured power back office decision-making (e.g. workload balancing).
- Quicker response times.
- Productive “wrench time” is significantly increased.

While an organisational change towards mobility as key enabler for physical asset management is not without its challenges, recent surveys have reported workforce productivity improvements of up to 30%.

High costs – 25% savings potential

When companies employ mobility as a key field enablement tool, significant cost savings can be realised. These cost savings are the sum effect of:
- Shortened planning cycles
- Quicker response times
- Reduction in maintenance rework
- Overtime reduction
- SLA compliance – avoid fines
- Excessive reliance on contractors

Visibility not optimal – 50% improvement potential on field work visibility

A recent survey conducted by ARC revealed that asset intensive organisations have incomplete data on as much as 75% of all field work. The primary reasons for the lack of the visibility include:
- Unknown field personnel location information.
- Field workers only to submit work order paperwork at the end of their shifts – resulting in inaccurate and out dated information.
- Field workers often detect and repair problems outside of a work order’s scope – resulting in inaccurate asset and work performed data.

Potential benefits to be realised with mobile automation:
- Bi-directional communication and full-circle visibility across the enterprise.
- Data and communication occur in real-time.
- Geographic positioning system (GPS) and geographic information system (GIS) capabilities can optimise field work response time and improve on safety compliancy.
- Accurate asset and failure analysis data.
- Operational data at the manager’s fingertips – actionable intelligence (predictive analytics), improved decision-making.
- Improved asset uptime – translates to reduced maintenance costs.

Governance and compliance a priority – 25% improvement potential

Well-structured physical asset management is central to regulatory compliance and accountability for asset intensive industries. A well-managed technical document repository

![Fig. 4: Key business drivers comparison chart – asset service vs. field service.](image-url)
forms the basis upon which organisations meet regulatory guidelines and public expectations for safety and environmental impact.

For the municipal sector, as with many other asset intensive industries, sound governance and compliance begin in the field. The biggest hurdles in improving governance out in the field are inaccurate data collection and lacking audit trails.

Potential benefits to be realised with mobile automation:
- Real-time, time-stamped data recording.
- Data validation at the point of entry – improvement in regulatory reporting.
- Behaviour enhancement in terms of field workforce productivity and safety.
- Improved and simplified access to the 'right' information – no need to consult a hard copy manual.

The PAS 55 standard has earned broad acceptance, with development spanning over fifty public and private organisations. It represents a huge stride forward in improving municipal sector specific governance and compliance requirements.

Health and safety concerns – focused improvement potential

Paper-based work orders, safety procedures and checklists are still at the order of the day for many asset intensive industries. In the field, work is carried out with paper-based work orders and hard copy manuals – utilising two-way radios if assistance and or spare parts are needed. In instances where field workers do not have access to radio communication, they are to rely on their own knowledge and experience. This scenario in many cases drives a rift between regulatory compliancy and the workforce.

Potential benefits to be realised with mobile automation:
- Health and safety process efficiency improvement.
- Enhanced planning and scheduling – availability, proximity, skill set and certifications.
- Real-time data – status updates, technician location.
- Route planning and optimisation – safest and shortest.
- Work safety guidance – factoring actual conditions and proven methodologies.

Compliancy – appropriate skills and certifications.

Automated risk assessment, workflow approvals and safety checklists.

PAS 55 compliance

Manage risk proactively

The PAS 55 standard mandates mitigating risk before it becomes a problem, versus addressing risk after the fact with root cause analysis.

Potential benefits to be realised with mobile automation:
- Risk assessment built into the mobile application as standard function across all modules – work orders, alarms, defects.
- ‘Start by’ and ‘complete by’ dates calculated automatically according to work prioritisation.
- The work order mobile application can also trigger follow-up tasks based on alarm criteria set.
- The application can also display the last audited results, related to the specific asset in question.
- Record failure analysis data.
- Actionable intelligence on defects and risks posed to the business.
Potential benefits to be realised with mobile automation:
- Asset condition is automatically calculated and updated based on audit responses.
- Support for complex and enterprise wide asset inspections/audits.
- Follow-up actions – new work orders – are automatically triggered based on audit responses.

Standardise the asset register administration business process

The PAS 55 standard provides guidelines for establishing and maintaining an effective electronic asset register. An effective electronic asset register consists of three key elements, namely:
- Complete history of all asset related work orders – defects, failure analysis, work performed and costs.
- Hierarchical structure – parent assets, components, associated equipment, tasks, spares.
- Flexibility in accommodating changes/updates.

Potential benefits to be realised with mobile automation:
- Facilitate an effective asset register – collecting asset data aligned with PAS 55 guidelines.
- Regular updates of unregistered asset data (scheduled audits) – ensuring data integrity.

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Paper-based work orders, safety procedures and checklists are still at the order of the day for many asset intensive industries. In the field, work is carried out with paper-based work orders and hard copy manuals – utilising two-way radios if assistance and or spare parts are needed. In instances where field workers do not have access to radio communication, they are to rely on their own knowledge and experience. This scenario in many cases drives a rift between regulatory compliance and the workforce.

Potential benefits to be realised with mobile automation:
- Management perspective
  - Health and safety process efficiency improvement
  - Enhanced planning and scheduling – availability, proximity, skill set and certifications
  - Real-time data – status updates, technician location
- Technician’s perspective
  - Route planning and optimisation – safest and shortest
  - Work safety guidance – factoring actual conditions and proven methodologies
- Compliance – appropriate skills and certifications
- Automated risk assessment, workflow approvals and safety checklists

Conclusions and outlook

An intense examination of the topic “mobility as key physical asset management enabler within the municipal sector” shows that mobile-technology based solutions are already widely adopted all over the world. With ongoing mobile development and exponential market increase, we expect the trend of mobile adoption to further intensify. The importance of mobility is substantiated by the various activities in the field of municipal physical asset management. So far, this paper has provided a detailed overview of current trends, industry specific drivers identified and an outlook to potential solutions. In this section, the core findings of this paper are summarised.

Core findings

In the municipal sector financial success is directly linked to physical asset reliability and productivity. Well-structured asset management programs can dramatically impact the overall performance and useful life of these physical assets.

Accordingly, municipal sector responsible asset owners are continually trying to improve their maintenance practices. Based on extensive research done, we know that asset intensive industries have been underserved for decades with solutions and mobile technologies. Due to the following trends these industries are now forced to take a fresh look at physical asset management mobile solutions that address their unique pressures and priorities:
- The global economic crisis – reduction in revenues and available capital.
- Ageing and retiring workforces – knowledge retention.
- Ageing infrastructure and increased demand.
- Carbon footprint advocacy – environmental impact.
- Increasing public scrutiny forcing increasing regulation.
- Regulatory compliance necessitates optimised business processes.
- Security demands.

The municipal sector must thus increasingly seek mobile physical asset management solutions that enable their field workforce to:
- Proactively perform physical asset management – based on early detection.
- Respond more quickly to maintenance events.
- Perform planning and scheduling based on real-time resource availability and location awareness.
- More effectively enforce safety standards.
- Respond more organically to changing priorities.
- Mitigate asset failure risk more effectively.
- Increase regulatory compliance levels.
- Increase asset life – physical asset longevity.
- Ensure operational continuity.

Email marketing reports research has shown that mobile device use has increased from just 750 000 mobile subscribers in 2001 to roughly 5-billion subscribers in 2011. By 2015, mobile devices will become ubiquitous, as research analysts predict their use will increase fifty fold.

Directly aligned with this growth spurt, the physical asset management enterprise mobility market has evolved dramatically since 2008/9 – starting off from simplistic data collection to integrated enterprise solutions focused on automating complex asset management processes.

In closing

This paper validated that given various market drivers in play, mobilising the asset oriented/long-cycle work remains an untapped opportunity for the municipal sector.

The opportunity is now...

Mobile solutions purpose-built for asset intensive industries can provide a huge opportunity to:
- Ensure worker safety through adherence to best practices.
- Decrease maintenance costs through optimised workforce utilisation.
- Create a preventative asset management business mentality throughout the organisation.
- Improve service delivery and productivity through real-time access to asset information.
- Remove information silos to further drive across-all-stakeholders collaboration
- Improve operational efficiency.
- Achieve better field service responsiveness.
- Reduce costs.
- Ultimately realise a greater return on assets (RoA).

Mobility and program-driven asset management has become core to every industry. It is transforming business-to-consumer, business-to-business and business-to-employee relationships. This convergence phenomenon is fast becoming table stakes for the municipal sector to achieve sustainable success, and improved operational efficiency.

References


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