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# 1. Executive summary

## Introduction

The City of Perth, Western Australia, was one of 16 cities selected to receive a Smarter Cities Challenge® grant from IBM in 2014 as part of the company's citizenship efforts to build a Smarter Planet®. During three weeks in July and August of 2014, a team of five IBM executives worked to deliver recommendations on a key challenge identified by Lord Mayor Lisa Scaffidi and her senior leadership team:

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## Plan for growth with better information and collaboration.

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Perth is the capital of Western Australia and one of the region's most vibrant centres of growth. The population of the City of Perth has been rising at an annual rate of 7.93%, and the total residential population is expected to reach 30,140 by 2025.<sup>1</sup> In parallel with residential population growth, the workforce is booming, having reached almost 125,000 workers in 2011. Investments continue to move into the city, and major state development initiatives, such as the Elizabeth Quay, Perth City Link and Riverside, continue to evolve. As a result, the growth trend is expected to continue.

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**"It's vital that we explore better ways of doing things and planning for the consequences of growth. Ready access to reliable information can help to avoid or mitigate problems."**

— Lord Mayor Lisa Scaffidi

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## The challenge

The City of Perth faces increasing logistical challenges brought on by a growing need for accessible, integrated and coordinated information about the real-time use, demand, capacity, location, age and ownership of essential City infrastructure.

As the state and greater area grow, and as the City of Perth develops to drive and support the state's economy, it will only become more important for the City to deliver timely and efficient design, implementation and management of the essential infrastructure for transportation, water and energy.

Lord Mayor Scaffidi asked IBM to help "future proof" the City of Perth by developing a roadmap for an integrated system that enables efficient implementation and management of infrastructure for essential services. This system will help reduce risk, improve service delivery and enhance infrastructure reliability and usability while reducing costs.

## Findings and recommendations

In order to address the challenge posed by the City of Perth, the IBM Smarter Cities Challenge team conducted a series of 32 interviews with more than 65 representatives of stakeholder organisations that maintain relationships with the local government. As a result of this effort, the team identified the following findings:

- Key infrastructure data exists but only in agency-specific systems and without systematic sharing
- Water and energy resources are scarce but can be intelligently deployed with the right planning inputs
- Foundational building blocks for a "mission control" hub do exist in some organisations and teams in Western Australia (WA)
- Innovative capabilities for publishing geographical data are available to the City at minimal cost
- Passion exists among thought leaders and innovation hubs to engage with the City
- City employees are developing innovative solutions and are seeking support to scale them for statewide or broad public use

Based on these findings, the Smarter Cities Challenge team offers the following recommendations organised according to three key concepts outlined by the City of Perth:

1. State and government trading enterprises (GTEs) collaboration
2. Mission control hub
3. Support for City of Perth development

### State and government trading enterprises (GTEs) collaboration

- Establish a Chief Data Officer (CDO) position for the City of Perth in order to drive a horizontal data view, ensure high-quality data integration and standards compliance across City systems and create a leadership alliance with external stakeholders
- Engage the city's thought leaders
- Ensure that a formal organisational and cultural change management program is in place to underpin any transformational projects the City undertakes

### Mission control hub

- Enhance social listening for citizen engagement
- Assemble and publish a "Team Perth" dashboard
- Leverage Landgate systems, a primary source of land information and geographic data for WA, as a common infrastructure in order to achieve faster results in data quality, integration and visibility and to help generate business value at lower cost
- Develop a City planning data feed

### Support for City of Perth development

- Transform the current asset inventory into an enterprise asset management system
- Reinvent and digitise development approvals
- Enhance energy resiliency and sustainability

## Conclusion

Becoming a Smarter City is a journey to a fundamentally different mindset. Every step helps increase efficiency. Every initiative that delivers return on investment can trigger another project. The resulting Smarter City is one that attracts citizens and businesses by delivering on its potential as never before.

The City of Perth has a strong vision for its future as a safe, vibrant, social hub that attracts people to its centre day and night, while providing headquarters locations for many major corporations. The potential to achieve the City's vision exists, and the vision can be realised through the effective management of infrastructure as the City grows and enhances its ability to provide high-quality services for citizens.

## Highlights

- Small city with large potential for new development, corporate expansion and population growth
- Short-term initiatives can help boost the City's capacity to provide high-level services to its citizens
- Openness to innovative strategies in energy and transport that can enhance quality of life
- Innovative initiatives using digital resources can build the city's reputation as a social hub
- Team Perth will help drive integration, collaboration and culture change

# 2. Introduction

The City of Perth is one of the most vibrant centres of growth in Western Australia (WA). Its population has been growing at an annual rate of 7.93%, and its total residential population is expected to reach 30,140 by 2025. Like its residential population, the city's workforce is also booming, having reached almost 125,000 workers in 2011. Investments continue to move into the city, and major state development initiatives continue to evolve, including the Elizabeth Quay, Perth City Link and Riverside. As a result, this strong growth trend is expected to continue.

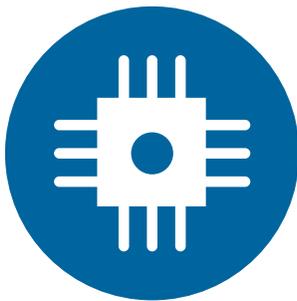
This kind of explosive growth puts stress on critical infrastructure for power, water, gas and transportation. To handle this stress and deliver world-class services for its citizens, the City will need to reach new levels of efficiency in infrastructure management and coordination among departments. Citizens expect growth, but they also expect minimal disruption to daily business and a high return on the investments made in the region.

The IBM team identified several areas the City can target to better achieve these objectives. These areas of focus are described in more detail in Section 3.

## A. The Smarter Cities Challenge

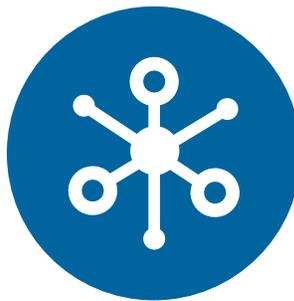
By 2050, cities will be home to more than two-thirds of the world's population. They already wield more economic power and have access to more advanced technological capabilities than ever before. Simultaneously, cities are struggling with a wide range of challenges and threats to sustainability in their core support and governance systems, including transport, water, energy, communications, healthcare and social services.

Meanwhile, trillions of digital devices, connected through the Internet, are producing a vast ocean of data. All of this information — from the flow of markets to the pulse of societies — can be turned into knowledge because we now have the computational power and advanced analytics to make sense of it. With this knowledge, cities could reduce costs, cut waste and improve efficiency, productivity and quality of life for their citizens. In the face of the mammoth challenges of economic crisis and increased demand for services, ample opportunities still exist for the development of innovative solutions.



### Instrumented

We can measure, sense and see the condition of practically everything.



### Interconnected

People, systems and objects can communicate and interact with one another in entirely new ways.



### Intelligent

We can analyse and derive insight from large and diverse sources of information to predict and respond better to change.

Figure 1: Instrumented, interconnected, intelligent

In November 2008, IBM initiated a discussion on how the planet is becoming “smarter.” By this it meant that intelligence is becoming infused into the systems and processes that make the world work — into things no one would recognise as computers: cars, appliances, roadways, power grids, clothes and even natural systems, such as agriculture and waterways. By creating more instrumented, interconnected and intelligent systems, citizens and policymakers can harvest new trends and insights from data, providing the basis for more informed decisions.

A Smarter City uses technology to transform its core systems and optimise finite resources. Because cities grapple on a daily basis with the interaction of water, transportation, energy, public safety and many other systems, IBM is committed to a vision of Smarter Cities® as a vital component of building a Smarter Planet. At the highest levels of maturity, a Smarter City is a knowledge-based system that provides real-time insights to stakeholders and enables decision makers to manage the city’s subsystems proactively. Effective information management is at the heart of this capability, and integration and analytics are the key enablers.

Intelligence is being infused into the way the world works.

The IBM Smarter Cities Challenge contributes the skills and expertise of top IBM talent to address the critical challenges cities around the world now face. We do this by putting teams on the ground for three weeks to work closely with City leaders and deliver recommendations on how to make the City smarter and more effective. Over the past four years, more than 100 cities have received these grants. The Smarter Cities Challenge is the largest philanthropic initiative IBM has launched, with contributions valued at more than \$50 million to date.

The City of Perth, Western Australia, was selected through a competitive process as one of 16 cities to be awarded a Smarter Cities Challenge grant in 2014.

During a three-week period in July and August of 2014, a team of five IBM experts worked in Perth to deliver recommendations around the challenge issued by Lord Mayor Lisa Scaffidi:

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Plan for growth with better information  
and collaboration.

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## B. The challenge

The City of Perth faces increasing logistical challenges brought on by a growing need for accessible, integrated and coordinated information about the real-time use, demand, capacity, location, age and ownership of essential infrastructure.

As the state and greater area grow, and the City of Perth develops to drive and support the state's economy, it will only become more important for the City to deliver timely and efficient design, implementation and management of the essential infrastructure for transportation, water and energy.

Lord Mayor Scaffidi asked IBM to help “future proof” the City of Perth by developing a roadmap for an integrated system — or “mission control hub” — that enables efficient implementation and management of infrastructure for essential services. This system will help reduce risk, improve service delivery and enhance infrastructure reliability and usability while reducing costs. The IBM team identified several important considerations:

- Although the City initiated a major asset management initiative two years ago, there are several improvements the City can make to achieve even greater benefits from an enterprise asset management (EAM) process.
- Citizens see the City of Perth as the face of government in many situations. In the era of social media, mobile devices and crowdsourcing, there is an opportunity for the City to augment established social assets with social listening or social media monitoring. This will help the City develop insights about citizens' current wants and needs. This information also can feed tactical, long-term planning and sentiment management systems.
- State agencies, utility companies and the government of Perth have numerous strategic and operational plans. In some cases these plans are not aligned and there is no clear relationship between them.
- Citizens expect a high return on the investments made in Perth. Available land for development is limited, so the City must make sure the projects it approves make the best possible use of the land in question, whether measured in financial return or in contributions to quality of life.
- The City can tap into a significant reservoir of innovation by engaging local thought leaders, such as universities, innovation hubs, chambers of commerce and entrepreneurs.
- There is potential to enhance the City's energy conservation program in order to generate financial gains that could fund portions of the IBM team's recommendations.
- There is a strong culture of maintaining the status quo within City administration.

# 3. Context, findings and roadmap

## A. Context and findings

In order to address the challenge posed by the City of Perth, the IBM Smarter Cities Challenge team conducted 32 interviews with more than 65 representatives from stakeholder organisations that have relationships with the local government. These organisations included state agencies, the City of Perth Council, utility providers and universities.

The team focused on the following key concepts: state and Government Trading Enterprises (GTE) collaboration, a mission control hub and support for city development.

As a result of this effort we were able to identify the following findings for each concept:

### State and GTE collaboration:

- Organisations within and outside the City of Perth tend to be very siloed. Each organisation generates its own data, and there is little active sharing of information. Any sharing that occurs often depends on informal interactions across departments. Overall, there is a “pull” mindset (reactive) as opposed to a “push” mindset (proactive) when it comes to data acquisition. Data is often shared through file exchange, spreadsheets and other nonintegrated formats.
- Thought leaders and innovation hubs are passionate about engaging with the City.
- The City will undergo a great deal of change if proposed boundary changes go into effect, leading to the possible consolidation of local governments.<sup>2</sup> The City has attempted formal organisational change management, but these efforts have not been very successful in achieving pervasive cultural change through transformational projects.
- City employees are developing innovative solutions to some of the issues at hand and are seeking support to scale them for state or public use.

- Large amounts of time and effort are spent preprocessing and reformatting information to make it usable. These efforts occur regularly.
- There is no horizontal view of data across multiple siloed processes. Information access is handled on a per-request basis. Each request takes up to two weeks to be processed.
- Data is often lost, especially unstructured data, such as technical designs, manuals, blueprints and other documents. This happens because there are no strong document management practices tied to business processes within City administration.

### Mission control hub:

- The City already uses social media to engage citizens and key stakeholders. It maintains an active official Facebook page and Twitter feed. Some keywords are monitored, but this basic social listening generates very little follow-up.
- A well-established website is used to publish the City’s vision, planning information and details about key activities and infrastructure-related events.
- The City solicited input from citizens and stakeholders through its website, workshops and surveys. This information was included in the Vision 2029+ plan.<sup>3</sup>
- The City is seen as the primary point of contact for local services. Citizens often call or tweet at the City to report service breakdowns.
- Each agency maintains its own data source. Due to disaggregation of data and dispersed responsibility for key utilities, the City lacks a centralised “mission control” that can respond to citizens and businesses in a timely and efficient manner.
- Innovative tools for publishing geographical data are available to the City at minimal cost.

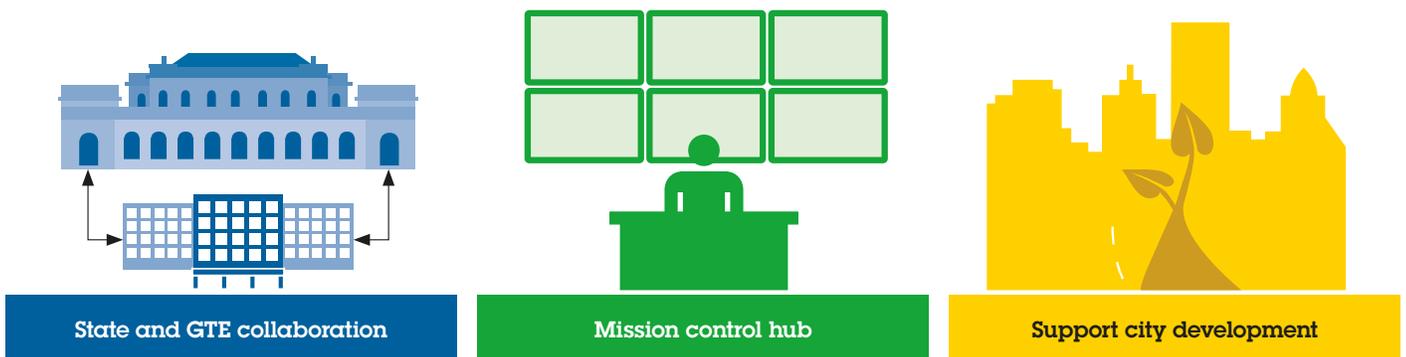


Figure 2: Three key concepts

### Support city development:

- The current asset management process was created primarily to support a financial view of a simple inventory of assets.
- There is very little cross-department collaboration with clear rules for how asset custodians should act on asset data throughout its lifecycle.
- Integration of asset management processes with supply chain and contract management processes will be vital.
- Asset data has insufficient granularity to support important business process, such as proactive maintenance management and energy efficiency management.
- Water and energy resources are limited but can be deployed intelligently with the right planning inputs.

### B. Roadmap

The recommendations of the IBM team can be separated into two distinct groups:

- Quick value: These recommendations can be enacted relatively quickly and start generating benefits within a short period of time (three to six months). Rapidly demonstrating value can build momentum for the entire effort and help generate funding for long-term projects.
- Projects: These recommendations require more thorough planning and formal project management to be enacted effectively. Projects can be started immediately as “fast followers” to quick value activities and will help the City generate iterative value from the full set of recommendations.

Underpinning these initiatives is a final recommendation for an ongoing and continuous organisational and cultural change process executed with a drumbeat of communications to internal and external stakeholders in order to build and maintain momentum.

## How should the City deliver over time?

### Deliver as quick value

#### Start now and see near-term results

- Appoint a Chief Data Officer (CDO)
- Accelerate data sharing with Landgate
- Enhance social listening for citizen engagement
- Engage the city’s thought leaders
- Enhance energy resiliency and sustainability
- Develop a City planning data feed

### Manage as projects

#### Plan ahead with City, state and GTEs

- Assemble and publish a Team Perth dashboard
- Transform asset inventory to enterprise asset management
- Reinvent and digitise development approvals

### Ongoing

#### Maintain a focus throughout the effort

Implement organisational and cultural change with the drumbeat of communication

Figure 3: Roadmap of recommendations

# 4. Recommendations

## A. Quick value

### Recommendation 1: Establish a Chief Data Officer (CDO) position

Perth lacks a horizontal view of information, meaning a view that encompasses multiple departments, organisations and processes. It also lacks standards and agreements for sharing information with external state government agencies. These deficiencies create an environment in which it is difficult for the City to take advantage of the wealth of data stored in silos across these organisations. This situation is not unique to Perth. It is a common problem for many organisations and industries outside of government.

As the value of data has grown, a new C-level role has emerged. The Chief Data Officer (CDO) is a corporate officer responsible for enterprise-wide governance and utilisation of information as an asset. The CDO typically drives a number of data-related efforts:

1. Identifying how data can be used to support the company's most important priorities. In other words, evaluating these priorities by asking what data sets can help address the need.
2. Making sure the right data gets collected, often by collaborating with other departments and third-party providers to ensure that instrumentation, collection and storage capabilities are in place.
3. Ensuring the organisation is “wired” to make data-driven decisions. This requires a complete chain of functional activities from data collection to visualisation to analytics.
4. Establishing a strategy to use data in structured and unstructured formats. Unstructured data includes text documents, photos and engineering documents.

Recent studies<sup>4</sup> indicate the CDO should have a strong, business-oriented perspective and remain unconstrained by the “project mindset” common in IT. In many organisations, the CDO helps ensure data is used effectively to achieve better outcomes. For example, the City of San Francisco appointed Joy Bonaguro as CDO in 2013 with precisely these objectives and responsibilities.

We recommend that the CDO report directly to the CEO and remain dedicated to supporting the City's objectives by using data as a strategic asset. The new CDO should focus on the following actions, which can be undertaken immediately to quickly improve how Perth uses information:

- Establish a cross-collaborative data committee with state agencies and other stakeholders to evaluate what information is available and how that information can be leveraged to support the City of Perth and its business goals.
- Create a horizontal view of information within the City of Perth, mapping primary business processes to understand how they can be improved through more effective use of data.
- Leverage Landgate systems as a platform for data sharing across state and local government agencies, as well as a geographic information systems (GIS) 2D and 3D visualisation tool (see Recommendation 2).
- Establish a clear strategy for the use and management of unstructured data, such as engineering documents, blueprints, maps, photos, videos and others, in order to determine how best to leverage these kinds of data in business-critical processes.

### Recommendation 1: Establish a Chief Data Officer (CDO) position

The City should appoint a CDO to realise a horizontal view of data, drive data integration and standards across City of Perth systems and align with external stakeholders in a leadership alliance.

#### Scope and expected outcomes

##### Scope

The CDO of the City of Perth would be responsible for strategic, data-related activities across all City departments.

##### Expected outcomes

- Improved decision making and more efficient business processes through more effective use of available data, which currently resides in silos in the City and external agencies
- Alignment of the City's data strategy with business objectives
- Support for creating and enforcing measurable key performance indicators (KPIs) that can be used to keep the City on track to achieve its goals
- Greater control of business processes through the use of dashboards, visualisation tools and reports
- Lower data costs by eliminating the hours of labour currently spent accessing and reformatting data for multiple purposes

##### Cost of inaction

It is unlikely that the City of Perth would be able to create the new culture it desires — one that uses data as an asset. Data would not support business objectives well, and important information would continue to be lost. The City would continue to invest large amounts of labour in the manual exchange and reformatting of information for multiple purposes.

Proposed owner and stakeholders	Suggested resources needed
<p><b>Owner:</b> CEO of the City of Perth</p> <p><b>Stakeholders:</b></p> <ul style="list-style-type: none"> <li>• Infrastructure and Enterprises</li> <li>• Planning and Development</li> <li>• City Services</li> <li>• Corporate Services</li> </ul>	<ul style="list-style-type: none"> <li>• New CDO (offset by productivity gains)</li> <li>• One point person for every major City system to support information mapping</li> <li>• Use of Landgate systems and expertise</li> </ul> <p><b>Cost estimate:</b> Medium (CDO) to low (point person, Landgate systems)</p>
Dependencies	Key milestones, activities and timeframe
<p>Commitment by the City Council to appoint the new CDO</p>	<ul style="list-style-type: none"> <li>• Appoint a CDO: 2 weeks</li> <li>• Establish a cross-collaborative committee: 5 weeks</li> <li>• Establish a clear strategy for unstructured data: 1 to 2 months</li> <li>• Leverage Landgate systems and expertise: 1 to 2 months</li> </ul>
Priority	
<p>High</p>	

## Recommendation 2: Accelerate data sharing with Landgate

Creating a truly horizontal view of information requires investment in harnessing and reformatting data from a variety of sources and organising them in a model suitable for the needs of diverse business processes. The vast majority of these costs (up to 70%) are spent on the extraction, transformation and loading of data from various sources.

During our interviews, the IBM team found that the Landgate agency has already made much of the investment required to create a horizontal view of information that includes data from state agencies and utility providers. Landgate's systems feature consolidated layers of data sourced from many stakeholders that are vital to Perth. The agency is about to release a 2D and 3D visualisation engine that will make it much easier to tap into this data. The City should be able to create quantitative and qualitative dashboards by leveraging Landgate's data through application programming interfaces (APIs) created for this purpose.

If data from the City of Perth can be combined with Landgate's data, the City could achieve the following benefits more quickly and at a lower total cost:

- Creation of a richer view of GIS data, including information from state agencies, utility providers and even external sources
- Implementation of quantitative and qualitative dashboards to complement the GIS visualisation tools
- Design of a 3D visualisation of the city to support new development planning as well as other critical City business processes, such as asset management data acquisition
- Linkage of a document management repository to geocoded data and other metadata, enabling these documents to connect to City assets and other important entities, such as commercial buildings and vacant lots, and support more meaningful and business-driven document handling

By exploring the synergy between the City of Perth and Landgate's systems, the City can achieve these benefits at a fraction of the cost of developing these systems independently. The City could avoid a great deal of the effort required to extract, transform and store data. This alliance would enable the City to tap into Landgate expertise to accelerate results.

## Recommendation 2: Accelerate data sharing with Landgate

Leverage Landgate resources and expertise to accelerate the use of data as an asset.

### Scope and expected outcomes

#### Scope

Some state departments have already made investments in technology designed to enable data-driven decision making. There is an opportunity for the City of Perth to leverage Landgate innovations to achieve this same objective.

#### Expected outcomes

- Data about critical infrastructure and City data could be combined with other information sources to drive faster, better decision making.
- Landgate infrastructure could enable the City to publish a wealth of information to engage the public.
- Virtual walkthroughs of the city created through the acquisition of asset data and its direct deployment into a virtual 3D model instead of sending crews into the field.
- Planning of new development could thrive with more accurate data about all the interconnections and potential effects on critical infrastructure assets.
- Potential monetisation of information the City provides to Landgate, such as selling property data to real estate agents and developers.

#### Costs of inaction

If the City of Perth does not leverage a partnership with Landgate, the levels of investment required to achieve comparable results and capabilities would be very high. Landgate has been improving its systems for several years and is now in a privileged position to act as an information provider to the whole state.

Proposed owner and stakeholders	Suggested resources needed
<p><b>Owner:</b> CDO of the City of Perth</p> <p><b>Stakeholders:</b></p> <ul style="list-style-type: none"> <li>• Infrastructure and Enterprises</li> <li>• Planning and Development</li> <li>• City Services</li> <li>• Corporate Services</li> <li>• Landgate</li> </ul>	<ul style="list-style-type: none"> <li>• New CDO</li> <li>• Front-end application leveraging Landgate APIs</li> </ul> <p><b>Cost estimate:</b> Medium (CDO) to low (application development)</p>
Dependencies	Key milestones, activities and timeframe
<ul style="list-style-type: none"> <li>• Establish a cooperative relationship with Landgate</li> <li>• Recommendation 1 (Establish a CDO position)</li> </ul>	<ul style="list-style-type: none"> <li>• Establish a cooperative relationship with Landgate: 3 - 5 weeks</li> <li>• Define agreements to consolidate City of Perth data into Landgate databases: 4 - 8 weeks</li> <li>• Establish standards so that information provided by Landgate supports City requirements: 4 - 8 weeks</li> <li>• Develop a front-end client application that can present Landgate data according to City requirements: 2 months</li> <li>• Establish a document management system that can be cross-referenced with metadata in Landgate databases (GIS and/or other information): 6 months</li> </ul>

### Priority

High

### Recommendation 3: Enhance social listening for citizen engagement

Social listening is the process of continuously monitoring social media networks to capture and retain real-time data about an organisation. In the City of Perth, social listening would enable decision makers to remain aware of emerging issues and discussions about the City's vision, plans and services without manually collecting data from citizens.

Social listening can surface real-time citizen comments that require immediate action, in which case the City can respond more quickly. It provides qualitative metrics (such as conversation sentiment) and quantitative metrics (such as volume of conversation) to optimise City management strategy. Social listening also sets the stage for more collaborative, two-way communication with citizens, creating opportunities to acquire timely input for short- and long-term planning and decision making.

The rise of social and mobile technologies, combined with unprecedented access to data, means today's citizens are connecting and collaborating like never before. As a result, their behaviours and expectations are changing:

- Nearly 80% of adult smartphone users keep their phones with them an average of 22 hours a day.
- 84% of smartphone users check an app as soon as they wake up.
- 70% of people who contact a government agency via social media expect a response in five minutes.

Social media isn't limited to Twitter and Facebook. The phenomenon has the potential to become more powerful, creating an environment in which citizens, government agencies and industries can connect with one another to share vast amounts of knowledge, bring new innovations to life and create more meaningful relationships. This requires government agencies to take a systematic approach to engagement:

1. Use mobile and social technology to increase responsiveness to complaints and emergencies as well as to gather citizen input and understand sentiment about service disruptions.
2. Examine social media data acquired through social listening to identify trends and consider citizen opinions to make planning and decision making more collaborative.

The City of Perth is a role model for how cities should use social media to engage citizens and other stakeholders:

- Perth has a well-established website where it publishes vision and planning materials as well as details about upcoming activities and infrastructure-related events.
- Perth solicited input from citizens and stakeholders through the website, workshops and surveys and included it in the development of the City's Vision 2029+ plan.
- Perth maintains an active official Facebook page and Twitter feed.
- The Lord Mayor is very active with citizens through her personal Twitter account.
- The City monitors certain keywords (such as "traffic") and follows up accordingly with City Council employees.

Even so, Perth can leverage its established social assets even more by enhancing its social listening capabilities.

### Recommendation 3: Enhance social listening for citizen engagement

Leverage established social assets to enhance social listening capabilities and gain greater insight from citizens and use this information to feed tactical, long-term planning and sentiment management.

#### Scope and expected outcomes

##### Scope

To take a more systematic approach to engaging citizens and other key stakeholders, the City needs to take the following steps:

- Establish a social liaison in the Communications and Marketing department who is responsible for social listening and sentiment management.
- Evaluate and purchase social listening tools to collect and synthesise input from citizens and stakeholders.
- Use social listening data as input and feedback for planning:
  - Collect and feed back data about trends in citizens' needs and preferences as well as opportunities for innovation.
  - Analyse social listening data and synthesise it with insight and feedback about City planning to make planning more collaborative and improve outcomes.
- Build a social sentiment scorecard (with KPIs) to monitor citizen satisfaction and manage issues.
- Leverage social listening to detect problems, issues, complaints and compliments and feed these back to issue owners, who can respond faster.
- Promote the Team Perth dashboard (see Recommendation 7) to citizens, City executives and other stakeholders as a source for comprehensive, timely updates about City events, planned improvements, service disruptions and outages.
- Build measurable KPIs to track how well the City's actions align with social trends.

##### Expected outcomes

- Increased satisfaction of Perth citizens
- Increased data input and collaboration for sound, data-driven, fact-based planning
- Increased responsiveness and management of issues

##### Cost of inaction

Citizens' behaviour and expectations are changing in fundamental ways with the advent of mobile and social technologies. If the City of Perth does not tap into a rapidly growing reservoir of social data about City services, it will miss an important opportunity to gain new insight that could vastly improve decision making and issue management.

Proposed owner and stakeholders	Suggested resources needed
<p><b>Owner:</b> Director of Communications and Marketing</p> <p><b>Stakeholders:</b></p> <ul style="list-style-type: none"> <li>• Lord Mayor</li> <li>• Planning and Development</li> <li>• Western Australian Planning Commission (WAPC)</li> <li>• Perth IT directorate</li> <li>• Citizens of Perth</li> </ul>	<ul style="list-style-type: none"> <li>• Social listening tools</li> <li>• Social listening skills</li> <li>• Social liaison within Communications and Marketing team</li> </ul> <p><b>Cost estimate:</b> Low</p>
Dependencies	Key milestones, activities and timeframe
<p>Team Perth dashboard</p>	<p><b>Short term:</b></p> <ul style="list-style-type: none"> <li>• Establish social listening project focus</li> <li>• Define project scope, approach, KPIs and funding request</li> <li>• Secure funding for execution</li> <li>• Evaluate software options</li> <li>• Issue social listening weekly reports</li> </ul> <p><b>Medium to long term:</b></p> <ul style="list-style-type: none"> <li>• Make ongoing improvements to social listening functions and KPIs</li> </ul>
Priority	
<p>High</p>	

#### Recommendation 4: Engage the city's thought leaders

To continue leading with vision and insight, the City should engage with and leverage insights from thought leadership think tanks in urban design and sustainability. These can be found in local universities; innovation hubs, such as Spacecubed; the various chambers of commerce; and industry advocates, like the Property Council of Australia. These thought leaders can help drive innovative thinking about Perth's growth and planning concerns. Harnessing their passion, energy and desire to make a difference can help the City achieve its full potential in a cost-effective manner.

Curtin University, for example, works on issues related to the green economy and the long-term sustainability of Australian cities. Sixty PhD students work in the Curtin University Sustainability Policy Institute (CUSP), and the university has a number of published papers directly related to Perth.<sup>5</sup>

Some examples of innovative thinking in urban design include the Federation Square development in the heart of the Central Business District (CBD) in Melbourne, Australia, which was built over the existing Jolimont railway yards. The design was selected during post-Victorian government, launching an international two-stage design competition to develop the precinct. The site contains cultural and commercial buildings, entertainment, restaurants, free WiFi and a parking garage. In July 2014, it was voted one of the best public squares in the world by the Landscape Architects Network.

Another design concept in Berlin, Germany, uses air space in creative ways.<sup>6</sup> A 600-meter-long building built over a freeway features a multi-story parking garage under the freeway. At ground level, the structure features an overhanging roof, wide sidewalks, many shops, offices and restaurants and a park around the perimeter. Garbage is sent down vacuum chutes and central heating comes from long-distance heating plants.

Current projects in Perth are already expanding north (Perth City Link), east (Riverside) and south (Elizabeth Quay). The City may want to explore building over freeways or railways in the CBD, which would hide the road and traffic, reduce traffic noise for local residents and link the historic gateway near Parliament House and King's Park with the west end of the city and its surrounding suburbs. This kind of innovation opens up valuable land that can be used for development, entertainment and/or improving liveability in the city.

As the city grows and travellers' needs change, multimodal interconnectivity should be investigated. Perth already has interconnected travel for buses, rail and ferry. This should be extended to include one-way routes for bicycles and Segways as well as electric vehicle rental stations. The City should consider the movement of pedestrian traffic during planning to help reduce congestion.

Another valuable resource is a Curtin University multimodal report that discusses future transportation and land use options for Perth. It shows how rail and Transit Oriented Development (TOD) can reduce dependency on cars and deliver significant economic, social and environmental advantages. The report contains many ideas for how to reduce congestion and improve commuting for citizens while reducing the ever-growing demand for more parking spaces in the CBD. This could create an opportunity to repurpose the parking garage rooftops to incorporate gardens and leisure areas that residents and workers in the heart of the city can enjoy.<sup>7</sup>

#### Recommendation 4: Engage the city's thought leaders

To continue leading with vision and insight, the City of Perth should engage and leverage thought leaders in urban design and sustainability to drive innovation and allow the city to achieve its full potential in a cost-effective manner.

#### Scope and expected outcomes

##### Scope

The City should engage thought leaders to generate new ideas related to urban design and planning and multimodal interconnected travel.

##### Expected outcomes

- Cultivation of three core attributes — charisma, resiliency and vitality — within City planning and management teams as well as infrastructure and the citizens of Perth
  - Charisma: bold leadership toward a differentiated brand identity
  - Resiliency: improved infrastructure that enables the City to anticipate and respond to a wide variety of resource challenges
  - Vitality: smarter systems and service delivery to help the City reach its full potential
- Capitalising on new insights to approach long-standing challenges in innovative ways
- Creation of system-wide efficiencies to do more with less
- Collaboration that can transform traditional work structures and promote innovation

##### Cost of inaction

Without engaging thought leaders, the City of Perth may not achieve its published Vision 2029+ plan. The City may continue to support the status quo, doing things the same way they have always been done. Innovation will be limited or take longer to achieve.

Proposed owner and stakeholders	Suggested resources needed
<p><b>Owners:</b></p> <ul style="list-style-type: none"> <li>• CEO of the City of Perth (to engage universities)</li> <li>• Director of Planning and Development (to manage engagements)</li> </ul> <p><b>Stakeholders:</b></p> <ul style="list-style-type: none"> <li>• Planning and Development</li> <li>• City Services</li> <li>• Corporate Services</li> </ul>	<p>Engagement with Curtin University PhD students, Spacecubed members, chambers of commerce and industry advocates</p> <p><b>Cost estimate:</b> Low</p>
Dependencies	Key milestones, activities and timeframe
<p>Commitment to an ongoing program of innovative change</p>	<ul style="list-style-type: none"> <li>• City of Perth agrees to engage thought leaders: immediate</li> <li>• Engage with thought leaders: before November 2014</li> <li>• Create and publish a five-year roadmap to deliver short-term wins and long-term initiatives: before the end of 2014</li> <li>• Kickoff of the first initiative: January 2015</li> </ul>
Priority	
<p>High</p>	

### Recommendation 5: Enhance energy resiliency and sustainability

Global warming, population growth and changing lifestyles are driving demand for energy. Costs are rising and will continue to do so. The world's electrical grids will change more in the next 20 years than they have in the last century. Decisions made in the next five years will determine whether cities will make this transition successfully. This is why Smarter Cities are embracing innovative solutions as they transform.

A compelling case exists for taking a smarter approach to building management, one that helps reduce consumption of natural resources, decreases waste production and reduces greenhouse gas emissions. This approach requires greater instrumentation at all levels, the interconnectivity of all building systems to measure total energy consumption and the optimisation of space to improve operational efficiency.

Smarter buildings have interconnected facilities and IT systems, which can increase efficiency and reduce costs.<sup>8</sup> New technologies enable building operators to collect real-time information from multiple building management systems, analyse the data in a central location and identify both operational anomalies and opportunities to increase efficiency. When facilities and IT systems are interconnected, building managers can significantly improve management of energy, operations and space and, in the future, store energy for use at night.

The City of Perth should investigate and plan to implement the following recommendations immediately:

- Because the City's energy consumption is significant, it should consolidate its energy purchasing power with that of small and medium-sized businesses (SMBs) to negotiate better rates and use the savings to fund sustainability projects. This will provide additional value for the city's SMBs.
- Expand the Elder Street parking garage innovations — including solar photovoltaic (PV) arrays, smart glass, stormwater capture, intelligent lighting and incorporation of natural light and ventilation — to buildings across the city.
- Equip every City building with the capability to sell excess energy by installing PV arrays above parking garages. These arrays provide shade while reducing the City's heat and carbon footprints. Currently only 2% of Perth households have PV panels, compared to 10% of households across the entire Synergy network. Many suburbs have usage rates as high as 25%. In other words, room for improvement is significant.
- Apply the power of big data analytics to data from smart meters installed in City buildings.

### Recommendation 5: Enhance energy resiliency and sustainability

The City should enhance its Towards an Energy Resilient City initiative and its Energy Resilient City Policy and use the subsequent savings to fund related innovation programs.

#### Scope and expected outcomes

##### Scope

To build a resilient, sustainable infrastructure, the City should investigate and plan to implement four projects immediately: combining its energy purchasing power with SMBs, expanding energy-saving innovations from parking garages to other City buildings, adding PV arrays to all City buildings and applying big data analytics to smart meters already installed in City buildings.

##### Expected outcomes

- Reduced energy costs, creating savings to fund energy-related innovation initiatives
- Reduced heat and carbon footprints
- Reduced greenhouse gas emissions
- Stronger reputation of the City as a trusted broker for public utility customers

##### Cost of inaction

Without these immediate actions, it will take much longer for the City to realise the benefits of energy resiliency and sustainability.

Proposed owner and stakeholders	Suggested resources needed
<p><b>Owners:</b></p> <ul style="list-style-type: none"> <li>• CEO of the City of Perth (to sponsor initiatives)</li> <li>• Director of Planning and Development (to manage implementation)</li> </ul> <p><b>Stakeholders:</b></p> <ul style="list-style-type: none"> <li>• Planning and Development</li> <li>• City Services</li> <li>• Corporate Services</li> <li>• Engineers and maintenance services</li> </ul>	<ul style="list-style-type: none"> <li>• Planning and Development department</li> <li>• City Services</li> <li>• Corporate Services</li> </ul> <p><b>Cost estimate:</b> Medium</p>
Dependencies	Key milestones, activities and timeframe
<p>Commitment to fund the initial investment</p>	<ul style="list-style-type: none"> <li>• City of Perth agrees to act on the recommendation: immediate</li> <li>• Implement smart meter big data analytics: immediate</li> <li>• Engage with City of Perth ratepayers to register for the initiative: by November 2014</li> <li>• Negotiate and agree to commercial terms with energy companies: before January 2015</li> <li>• Engage with energy providers and negotiate a matrix of potential savings: by January 2015</li> </ul>
Priority	
<p>Medium</p>	

### Recommendation 6: Develop a City planning data feed

Citizens expect that the Lord Mayor and the City Council will focus not only on operations but also on creating a long-term strategy that will shape the City's landscape, demographics, economy, transportation network and environmental footprint for years to come. The actual delegated power of the City is more limited, however. Key state agencies, such as the Department of Planning, the Department of Housing, the Public Transport Authority, Main Roads Western Australia and the Department of Finance, are endowed with more power by the state to develop a long-term strategy.

The City has had recent success collaborating with state agencies on integrated planning. One example is the 2012 - 2016 transportation plan for Elizabeth Quay, Perth City Link and other key development projects. The plan is still used as a reference document, with multiple agencies and utilities convening regularly to check progress and adjust the plan as projects progress.

Led by its Department of Planning, the state has coalesced around two planning horizons: 2031 and 2050. Supported by common forecasts for population and economic growth, the 2031 and 2050 plans are being distributed to other state agencies and major utilities (for example, Water Corporation and ATCO Gas). Individual agencies and service providers are accountable for establishing their own detailed strategies to align with the goals in the 2031 and 2050 plans. While 2050 may seem distant, achieving the plan's targets by this date will require City of Perth departments to act in the next three to five years.

In late 2013, the City of Perth published Strategic Community Plan – Vision 2029+ to coincide with its bicentennial. This document has significantly advanced the conversation about the City's vision for the future. However, key state agencies and utilities still require additional quantitative data and plans that extend beyond 2029. If these needs are not met, some agencies may assume the City's current trends will continue. They may seek third-party perspectives or use their own ideas to fill the gaps in planning.

To avoid the state making decisions that will be expensive for the City to undo, Perth should increase its participation in state planning functions, starting with the 2050 plan. The new CDO (see Recommendation 1) should engage each of the key planning agencies to identify gaps in information supplied by the City. The CDO should use the findings to define a common data layer for strategic planning that can be implemented across platforms, such as the Landgate systems and a document management system. This data layer would establish the following:

- Common horizons for each future planning iteration
- Key data items required
- Stakeholder owners for each data item
- Dates when information can be provided

With this alignment, the City of Perth will be able to provide the additional information more easily. The City Planning and Development team can then engage with the Lord Mayor, the City Council and other stakeholders to expand on the Vision 2029+ plan and help ensure that the City has a voice in planning processes at the state level.

## Recommendation 6: Develop a City planning data feed

The City should quantify and extend long-term planning goals beyond 2029 and create a data feed that pushes this plan of record to state agencies and GTEs for use in 2050 planning and other state-level planning activities.

### Scope and expected outcomes

#### Scope

To expand the City's 2029+ vision and align with the state horizon of 2050, the City will need to consider underlying demographics, employment profiles and key innovations. The City should identify key WA agencies and GTEs with long-term plans that could reshape or inhibit the City's vision, then develop the data and/or analytics required to help these organisations understand and accommodate the City's plans. The new CDO should drive cross-government alignment on key content and metadata as well as publish a regular data feed containing the quantified plans.

#### Expected outcomes

- Align the City's long-term plans and innovation pathways with the investment, policy and regulatory strategies of key WA agencies and GTEs
- Relevant state agencies include the following:
  - Department of Housing
  - Public Transport Authority
  - Main Roads Western Australia
  - Department of Planning
  - Utilities: Water Corporation, ATCO Gas, Western Power

#### Cost of inaction

The cost of inaction will not be felt immediately. However, within 20 to 30 years, failure to act now may result in city housing that promotes demographic shifts that are out of sync with the City's vision. Public transportation may not support the City's desire to increase density. Utility infrastructure may require significant reinvestment due to misalignment with city needs.

Proposed owner and stakeholders	Suggested resources needed
<p><b>Owner:</b> CDO of the City of Perth</p> <p><b>Stakeholders:</b></p> <ul style="list-style-type: none"> <li>• Lord Mayor</li> <li>• CEO</li> <li>• Planning and Development</li> <li>• Infrastructure and Enterprises</li> </ul>	<ul style="list-style-type: none"> <li>• Leadership from City Planning and Development staff</li> <li>• Document management platform or other technologies to publish strategic plans</li> </ul> <p><b>Cost estimate:</b> Low</p>
Dependencies	Key milestones, activities and timeframe
<ul style="list-style-type: none"> <li>• Landgate integration</li> <li>• CDO (see Recommendation 1)</li> </ul>	<ul style="list-style-type: none"> <li>• Review the 2050 planning framework for the state and identify key impacts on the City: 2 weeks</li> <li>• Meet with state agencies to identify City input needed for the state's 2050 plans: 6 weeks</li> <li>• Extend the 2029+ vision to 2050 and quantify key data for state agencies: 6 weeks</li> <li>• Seek council approval to publish and share 2050 data with state agencies and the public: 2 weeks</li> <li>• Collaborate with state agencies to incorporate new data and weigh in on complex trade-offs: 4 weeks</li> <li>• Build a mechanism to push planning data to the state and GTEs on a regular basis: 16 weeks (can run in parallel)</li> </ul>
Priority	
Medium	

## B. Projects

### Recommendation 7: Assemble and publish a Team Perth dashboard

The City of Perth administration is the face of local government services. Citizens often call or tweet at the City of Perth administration to get information about traffic issues, major development activities and road construction as well as to report utility service breakdowns. Information that could help the City better understand and react to these situations exists, but it is scattered across different information silos, and information governance is unclear.

The City of Perth lacks a centralised “mission control hub” that would help the City plan its work, inform citizens and react to emerging situations more effectively.

During our interviews, we observed that various utility owners have many effective ways to collect service breakdown reports and publish them for public use:

- Water Corporation Call Centre receives service breakdown reports and publishes them on its website.
- Main Roads owns an app called Right Move Perth, featuring real-time traffic reports designed to help citizens plan travel routes more efficiently.
- ATCO Gas has a very robust emergency management process that allows them to monitor, communicate and quickly respond to gas-leak emergencies and ensure citizen safety.
- Western Power has a management system for handling service breakdowns.
- The City of Perth announces official events on its website and through social media accounts.

In Perth, information about official City events, traffic disruptions and service breakdowns are scattered throughout disparate systems. There is no formal process for integrating service breakdown information and making it available to citizens. Currently, the Lord Mayor and the City Council Customer Services team do not have access to a holistic, real-time overview of City activities.

A dashboard of information would enable the City to publish important information and communicate with citizens in a more timely, informative and holistic manner.

We recommend that the City of Perth coordinate multiple information sources to create a holistic operational dashboard that includes the following information:

1. Executive dashboard: allows the Lord Mayor, senior managers and executives to gain a higher level of understanding about the City through an intuitive dashboard
2. Citizen collaboration: allows the public to report on non-emergency events (potholes, streetlight outages) and log these with the City Council
3. Social media analytics: turns data from citizens into useful information that can be displayed in the executive dashboard and pushed to executives and infrastructure owners for action
4. Standard operating procedures for emergency response: clarifies roles and responsibilities for emergency events, including resources necessary for resolution, driving more efficient responses

### Recommendation 7: Assemble and publish a Team Perth dashboard

Assemble and publish a comprehensive dashboard to help the City plan operations, coordinate activities and react to emerging events more efficiently.

#### Scope and expected outcomes

##### Scope

- Formalise collaboration with Main Roads Western Australia (MRWA) to add City data to the Right Move Perth app
- Consolidate multiple City, state and utility dashboard efforts
- Use consolidated dashboards to plan, manage and approve decisions
- Connect with citizens to capture feedback and allow them to report incidents
- Route reported incidents to the correct organisation
- Report to citizens about actions taken

##### Expected outcomes

- Real-time information about events and emergencies will drive proactive decision making and resource coordination.
- Holistic, timely and two-way communication with citizens and enterprises about major events and emergencies will help them plan daily life better.
- Increased satisfaction and fewer complaints from citizens about inaccurate information and/or a lack of communication with the City.
- Increased cross-agency collaboration.
- Faster emergency response and resolution.

##### Cost of inaction

Increased citizen dissatisfaction with City services and a continued lack of holistic information to aid decision making.

Proposed owner and stakeholders	Suggested resources needed
<p><b>Owner:</b> City of Perth Planning and Development</p> <p><b>Stakeholders:</b></p> <ul style="list-style-type: none"> <li>• Lord Mayor</li> <li>• MRWA</li> <li>• Water Corporation</li> <li>• ATCO Gas</li> <li>• Western Power</li> <li>• Landgate</li> <li>• City of Perth 3D team</li> <li>• Communications and Marketing</li> </ul>	<ul style="list-style-type: none"> <li>• City of Perth IT department</li> <li>• Dashboard consulting firms</li> </ul> <p><b>Cost estimate:</b> High</p>
Dependencies	Key milestones, activities and timeframe
Data sharing recommendations	<p><b>Short to medium term:</b></p> <ul style="list-style-type: none"> <li>• Form a core project team for the dashboard</li> <li>• Define the project scope, approach and funding request</li> <li>• Secure funding for execution</li> <li>• Development</li> </ul> <p><b>Medium term:</b></p> <ul style="list-style-type: none"> <li>• Implementation</li> </ul>

#### Priority

Medium

### Recommendation 8: Transform asset inventory to enterprise asset management

Asset management refers to the “systematic and coordinated activities and practices through which an organisation optimally and sustainably manages its assets and asset systems, their associated performance, risks and expenditures over their lifecycles for the purpose of achieving the organisational strategic plan.”<sup>9</sup>

In order to manage the full asset lifecycle and better address business imperatives, asset-intensive organisations require the following foundational elements in an asset management practice:

- **Visibility:** Effective enterprise asset management (EAM) requires assets to be clearly observable by officials across the enterprise to improve and accelerate decision making.
- **Control:** Control of the asset base and asset-related data should be done through strong, clear and comprehensive governance of asset lifecycle management.
- **Automation:** Eliminating manual work helps organisations achieve cost-effective, large-scale and highly granular asset management.

Those three core elements of EAM, if implemented by the City of Perth, will empower the City to achieve the following objectives:

- Better manage and secure investments
- Increase governance and reduce operational risk
- Extend asset life, reduce inventory costs and control spending
- Mitigate compliance issues and risk
- Improve health, safety, environment and security for citizens

In addition, increased automation will enable the City of Perth to accomplish the following:

- Build agility and flexibility into operations
- Improve asset utilisation with proactive asset management and systems consolidation
- Enhance operational capabilities by automating workflow, reporting through KPIs and dashboards and improving inventory data reliability

Another important aspect of automation is integration across the supply chain. By tightly managing and synchronising contracts with asset suppliers, contractors and vendors throughout the lifecycle, the City can improve efficiency even more.

The IBM team identified a number of potential benefits of expanding and enhancing the City’s current asset management program:

1. System assets are stored in two information systems with varying levels of granularity. Each system has different functionality. This creates day-to-day data integration challenges and makes it extremely difficult to apply asset information to City processes, such as the Energy Conservation plan. To achieve the full benefits of an EAM solution, the City needs to consolidate asset information in a single system that coordinates and automates all asset levels.
2. The current asset management process was designed to enable more accurate financial control of larger City assets. As a result, many assets lack the granularity necessary for more advanced asset management applications, such as maintenance efficiency, energy efficiency and sustainability. To gain a more detailed understanding of how costs affect assets, like parking garages and City buildings, the City needs more granular information. As part of the consolidation effort, the City should improve the level of granularity for all assets.
3. The City has an opportunity to improve automation and digitisation of asset-related processes. This should be reflected in stronger rules regarding the capture, management and governance of asset data. These rules should be enforced within automated processes according to clear service level agreements (SLAs) and KPIs so that processes can be monitored and managed accordingly. Asset documentation should be retained in a document management system and tagged with metadata that enables easy retrieval.
4. The City should take full advantage of its current asset management application, using mobile devices to capture and maintain information about assets in a more effective and accurate manner.

## Recommendation 8: Transform asset inventory to enterprise asset management

The City should upgrade its current asset management registry to a comprehensive and highly granular EAM system.

### Scope and expected outcomes

#### Scope

The City of Perth can expand and enhance its current asset management program to realise greater benefits. To do this, the following actions are recommended:

1. Consolidate asset management data in a single system to maximise synergy and data quality.
2. Review and unify the varying levels of granularity for individual assets so that more operational processes can take advantage of asset-related data.
3. Increase governance for asset ownership and asset data stewardship and invest in the implementation of automated processes to support the complete asset lifecycle.
4. Integrate asset management processes with supply chain and contract management processes.
5. Take advantage of mobile devices for acquisition and management of asset-related data.

#### Expected outcomes

The expected outcomes of this recommendation are faster responses and improved decision making. Visibility of assets provides an enterprise-wide view of asset details and processes. It also provides visibility into asset service processes across the enterprise supply chain:

- Better visibility and control of assets, enabling more effective and timely decision making throughout each asset's lifecycle
- Better governance of asset management processes, ensuring higher data quality
- Higher efficiency for asset-related processes
- Extended asset life, reduced inventory costs and controlled spending
- Increased operational agility and flexibility
- Improved asset utilisation via proactive asset management and data consolidation
- Enhanced operations from workflow automation, reporting via KPIs and dashboards and improved reliability of inventory data

#### Cost of inaction

The current asset management system will not support a truly cross-functional operational program and will be limited to high-level, financial analysis. The current system will not support critical processes, such as the energy conservation initiative, advanced maintenance management and supply chain management.

Without firm governance and process automation, all asset-related data can decay rapidly and become obsolete. Expanding the scope and functionality of the current system is required to protect and leverage current technology investments.

Without integrating EAM with contract management and supply chain processes, the City may continue to purchase services for assets that are no longer valuable or active.

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**Recommendation 8: Transform asset inventory to enterprise asset management (continued)**

Proposed owner and stakeholders	Suggested resources needed
<p><b>Owner:</b> CEO of the City of Perth</p> <p><b>Stakeholders:</b></p> <ul style="list-style-type: none"> <li>• Infrastructure and Enterprises</li> <li>• Planning and Development</li> <li>• City Services</li> <li>• Corporate Services</li> <li>• Asset custodians</li> </ul>	<ul style="list-style-type: none"> <li>• Asset management IT team</li> <li>• One point person from each agency or department with custody over any City asset</li> <li>• 10 tablet devices (at minimum)</li> <li>• Expansion of City WiFi or 3G cards for the tablets</li> </ul> <p><b>Cost estimate:</b> Low to medium</p>
Dependencies	Key milestones, activities and timeframe
<ul style="list-style-type: none"> <li>• Commitment to upgrade the current asset management system</li> <li>• Acquisition of tablets</li> <li>• Allocation of human resources</li> </ul>	<ul style="list-style-type: none"> <li>• Develop a plan for asset data consolidation and design interfaces between the asset management and finance systems: 3 weeks</li> <li>• Acquire tablets and train teams to use them: 1 month</li> <li>• Conduct reviews of current asset hierarchy and build a more granular model: 1 - 2 months</li> <li>• Map critical processes, define clear rules and responsibilities about asset data stewardship, automate processes using the current system where possible and establish KPIs: 2 months</li> </ul>
Priority	
High	

## Recommendation 9: Reinvent and digitise development approvals

The City of Perth is an attractive and popular destination for businesses establishing headquarters or opening new branches in Western Australia (WA). Growth in employment and the trend towards urban living are driving rapid development. But as suburban services grow and CBD transportation issues continue to be unresolved, the City of Perth will not be the only choice in Western Australia. Meanwhile, given the limited land available in the CBD, the City must make sure that the development projects it approves make the best possible use of allocated land, measured in terms of financial return or other contributions to citizens' quality of life.

In its development approvals, the City must consider stability and process transparency, which help attract investors, as well as the alignment of developments with the City's interests through decision support and analytics. Western Australia regulations are an additional consideration because only developments valued at less than \$15 million may be approved by the City, and for-profit state agencies, such as the Metropolitan Redevelopment Authority (MRA), can self-approve developments within project boundaries.

While the current development approval process is working, it has limitations:

- Multiple agencies, such as the Western Australia Department of State Development and MRA, have final or conditional approval authority.
- A large portion of each new approval's time span is spent validating applications.
- Developers have limited visibility of the status of individual applications and lack awareness of when the review process will be complete.
- Development reviews are focused on the final decision, potentially foregoing opportunities to update City infrastructure data as it changes during construction.
- Vocal members of the public remain sceptical about the motives of development approval, a situation worsened by the difficulty of accessing meaningful data about proposals in progress.
- Visualisations (3D models) are not submitted in formats that easily enable sharing and integration with 3D models from other planned developments.

Despite WA regulations, the City can exert leadership and potentially influence decisions beyond its delegation as the first point of contact for developers and the assembler of approval packages. To accomplish this, the City must define the principles that underpin the new approval process, such as application of analytics, transparency, integration of visualisations and extension beyond approvals. The City should then build core IT capabilities in workflow automation to support the new process, incorporating the new principles while publishing key information to stakeholders and tracking KPIs.

A re-engineered development approval process would incorporate the following characteristics:

### 1. Workflow automation (key enabler)

Alongside asset management, automatic forms and document management, workflow automation tools will be a core IT capability for the City. While workflow automation will have many applications across the city, development review, with its multi-agency coordination and complex approval tree diagrams, is particularly suited to the issues these tools address. Development approval is a high-visibility, high-value process that, if enhanced through workflow automation, will attract interest from participants and potentially achieve full return on the required investment. Leveraging these new tools to publish approval status and track process metrics will support the City's goals of improving openness and transparency.

### 2. Application of analytics

Workflow automation reduces administrative effort, not only by publishing data for every package but also by confirming that someone has reviewed each piece of data before a recommendation is submitted. Once workflow automation is in place, the City could begin to incorporate more advanced, automated analytics. It is possible to mine Landgate system data to estimate land values and assess the benefits of various site upgrades. Analytical tools can be incorporated into the approval process to add more objective comparisons.

### 3. Transparency

Enhancing development approvals with workflow automation will enable the implementation of a portal to publish relevant application information, such as submitted documentation, analysis reports, recommendations from reviewing agencies and board meeting minutes. This information could be made available to all stakeholders, which would help reduce uncertainty about where an application stands or why a particular decision was reached.

Utility companies want to know about proposed developments well before final approval. This information is a valuable input to capacity planning. Workflow automation could deliver this information more efficiently.

After the portal is implemented for the City of Perth, WA state government and utility stakeholders, the same technology could be made available to the public. Giving citizens the ability to review packages in progress or after completion would address concerns about secrecy or the perceived failure to consider key data during evaluation, as well as strengthen the overall transparency of development approval.

#### 4. Integration of visualisation

Maintaining a 3D model that reflects up-to-date project plans is emerging as a baseline function of city planning around the world. The City of Perth has the benefit of two excellent resources for this capability:

1. In-house 3D modelling efforts
2. Advanced capabilities of Landgate

By adding a requirement to provide 3D models during the development approval process and enforcing this requirement through workflow automation, the City can assemble a significant foundation of 3D visualisation data.

The City of Perth should connect its 3D visualisation capabilities with the 3D publishing and integration engines owned by Landgate. Landgate can integrate multiple 3D models to show different versions of these models based on different dates. Publishing 3D visualisations created by the City and developers could enable citizens to see what the City of Perth will look like in the future, whether next month, next year or five years from now.

#### 5. Extending beyond approval

Providing a final decision to approve (or modify) a planned development does not mark the end of the City's interest in a project. Between the approved plan and final construction, many details about the property will change, most of which will not require a package to be submitted for reapproval but are nevertheless important for the City to track. Examples include minor dimensional changes, adjustments to building materials, integration with traffic and utility interfaces. Defined processes in the workflow automation tool can trigger builders and developers to communicate these updates to the City throughout the project lifecycle, culminating in the final "as built" plans being filed with the City when construction is complete. These ongoing updates will help the City maximise the accuracy of its infrastructure data, one of the key goals of this challenge.



Figure 4: An aerial view of the Elizabeth Quay development site

### Recommendation 9: Reinvent and digitise development approvals

The City of Perth should expand the scope of its development approval lifecycle while incorporating workflow automation, applying analytics, improving transparency, integrating visualisations and extending the process to include steps that occur after project approval.

#### Scope and expected outcomes

##### Scope

- Develop an approval dashboard for all proposed developments in the city, even those for which City of Perth does not have final authority to approve, so decision makers see a complete picture of planned and in-progress development.
- Track and monitor projects beyond the approval through to the build stage. Monitor key completion milestones during construction, ending when as-built plans are filed with the City.
- Require developers to provide plans and 3D models so that Landgate and the City of Perth can create time-based visualisations of future cityscapes.
- Implement workflow automation tools to monitor, track and accelerate development applications and track KPIs for approval time and success rates.
- Publish supporting materials, such as drawings or impact analyses, through a document management platform that makes them accessible to the public whenever possible.
- Evaluate academic research about applying decision support analytics to Landgate data to generate optimum land value and recommended development usage.

##### Expected outcomes

- Citizens gain greater visibility of proposals and may raise issues the City has not recognised.
- Stability in timing of approvals will attract developers and large corporations that may also be considering suburban locations.
- The City maximises return on development projects, whether financially or through contributions to quality of life.
- Infrastructure management costs decline due to increased accuracy of asset locations and conditions.

##### Cost of inaction

Inaction will have multiple impacts. In the short term, citizens will continue to express scepticism that development decisions are made in the public interest. In the medium term, if completed projects are not required to file as-built data, the City will continue to accumulate unnecessary maintenance costs for infrastructure. Long term, development decisions made without the benefit of analytics may fail to deliver maximum benefit to the City.

Proposed owner and stakeholders	Suggested resources needed
<p><b>Owner:</b> Planning and Development</p> <p><b>Stakeholders:</b></p> <ul style="list-style-type: none"> <li>• Information Services</li> <li>• WA Department of State Development</li> <li>• MRA</li> <li>• Private developers</li> <li>• Infrastructure and Enterprises</li> <li>• University researchers</li> </ul>	<ul style="list-style-type: none"> <li>• Information Services staff to select and implement workflow management software</li> <li>• Approval process champion assigned from Planning and Development</li> <li>• City Communications staff to publish the new process and communicate with developers and ratepayers</li> </ul> <p><b>Cost estimate:</b> Medium to high</p>

**Recommendation 9: Reinvent and digitise development approvals (continued)**

Dependencies	Key milestones, activities and timeframe
<ul style="list-style-type: none"> <li>• Document management system</li> <li>• Workflow management</li> <li>• Landgate integration</li> </ul>	<p><b>Short term:</b></p> <ul style="list-style-type: none"> <li>• Evaluate and purchase a workflow management tool, considering options, such as Alfresco, that the City already licenses: 10 weeks</li> <li>• Map the proposed approval process, incorporating existing and new practices: 8 weeks</li> <li>• Collaborate with other state agencies that have approval delegation: 8 weeks</li> </ul> <p><b>Medium term:</b></p> <ul style="list-style-type: none"> <li>• Update council approval policies to reflect new requirements: 4 weeks</li> <li>• Develop process to share new data with Landgate and document management systems: 8 weeks</li> <li>• Implement new workflow management processes: 12 weeks</li> <li>• Publish new process guidelines to stakeholders: 12 weeks</li> <li>• Set target date for requirements to take effect: 4 weeks</li> </ul>
<b>Priority</b>	
Medium	

## C. The underpinning recommendation

### Recommendation 10: Implement organisational and cultural change with the drumbeat of communication

The City has already undertaken several initiatives that give them a head start on many of the recommendations in this report. These include social media, proactive communications through apps and other media, usage of 3D and GIS data, use of Landgate systems, sustainable building, innovative enhancements to parking infrastructure and retention of heritage data, to name only a few. These initiatives position the City to become the integrated, reliable and vibrant destination it aspires to be.

It is important to note that the recommendations made here require transformational and disruptive changes to the way teams in City of Perth administration and stakeholder organisations currently operate. To ensure success, the City must first change its culture.

Organisational and cultural change management, supported and reinforced by a constant drumbeat of communication, should be the principle to which all other changes align. This applies not only to the Smarter Cities Challenge roadmap but also to future transformative initiatives.

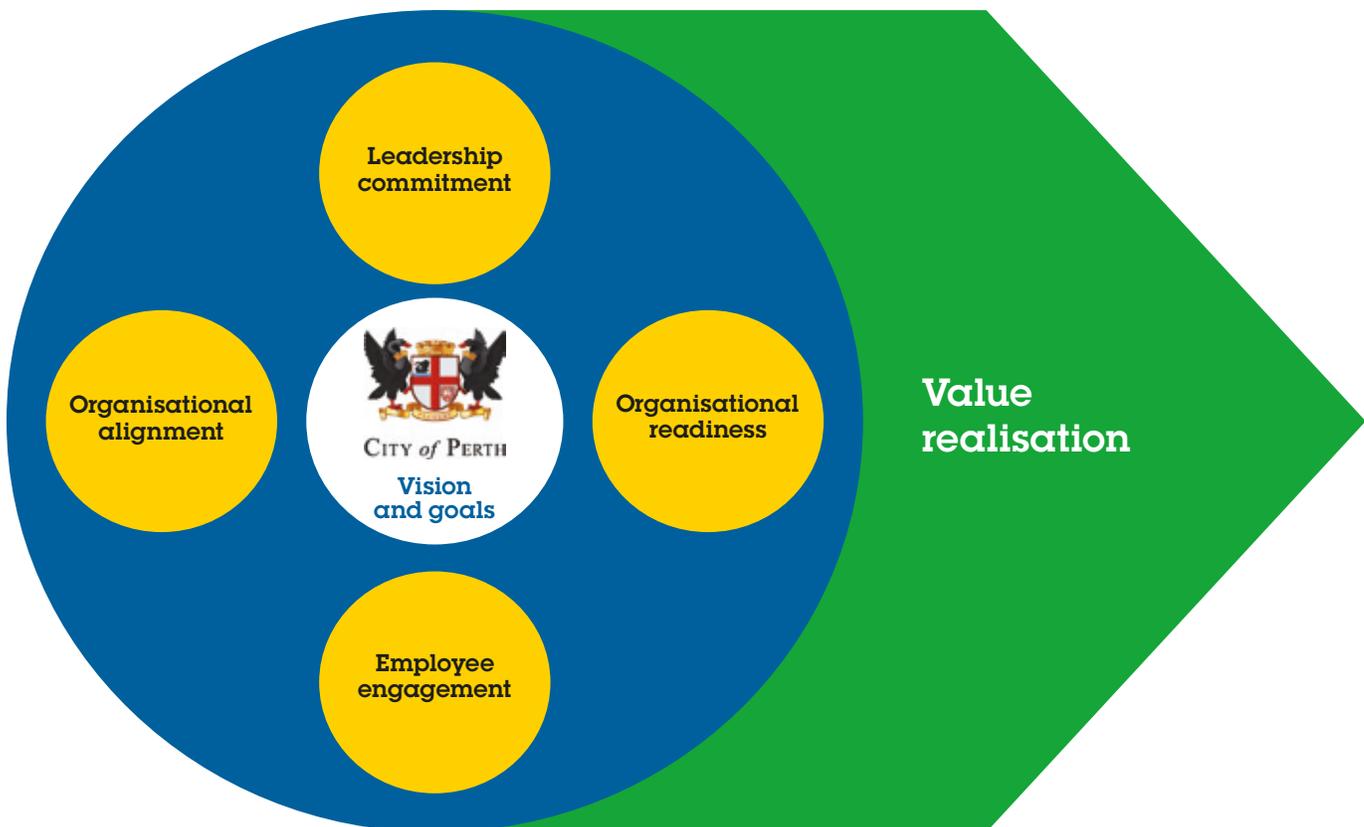


Figure 5: Realising the full value of the recommendations in this report requires a vision as well as leadership, alignment, readiness and engagement



Figure 6: Transformational changes can affect employees and stakeholders on several levels

In 2008, IBM conducted a study of more than 1,500 clients worldwide and confirmed that most of the critical challenges to implementing change involve people. The study confirmed that the reason transformative changes fail is most often attributable not to technical or process issues but to the inability to change the mindsets and attitudes of people, the corporate culture, a lack of higher management commitment and a lack of motivation of involved employees.

It is key to have a person on the leadership team who has a fearless, driving personality and is not easily discouraged by naysayers or the “we’ve tried that before” voices. Although many organisations try to “fit in” organisational change with existing project management processes, it needs to stand apart to succeed. Organisational change and culture management needs to have a distinct owner with significant influence and enough leverage within the organisation to ensure it does not get buried or forgotten. This person and the organisational change and culture management initiative both need strong executive sponsorship. For the City of Perth, one way to ensure this person is successful is for the City to turn the recommendations into official policy.

Measurement and visibility are critical as well. Without clear, attainable goals that can be measured and articulated internally and externally, transformations will not be complete. Activities that are not measured and reported do not get attention. An executive-level scorecard is critical to ensure visibility and ongoing support. Finishing the feedback loop means that the process is in place, people understand it, it works, there is buy-in from all parties, citizens see the benefits and, most important, they see a clear connection between the benefit and the transformational work done on their behalf.

Organisational and cultural change is not a one-time event. The program needs to be set up for continuous improvement to become part of an ongoing project management culture. If a change is important enough to justify a project within the City of Perth, it is important enough to ensure that the City’s culture accepts and embraces the outcomes at the organisational level. Otherwise, the City has wasted resources, and teams will gradually return to their previous silos.

## Recommendation 10: Implement organisational and cultural change with the drumbeat of communication

The City should drive formal organisational and cultural change to ensure the success of the recommendations in this report.

### Scope and expected outcomes

#### Scope

The roadmap of recommendations requires transformational and disruptive changes that will not succeed if the City maintains the status quo. To ensure the success of these recommendations, the City must first address the corporate culture to change mindsets and attitudes about change itself in addition to the changes that will be made to day-to-day processes. This recommendation includes the following activities:

1. Constantly state and repeat the City's vision and goals to staff, stakeholders and citizens
2. Actively enlist elected members and leaders to take ownership of changes
3. Assess change impact and plan how change will be managed across stakeholder groups
4. Engage and prepare employees to adopt the new way of working
5. Align organisations to enable and reinforce desired behaviours
6. Monitor and measure adoption of changes to ensure desired behaviour

It is recommended that the City Council appoint an organisational change and cultural management (OCCM) lead to take ownership and responsibility for driving this process. This person may be reallocated from an existing position or be a new appointment. The OCCM lead should have delegated powers from the CEO and/or the Lord Mayor to ensure proper visibility and coordination with stakeholder organisations.

#### Expected outcomes

- Higher rate of success in implementing the desired transformation
- Better integration with stakeholder agencies
- More effective management of essential infrastructure and communications

#### Cost of inaction

Without widespread and consistent implementation of an effective communications strategy or a cultural shift with respect to change management, the stakeholders and the constituency will not be as acutely aware of incremental progress and will not experience the excitement and momentum behind the transformation.

Proposed owner and stakeholders	Suggested resources needed
<p><b>Owner:</b> OCCM</p> <p><b>Stakeholders:</b></p> <ul style="list-style-type: none"> <li>• Various City Council divisions (all users of data and social media, up to and including the office of the council, executives and the Lord Mayor)</li> <li>• State agencies</li> <li>• Utilities</li> <li>• Citizen representatives</li> <li>• Landgate representative</li> </ul>	<ul style="list-style-type: none"> <li>• OCCM lead</li> <li>• Access to social media and network/WiFi support</li> <li>• Training for OCCM lead and key stakeholder representatives</li> <li>• Internal and external communications</li> <li>• Team-building and informational activities across organisations</li> <li>• Dashboard or tools to measure organisational success through KPIs and attainable metrics</li> </ul> <p><b>Cost estimate:</b> Medium</p> <p>OCCM should not be an afterthought. There not a relatively large cost outlay for the program itself, but resources do need to be allocated and budgeted to ensure the program is successful and maintained over time.</p>

**Recommendation 10: Implement organisational and cultural change with the drumbeat of communication (continued)**

Dependencies	Key milestones, activities and timeframe
<p>OCCM underpins of all the other recommendations in this report. Its concepts should be applied to the rollout of each and every change needed to successfully achieve the City's vision for growth and development.</p>	<p>For each transformational activity, the OCCM lead will coordinate with the project manager. Timelines for the following steps will vary according to the complexity of the transformation and the number of stakeholders.</p> <p><b>Design and plan</b></p> <ul style="list-style-type: none"> <li>• Articulate the vision and reason for change through a formal document of understanding</li> <li>• Design how the change will be managed and identify groups that have a vested interest in the change</li> <li>• Create achievable and measurable metrics to track adoption of the change and publish these regularly to high-level internal and external stakeholders</li> </ul> <p><b>Develop</b></p> <ul style="list-style-type: none"> <li>• Get buy-in to ensure leaders are committed to the change</li> <li>• Analyse and document how people and organisations are impacted by the transformation</li> <li>• Assess the readiness to absorb the change</li> <li>• Determine how key messages will be communicated by developing a formal communications plan</li> </ul> <p><b>Deploy</b></p> <ul style="list-style-type: none"> <li>• Train leaders and ensure they model desired behaviours</li> <li>• Develop a strategy for how resistance can be avoided or mitigated</li> <li>• Provide people with skills and knowledge to perform in the new environment and provide adequate training</li> <li>• Determine whether the organisation is ready to execute the change and mitigate any areas of concern</li> </ul> <p><b>Adopt</b></p> <ul style="list-style-type: none"> <li>• Follow up with leaders to be sure they hold people accountable for performing in the new way</li> <li>• Determine effective incentives to sustain the transformation</li> <li>• Assess the need for continuing actions to sustain the change and realise expected value</li> <li>• Measure progress through metrics</li> </ul>
<b>Priority</b>	
High	

# 5. Conclusion

Becoming a Smarter City is a journey that requires a shift in mindset. Every step drives increased efficiency. Every initiative delivers return on investment and can inspire another project. The resulting Smarter City is one that attracts citizens and businesses by delivering on its potential as never before.

The City of Perth and its stakeholders have work to do to attain the desired vision, but the City has a great head start in many areas where previous initiatives have already taken root. Great work is being done by the City and its stakeholders in many areas:

- Sustainable living
- Social apps
- Social networking, particularly the Lord Mayor
- Organisational data from the City of Perth Heritage group
- 3D models and GIS systems
- Broad stakeholder presence in Landgate's systems

We encourage the City to keep the focus on these initiatives and help them mature. The recommendations in this report are designed to support and augment these projects, creating new momentum that will help the City lead collaboration efforts among City and state agencies, create Team Perth, embrace a "push model" for sharing data and achieve its vision for a thriving and sustainable future.

These are significant changes, but as long as they are built on a foundation of true organisational and cultural change management, the chances of success are very high.

# 6. Appendix

## A. Acknowledgements

The IBM Smarter Cities Challenge team wishes to thank all the stakeholders and citizens we met and interviewed during our three weeks in the City of Perth. A special thanks to Lord Mayor Lisa Scaffidi, Martin Mileham and the team within the Planning and Development section of City of Perth Council for their hosting and support.

Name	Title	Organisation
Dean Solmundson	Senior Manager, Technical Services	ATCO Gas
Jim Richardson	Manager, Engineering Services	ATCO Gas
Sin Wei Lim	System Performance Engineer	ATCO Gas
Lisa Scaffidi	Lord Mayor, City of Perth	City of Perth Council
Gary Stevenson	CEO	City of Perth Council
Douglas Forster	Director, City Infrastructure and Enterprises	City of Perth Council
Martin Mileham	Director, Planning and Development	City of Perth Council
Liz Handley	Project Manager	City of Perth Council
Louise Scott	Director, Communications and Marketing	City of Perth Council
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Tristan Loney	GIS Analyst	City of Perth Council
Jonathan Stoate	CIO	City of Perth Council
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Steve Beyer	Executive Director	Western Australia Department of Transport
Karen Sykes	Manager, Information Services	Western Australia Department of Water
George Simpson	Project Manager, Water Online	Western Australia Department of Water
Mike Bradford	Chief Executive	Landgate
Justin van Didden	Assistant General Manager, Business Development	Landgate
Damien Shepherd	Director, WALIS Business Development	Landgate
Doug Morgan	Executive Director, Planning and Technical Services	Main Roads Western Australia
Richard Jeffcote	Director, Operations Project Delivery	Metropolitan Redevelopment Authority
Eden Shepherd	Principal Urban Designer	Metropolitan Redevelopment Authority
Danijela Simic	Project Manager, Perth City Link project	Metropolitan Redevelopment Authority
Anna Spain	Project Manager, Waterbank project	Metropolitan Redevelopment Authority
Lee Pinkerton	Division Council President	Property Council WA
Rebecca Douthwaite	Policy Advisor	Property Council WA
Peter Jones	Acting Executive Director, TransPerth	Public Transport Authority
Gary Merritt	TransPerth Services Development Manager	Public Transport Authority
Thomas Pacy	Network and System Planner	Public Transport Authority
Dr. Joerg Baumeister		University of Western Australia
William Grace	Adjunct Research, Professor of AUDRC (Australian Design Research Centre)	University of Western Australia
Dave Currell	Manager, Information Services	Water Corporation
Phil Beach	Spatial Information Manager	Water Corporation
John Todd	Manager, Planning and Capability	Water Corporation
Tony Shanahan	Meter Services Manager	Western Power
Andrew Sherwin	Information Management Manager	Western Power
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## B. Team biographies



**Deborah Bolk**  
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Deborah Bolk is Director and Senior Delivery manager for one of the largest strategic outsourcing accounts IBM serves, with a global reach into more than 50 countries. She has more than 34 years of experience in the IT industry. Bolk's responsibilities and experiences range from mainframe application programming and capacity planning to strategic business analysis. She has been an ebusiness web-hosting delivery executive, managed technical personnel and large, complex server consolidation and data centre migration projects. Bolk has extensive customer relationship, organisational, project management and personnel management experience and technical knowledge.

Bolk graduated with a bachelor's degree in computer information systems and an MBA from West Texas A&M University. She earned a Master of Project Management from George Washington University. She is certified as an IBM Thought Leader in Project Management and as an IBM Project Executive and is PMI Certified as a Project Management Professional.

Bolk grew up in Texas and is a "cowgirl" at heart. She adores spending time outdoors in the mountains with her family and pets. She volunteers her time at a local Fort Collins hospital and works with organisations to help the homeless in northern Colorado.



**Luciano Dallolio**  
Technical Sales Executive  
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Luciano Dallolio is the Technical Sales Executive with the IBM Software Group in Brazil, managing an organisation of 300 employees covering all technical aspects of the sale and implementation of IBM software in the Brazilian marketplace. With 22 years of experience at IBM, Dallolio has held many different positions in hardware and software units in Brazil and Latin America. Recently, Dallolio participated in the definition and implementation of projects, including the emergency centre and the bus traffic monitoring system, for the City of Rio de Janeiro as well as the asset management project for the City of Porto Alegre.

Dallolio holds a degree in mathematics from the Rio de Janeiro Federal University, an MBA from IBMEC Business School and is a Senior Certified IBM Technical Sales Manager.

During his spare time, Dallolio enjoys playing electric and acoustic guitars, amateur photography, travelling and cooking.



**Li Jun Sun**  
Director of IBM Greater China  
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Li Jun Sun leads a team of more than 100 people responsible for marketing activities in the IBM Greater China Group, which serves China, Taiwan and Hong Kong. Prior to this role, Sun was a consultant in IBM Greater China Group Strategy and Development and IBM Consulting Services. Before joining IBM, she worked in the banking industry as a financial analyst.

Sun graduated from Tsinghua University, a top university in China. She holds a bachelor's degree in environmental engineering and a master's degree in finance and accounting. She has studied in Paris and London and holds an MBA from HEC Paris and London Business School.

She is fluent in Chinese, English and French. In her spare time, Sun enjoys skiing, swimming and travelling.



**Ian Watson-Jones**  
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Ian Watson-Jones is part of the Strategy and Analytics practice within IBM Global Business Services, focusing on operations and supply chain. With more than 15 years of experience at IBM, Watson-Jones has transformed and optimised manufacturing and supply chain processes in the electronics, aerospace and automotive industries. Currently, Watson-Jones is focused on bringing clients the best supply chain analytics solutions from the complete portfolio of IBM software, including quality management, manufacturing data collection, supply chain visualisation and supplier risk analysis.

Watson-Jones holds a bachelor's degree in computer science from Northwestern University and a master's degree in industrial engineering and operations research from the University of California at Berkeley. When not working, he runs and cycles for exercise and would definitely complete a triathlon if he knew how to swim.



**Jeffrey Wells**  
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Jeff Wells has 34 years of experience leading and managing both services delivery teams and large IT transformation and systems integration projects at IBM.

With a long and successful track record in financial services, communications and government industries, Wells has worked with large IBM clients, leading business development, management and delivery of complex system integration, custom development and package-based business transformation programs.

Throughout his career, Wells has worked with clients to help them achieve their business goals and lead them through project lifecycle requirements, including strategy, design, development, implementation and integration. He has been a line manager and project manager/director, directing and managing both large and small teams of IBM staff and subcontractor organisations. Wells is a certified Consultant and Program Director, certified by both IBM and PMI.

Wells is married with two adult children. He enjoys things that go fast, including motor car racing, muscle cars, jet skiing, quad bikes and power boats, as well as fishing, travel and spending quality time with family and friends. Wells is also a licensed electrical contractor and mechanic.

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