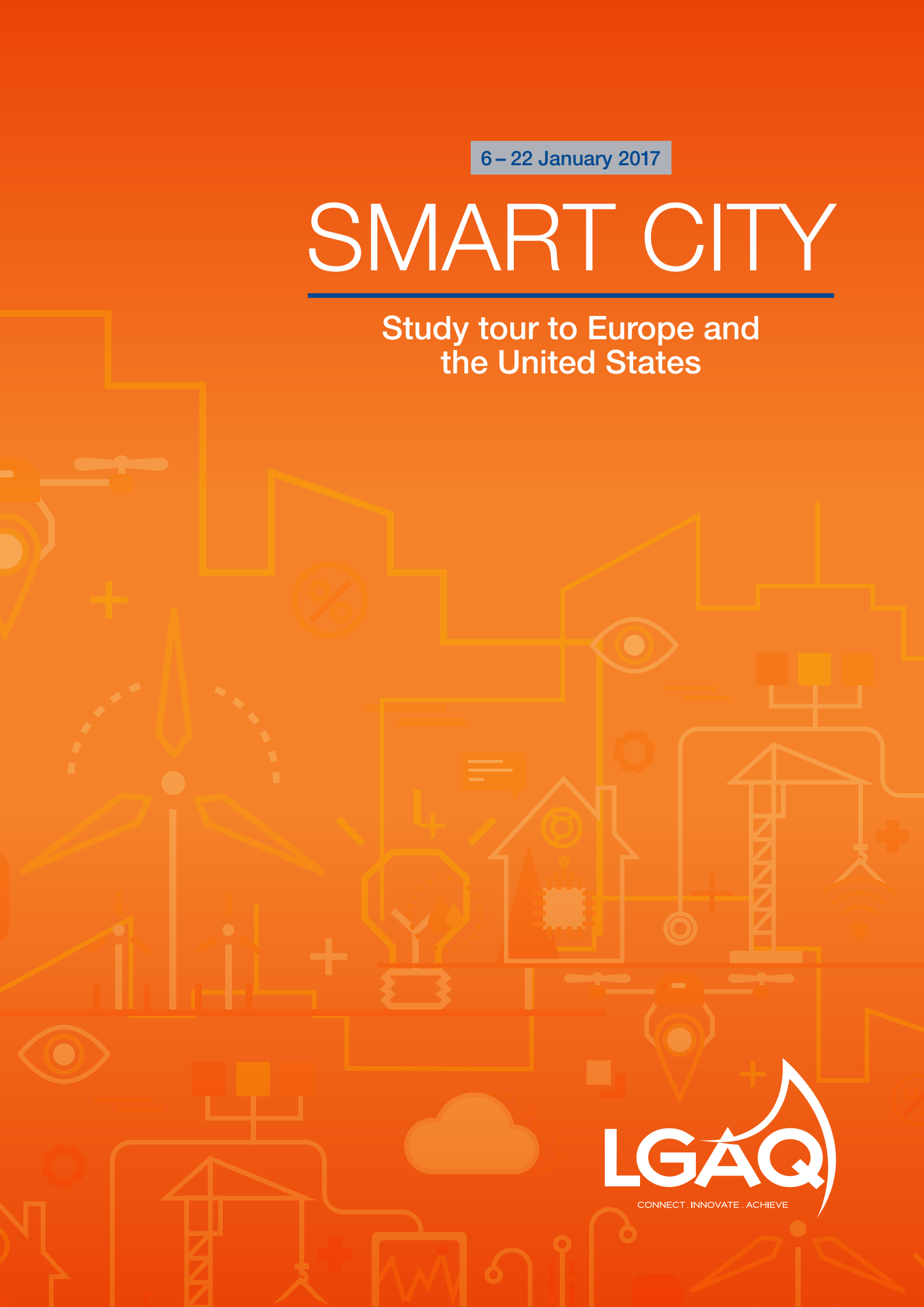
6 – 22 January 2017

SMART CITY

Study tour to Europe and the United States



LGAQ

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Acknowledgements

Smart City Study Tourto Europe and the United States
6 – 22 January 2017

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Executive summary

The LGAQ 2017 Smart City Study Tour to Europe and the United States clarified and, in some instances, validated several key strategic areas for the LGAQ and our business subsidiaries. These areas will be the foundation for future interactions and possibly services that will define a new LGAQ. The creation of platforms, services and product sets will not only shape a contemporary LGAQ, but will provide leadership and new opportunities for our members. It is imperative the LGAQ is well positioned to take advantage of the digital economy to create value for our member councils.

The President of the LGAQ, Mayor Mark Jamieson, led the 16-day study tour which included CEO Mr Greg Hallam PSM and other executives. The study tour also included a LGAQ Subsidiary Board Directors, CEOs of Propel and LGIS, a council representative and Telstra Business's National Manager for Local Government and Smart Cities.

This report will discuss in detail those strategic areas and other observations that were part of the 2017 study tour. The study tour covered a range of areas such as geothermal power stations, big data, smart and connected streets and the central role that smart lighting provides; the concept of Artificial Intelligence and machine learning and how it is being applied to the local government sector; the operation and support for start-ups, incubators and accelerators to ensure that next generation jobs are created and, finally, how digital disruption is changing the nature of councils in terms of interaction with the community, business and other levels of government.

The LGAQ delegates had briefings with senior executives representing global leading blue chip technology companies, including Amazon, Microsoft, Accenture and IBM.

The LGAQ also had as one of its key drivers the need to gain better understanding of the rapid and diverse changes occurring in society, which is being driven outside those "traditional IT" areas.

Hence the need to explore the opportunity of distributed ledger based technology, also known as blockchain, which is underpinning changes in identifying, validating and transacting and how it may be deployed in a local government environment; a site inspection of the world's first combined Concentrated Solar Power Geothermal, and PV power plant at Stillwater, Nevada (which is similar in technology but different in scale to planned sites in Queensland) and briefings with the London Waste and Recycling Board involving circular economy models.

In regards to start-ups, meetings were held with fledging companies from the Silicon Valley that are creating new markets in diverse areas such improving mobility and security; improving the collection and curation of data; and applying Artificial Intelligence and machine learning in ways that are driving business outcomes and improving customer service through call centres.

In addition, the LGAQ has the opportunity to meet with senior executives and managers from the Paris, Boston and Chicago City Councils, who shared some of their current strategies and initiatives – what worked, what didn't and the associated lessons.

One of the key themes of this study tour was moving from understanding the future directions of technology to how to obtain value from those key strategic initiatives; how can the benefits be maximised and negatives mitigated and how can the LGAQ transplant the best examples of what has been learnt into a Queensland context. This does not imply that local government in Queensland must look overseas for ideas. Rather it adds value to current models and projects in Queensland to take them further along the journey.

A key theme in past LGAQ Digital Productivity reports has been the rate of change and the challenges that this poses for decision makers within local government. The LGAQ needs to ensure it is peering over the horizon to understand the opportunities and threats, such as security, that underpin the digital economy to ensure local government in Queensland is healthy and robust.

The LGAQ also believes that size of the city, town or community should not affect their overall "smart" performance. Indeed, the concept of the "smart city" is considered a misnomer for many parts of Queensland. The technology is scalable, and can be procured through LocalBuy's aggregated demand model. Therefore, smaller communities are able to participate and obtain meaningful outcomes, in some instances possibly faster than towns and cities along the coast and in south-east Queensland.

Participation in the digital economy depends on access to telecommunication services. Ensuring there is connectivity to all councils, particularly those in Cape York and the Torres Strait, is a key priority for the LGAQ. The LGAQ President and CEO is leading this focus on connectivity and is encouraging its adoption throughout the whole organisation. Making sure councils and their respective communities have access to robust and scalable telecommunications in both the core and access networks is fundamental. Until this is available in the administration centres of all councils, the gap between the haves and have nots will continue to grow.

Other key learnings of the study tour identified areas important in the day-to-day transactional nature of local government. The tour did focus on the value of data. Indeed, some authorities refer to data as being "the new oil". The need to ensure councils benefit from analysis-based decision making is vital in improving the productivity of councils. This requires local government to have unimpeded access to data. For example, this would create the need for contracts between suppliers and councils to clearly identify rights in regards to the ownership and collection of data.

While the gathering of knowledge and understanding was an important part of the study tour, there is also a valuable personal side. The creation and maintenance of relationships with global government or industry leaders and operational experts is an intangible asset for the LGAQ. In due course, some of these leaders and experts will be invited to speak at LGAQ conferences, forums, and attend briefing sessions with individual councils. Concepts of job swaps, or even short-term recruitment of specific skills sets, are areas for further consideration.

The LGAQ was also fortunate to have business leaders fly from different corners of their respective countries and indeed from around the globe to present at their company's headquarters and share concepts about how the world and indeed local government will look and operate in the future.

The Queensland Government Trade Commissioner in the UK and Austrade in the United States provided considerable assistance in organising meetings and with logistics, which was greatly appreciated.

The report also recognises the support of Telstra in organising meetings, particularly those with Silicon Valley start-ups.

The openness and willingness of the people in local government and from the companies the delegation met during the 16 days was the cornerstone of the study tour's success. The LGAQ is indebted to those people and their organisation.

Background

In late 2015, the LGAQ undertook a study tour to the United Arab Emirates and Europe. The primary focus was on the concept, governance and strategies of the "Smart City" but the study tour also gathered information on renewable energy and energy storage, the role for councils in start-ups; and understanding the pre-requisites for councils to undertake the digital journey, which includes the organisational culture, capability and leadership.

In the 14 months between study tours, the LGAQ further explored a number of those concepts, which resulted in the need for further validation of some assumptions regarding geothermal power, smart street lights and the concept of connected streets as a cornerstone for smart communities.

There were also a number of topics on the horizon that were recognised as potentially having a profound impact on councils from knowledge and our areas of interest broadened over the past year. The LGAQ appreciated the opportunity that distributed ledger technology (blockchain), analytic-based decision making and Artificial Intelligence and chatbots could have on local government. The LGAQ set about meeting the people and organisations recognised globally as leading the development of those solutions. The need to understand the relationships between incubators, start-ups, and accelerators creating the next generation of jobs provided valuable insights into developing models that could be implemented locally.

In the Queensland context, "smart communities" and "smart councils" continue to be a growing area of interest for an increasing number of councils. Councils are also investing in different ways. Holistic regional strategies are being developed and councils are investing in smart solutions to solve specific problems.

The LGAQ continues to play a key role in both processes. It raises awareness about the journey that councils should consider and suggests various models including governance. The LGAQ also invests in understanding the benefit of technology to solve problems through keynote presentations and conferences, innovation tours, developing case studies, publications and newsletters.

It also encourages council to invest in solutions through the use of LocalBuy Industry Development Fund (IDF), which contributes 50 percent of the cost of projects. The nature of projects have varied greatly and include vehicle tracking solutions, noise sensors, bump technology, smart lights and CCTV, smart playgrounds as well as investing in core and access infrastructure for rural and regional councils. Research in areas such as the opportunity for drones, smart lighting and the development of the Digital Productivity reports have been also funded.

A common theme of past Digital Productivity reports has identified that councils are challenged by the rate of change and the need for awareness in understanding what is possible. However, the fundamental starting point has not changed _ what is the problem that needs to be solved, how do our communities and citizens benefit and how can technology assist.

As an industry association, the need to provide advice and guidance in understanding future trends is an important function of the LGAQ. So too is recognising the role that the LGAQ could play either directly or working with its subsidiaries in creating platforms or new services to help councils take advantage of these future trends.

Hence, the study tour provided a unique opportunity to meet with the globally leading blue chip technology companies specialising in these areas of big data, analytics, smart lights and the evolution of cities. The meetings with Paris, Chicago and Boston councils provided an opportunity to understand how the projects are being implemented on the ground. These meetings also discussed other citizen centric strategies that are adding to citizen satisfaction and the creation of next generation employment. The way councils support start-ups and the creation of new employment is critical.

It is a case of not "where" councils live, but rather "how" they live. That truth and an appetite for change is what drives a community forward. Many councils and the communities they serve, irrespective of size or location, will be able to benefit from "smart" strategies and solutions.

The 2017 study tour also provided concepts and ideas such as those associated with big data analytics and distributed ledger technology that could start local councils into a path to implementation.

Introduction

The 2015 Study Tour Report began with the statement that the fourth industrial revolution was on our doorstep. In the 14 months since, the industrial revolution has moved from the doorstep to be much closer – it's banging on the door and for some its already in the room.

Our society is being impacted by change the LGAQ needs to better understand and, if possible, find niches that could support new business models or offerings. In a way, the LGAQ aims to be a digital business that specialises in local government services for the benefit of our members.

This growing maturity of the elements that contribute to the fourth industrial revolution, whether it be ubiquity of service, the rise and power of mobile devices, social media, Artificial Intelligence, the volumes of data created through the internet of things, and disruptive technologies such as drones, autonomous vehicles and 3D printing, are combining to change work processes and interactions with the community. Data created by the movements of people and the operation and behaviour of assets is being captured at a rapid rate, allowing decisions to be made that result in better financial outcomes, better utilisation of assets and better services.

In some instances, councils look to technology to improve their operational efficiency – doing "more with less" is still a common theme for councils. But technology creates new opportunities for better communication and closer interaction with citizens, producing value in new and different ways for both citizens and the council. The "smart city" has citizens at the centre of digital transactions that aim to improve the lifestyle, environment and economy of a city, town or region.

For a State as big and diverse as Queensland, connectivity in the sense of network access for communities and citizens, is still vital for participation in the digital economy. Nearly every local government centre can use core and access networks (residential and enterprise quality – including GWIP, government wideband IP network). The exception is limited access for some remote communities in Cape York and the Torres Strait. Importantly, the issue of remote telecommunications is now better understood at the other levels of government and progress has been made to resolve this problem. No longer should governments say the NBN will fix community telecommunication problems.

Councils such as Barcoo, Diamantina, Burke, Aurukun and Kowanyama have benefited from capital works programs – some council initiated, some initiated by the State – that build core and access telecommunication infrastructure. Robust and scalable access infrastructure is critical for councils, people and things to connect in the digital economy and continues to be a driver of LGAQ policy.

Local council leaders need better awareness about the options available to solve problems. This need drives smart strategies. "Smart city" type projects should be focussed on creating awareness, knowledge and understanding of councils' ability to invest. It is a case of "how" councils live, rather than "where" they live. The LGAQ will continue to work with councils to raise awareness and understanding.

At a specific level, smart projects improve efficiency and productivity. Councils need to embrace new business models. There is a role for the LGAQ to help councils better understand these directions and assist with solutions. Without looking at new models, councils will not go forward.

Queensland councils manage approximately $108 billion in assets. The Internet of Things (IOT) creates opportunities to achieve greater life cycles for assets by providing real-time data on the condition of an asset, and the role for life extension through preventative maintenance or timely servicing. Technology continues to evolve, which creates regulatory challenges for councils wanting to adopt the latest solutions.

The LGAQ should continue to work with councils to ensure our advocacy looks at the bigger picture of working collaboratively with the State and the Commonwealth, to ensure legislation and policies are in place so that cities and towns move further down the digital path. The focus should be on councils adopting technology to improve the quality of life, environment and the economy for all towns. Along the way councils will also improve their own productivity and efficiency.

Smart Lights

The 2015 LGAQ Digital Productivity Report found that approximately 85 percent of Queensland councils plan some form of investment in smart lighting. This technology is attractive for a number of reasons, primarily because of the immediate benefit of reduced energy costs by replacing mercury vapour or other traditional lights (eg Mercury Vapour, High Pressure Sodium etc) with Light Emitting Diodes (LED) and controls.

Street lights and poles play a critical role in our communities. Smart lighting is the key asset to support a smart community's infrastructure environment. The focus on smart lights is global. Investments are evident at the street, suburb, city or region level. A key theme of the study tour was the opportunity to gain insights from both suppliers and city councils on their application of smart lights, the technology being used, including the nature of IOT devices on the pole, and the strategies for procuring solutions through tender processes.

Three key areas were explored: understanding the light and the fitting, the pole and power supply, and the associated software that controls the light. Cisco (October 2016) recognises that "Smart Lighting is the most logical asset to build out Smart City Infrastructure with power, backbone and connectivity…".

However, like many areas in the rapidly evolving digital economy, it is important to define what a smart light is. For the purpose of this paper, smart lights involve the combination of LEDs with controls. Some councils have replaced traditional lights for LEDs and while there have been savings, benefits have not been maximised.

Citelum

The study group met Citelum, one of the global leaders in smart lighting at their headquarters in Paris. Citelum specialises in lighting, traffic management, and other urban electrical systems. With a turnover of more than $415 million, of which 75 percent is front international projects, Citelum has a workforce of 3,000 employees and globally manages approximately 2.5 million lights. The company has rolled out solutions for provincial governments for Barcelona in Spain and Puebla in Mexico.

The meeting explored some of the concepts that were identified in the LGIS Smart Street Lighting Feasibility Study. Citelum research showing business outcomes of 25 percent increases in productivity, reduction of CO2, and a 70 percent reduction in energy bills was only slightly more than what was recognised in the study.

The Citelum value proposition has three key areas:

- **Improving the attractiveness of cities and businesses** – use of lights to make cities and businesses more attractive at a lower cost. Artistic lighting, Li-Fi, interaction between cities and light, lighting paths, light street art, reduction of light pollution and preservation of environment, as part of this attractiveness.
- **Improving security and safety** – improve liveability, optimise resources and citizen intelligence.
- **Using specific applications from the infrastructure such as smart mobility** – improve the fluidity of traffic and parking, fight pollution and enforce parking infringements.

Citelum provides key functions including design, integration, maintenance, construction, finance and delivery. The company's flexible model can include existing work force as part of the contract for the roll-out and operation of smart lights. The company places sustainable development in all of its forms—economic, societal, cultural, and environmental—at the heart of our systems and services.

The company is also investing heavily in research and development with a focus on:

- Improving the technical, environmental, and financial performance of urban electrical equipment and infrastructure
- Designing and installing breakthrough tools and processes that allow for the full integration of all types of urban electrical equipment.

Citelum's two software subsidiaries, Citegestion and Edelcom, have drawn from the field experience and technical expertise of Citelum engineers to develop innovative, state-of-the-art management applications. The software is used by cities in nearly 20 countries worldwide.

Paris Smart Lights

The Paris City Council has also invested in smart lights, installing LED into more than 200,000 street lights. Each street light will have its own control to monitor the electricity usage at each device which will help with preventative maintenance and cost-saving goals.

The city is investing $970 million on smart lights. Stage one is installing LED, controls and variable lighting. The smart lights project is also working with the company that manages the city's traffic lights and will create a platform around traffic management. It is expected that Paris will reduce energy consumption by traffic and street lights by 30 percent over the next 10 years.

Chicago Smart Lights

The study group heard that Chicago City Council was in the final stages of an open and transparent tender process seeking a smart light solution. Council kindly shared the documentation for their entire smart lighting tender, a valuable reference source for councils looking to follow a similar path.

Paris City Council – Hotel de Ville, Paris.

Blockchain
Distributed Ledger Technology

The concept of distributed ledger technology (blockchain) was first presented and demonstrated to the LGAQ in Estonia during its 2015 study tour to Europe. Since then the LGAQ has been researching the technology and its possible benefits to local government.

This research has involved meetings with IT consultants, including Gartner's Head of Research on Blockchain; participation at local blockchain awareness and demonstration events; support of Brisbane's fledging blockchain community; meetings and presentations with universities; presentations from Estonian practitioners at LGAQ conferences in Brisbane; discussions with individual councils throughout the State; meetings with Australian fintech and blue chip IT companies and the attendance and sponsorship at local blockchain industry events, which resulted in the development of a position paper for the LGAQ.

This paper recognises that blockchain will be a considerable force underpinning the nature of transactions (property, contracts, notices, assets etc). While the technology is still evolving and subject to considerable global investment largely from the fintech industry, it will develop into a meaningful solution. Gartner predicts that by 2022, a blockchain business will be worth $10 billion.

Blockchain technology is evolving and there is an element of risk (as with the early days of the internet) but in the long term it will prevail. The LGAQ needs to take leadership by supporting councils or LGAQ subsidiaries to better understand how blockchain could be introduced and the pragmatic benefits for local government.

Global leading blockchain company Everledger CEO and Founder, Leeane Kemp and President Mark Jamieson.

The fundamental strength behind blockchain technology is in the authenticity of records, content and transactions, and its decentralised nature. In theory, every type of document and type of record could be made a part of blockchain technology. Therefore, every piece of transacted data within the Internet of Things (IoT), every interaction between devices and the passing of information between them could also become part of the blockchain.

One of the challenges for local government is the need to provide an authoritative version of truth as well as visibility into a complex and distributed matrix that involves both geographic and organisational functions. This truth would need to act on things (funds, supply chains, people, assets etc) and work across many systems. Local government and other levels of government have been subject to sophisticated attempts at fraud, identifying weakness in the single-ledger model that underpins current transactions. A distributed ledger is a more compelling solution to verify and validate transactions.

Rather than replacing existing systems or attempting integration (a costly and complicated proposition), blockchain can provide a "meta-ledger" of cross-system transactions, achieve consensus, and provide a single integrated view. It can also act as a real-time audit function, identifying problematic transactions such as overspending funds, overextending the supply chain, or executing incompatible personnel moves, which otherwise could have only been detected after the fact. In general, uses of blockchain should be thought of in contexts that couldn't be achieved more simply or straightforwardly through distributed database technology.

With this in mind, the LGAQ has recognised that blockchain has the potential for the following:

- Reduced cost of operations, including reducing fraud and error in payments
- Greater transparency of transactions between councils, government agencies and citizens
- Greater financial inclusion of people currently on the fringes of the financial system
- Reduced costs of protecting citizens' data while creating the possibility to share data between different entities, allowing for the creation of information marketplaces
- Protection of critical infrastructure such as bridges, tunnels etc
- Reduced market friction, making it easier for small and medium-sized enterprises (SMEs) to interact with local and other government entities
- Promotion of innovation and economic growth possibilities for SMEs.

This broad range of possible benefits is delivered through the application of distributed ledger technologies in three different ways:

- Within currency and transaction applications.
- To manage contracts and create new forms of contracts.
- To prompt new applications by third parties, and provide more efficient ways of structuring and carrying out activities.

One of the highlights of the study tour, was meeting with UK-based start-up Everledger. Everledger CEO Leanne Kemp is a Brisbane woman recognised globally for her work with blockchain in a range of ways to authenticate and validate the identify of things, particularly assets. In late January, she was appointed to the Board of the World Trade Symposium in recognition of her work and her world-leading approach to the future of transactions.

Kemp achieved global recognition for her work with blockchain in the diamond industry. She is attributed as being one of the key factors in the enforcement of the Kimberly Protocol, which sets controls around the distribution of blood diamonds. Everledger is now working closely at a board level with a number of financial institutions including insurance. This work includes strategies involving the future of insurance, the way we work, how companies are framed (governance in an age of disruption), changes in how organisations collect and analyse data and linking it to developing commercial strategic niches.

One of her more interesting projects has been with prominent French wine houses and applying blockchain technologies to ensure the authenticity of premium wine, which aims to reduce the volume of counterfeit wine on the market. Other work includes a project to blockchain the artwork of the Vatican. Anything of value can be put into a database. As these examples show, blockchain is being applied to a broad range of assets and things.

High value items whose provenance might otherwise be reliant on paper certificates and receipts that can easily be lost or tampered with is mitigated through the use of blockchain. The blockchain is a distributed public ledger for tracking provenance in a way that is more robust and accessible than a paper trail.

If the technology can be applied to diverse asset types such as diamonds, wine and art, there are opportunities for it to be applied to things in the local government context, such as assets, contracts, transactions, and validation of identity.

The perfect use case for the blockchain is most definitely when there is an immutable ID on a device that cannot be changed and it is sitting within an immutable ledger. This circumstance can clearly occur within the world of IoT [Internet of Things]. The belief is that blockchain will become the lynchpin for security, data transactions and authentication for the Internet of Things. It is also believed that it could cause disruption with areas such as cloud-based solutions, because it can be decentralised and due to these factors, may also create the backbone for machine learning and true Artificial Intelligence.

Since the tour, the LGAQ has already taken steps to apply blockchain technology to local government.

Smart City

The study tour gained insights from the executives driving smart city strategies for Paris, Boston and Chicago. Every smart city strategy is unique, reflecting the individual environment, culture, leadership and challenges that are trying to be solved. However, it is important to appreciate some of the tactics and solutions being applied to solve problems or improve the citizen-centric model. What follows are examples of projects in those cities. They are thought provoking and may have relevance for councils considering similar activities.

The message that was repeated in many presentations was that there were many other examples of cities doing smart things, but there was not one city doing everything.

Paris City Council

Community led innovation

A smart city strategy is a citizen-centric strategy, but Paris takes it to a new level with dedicated funding allocated in its budget for citizen or community led innovation projects. Each year five percent of the Paris budget or €100 million (AUD $139 million) is set aside for community led innovation.

The process provides the citizen with one month to develop and submit an application. It then takes up to three months for the city to evaluate and pre-select projects, a further two months of consultation and collaboration between the applicant and council and then a further two weeks for an open community vote.

Together with the city council website, which invites citizens to provide feedback on almost all aspects of the community and council, a pulse is created which provides valuable insights into community attitudes.

As a result of the community-led projects combined with the public website, a political tool is created that provide valuable insights. For example, the number one feedback issue with more than 20,000 votes was for homeless people. The high ranking of social projects, such as the homeless issue, was a surprise to council.

Admin structure

The process and the approach to reducing internal silos, a key success requirement for implementing smart city policies, is more complex in Paris. The council recognises this as a challenging piece of work, but it is working towards that goal.

The council has 21 Deputy Mayors, previously there were 37 and each manages a portfolio. The Council has 163 Councillors, almost 60,000 employees and there are 130 advisors to the Deputy Mayor and Mayor.

Open city

A defining characteristic of the smart city strategy has been the concept of open data. In a general sense, the concept of making data sets available is an opportunity for innovators to develop solutions from insights based on the patterns and relationships of data. This could be used to solve local problems for councils or create a start-up.

Paris refers to its open data strategy as Open City. The council launched its challenge last year where start-ups and private partners were invited to analyse data about tourism, liveability, and energy usage to better understand characteristics and solve local problems. More than 140 candidates worked on 12 challenges in conjunction with the private sector. A number of commercial applications and solutions resulted from the process.

LGAQ President Mayor Mark Jamieson presents Paris City Council Director of Cabinet, Oliver Renard, a gift of appreciation for hosting the study group.

Connected city

Connected City was another key program for the Paris City Council. The concept combines three sub-programs that involve WiFi, greater use of digital services and the creation of a single data platform.

The city WiFi project encourages the use of a single WiFi network throughout the city. This allows the two-way exchange of information – users are able to access the internet, while the city gains insights into people movements through the city; repeat visitors, ratio of citizens to tourists and an efficient way to track the number of people in an area.

While smart lights play a key element, bus shelters have an important role as a sand pit or testing site. Council is encouraging start-ups to test their wares on a special network hosted on bus shelters throughout the city. Council accesses data on this network to track how the trial is performing as well as the ongoing support from the start-ups.

Sustainable city/Re-vegetate Paris

The sustainable city is a territory that meets the basic needs of its inhabitants and their quest for well-being. It places citizens and their quality of life at the centre. In order to face the five major social, economic, cultural, environmental and resilience challenges, Paris re-examines the functioning of the networks, urban planning and urban flows, in conjunction with all the players in the territory, to optimise and save resources.

And while there is a digital and connected aspect to improving liveability, the physical environment is still fundamental. Re-vegetate Paris is a strategy to increase the greenery of the city. The target by 2020 is to have 30 hectares of new green spaces; 100 hectares of "green walls" and 20,000 new trees.

Boston City Council

The LGAQ has an existing relationship with the Boston City Council through the Mayor's Office of New Urban Mechanics. This is the result of the Microsoft-sponsored visit to Australia of Boston City Council and industry representatives in June 2016. During that visit, the LGAQ jointly hosted an information session for LGAQ staff, local government industry and councils in southeast Queensland and adjoining council areas.

Mayor's Office of New Urban Mechanics

Obtaining additional information on the Boston model was extremely useful as it provides another example of options for smart city structure and governance. While the Amsterdam model recognises the value in having a body for governance at arms-length to the council, the Boston model aims to integrate the smart city model at the operational unit of council. Staff from the office of New Urban Mechanics work in small teams with the various departments and then return to New Urban Mechanics when the project is completed.

The Office of New Urban Mechanics serves as the mayor's civic innovation group. A city agency that was formed in 2010, the office pilots experiments that have the potential to significantly improve the quality of city services.

The Office is the result of the Mayor's strategy that identified unstructured innovation in council and urges the creation of a centre of change across the whole of Council. Its primary focus is on big issues of the city. The office recognises that council people have their own jobs to do, and hence assists in the enabling of ideas and projects aligning with the primary problems of the city.

At the operational level it helps the New Urban Mechanics staff not to be institutionalised while allowing units and teams at the coal-face to be aligned with the broader strategies and communication of the Mayor's office. The office of Urban Mechanics has a relatively modest number of staff – only 14.

The diversity of skills includes film makers, industrial designers, visual designers and creative artists. They measure success on the KPIs of the units that they are engaged with. The Office of New Urban Mechanics has a mantra that identifies four key themes:

- How you build is just as important as what you build. It has a specific focus on engagement with community and stakeholders. In involves public engagement, strong internal communication and consultation.
- Build things that people want and need. The need to "connect" with people on projects that are important to them. It provides an opportunity to address quality of life issues and involves the use of various forums that suit the problem they are trying to solve.
- Use technology to build compassion. The Office recognises that people hear the concepts of "faster, better, cheaper" with smart cities, but there is a need to humanise as well. Resilience and social capital/equity is the vital aspect of building trust.
- Be delightful. Recognise that beauty and elegance are important in the projects that are delivered.

The office's model for smart city projects is based on a design-thinking approach which involves the concepts of Explore, Experiment, Evaluate or Expand and then hand-off. The model recognises that there is an aversion to risk, which is managed by creating pilot projects. The Office helps units to implement the pilot, which extends to assisting with funding and procurement. The aim of the pilot is to look for best practice and to be able to replicate and scale.

City Worker app

Examples of specific solutions include an app to interface with council workers. The City Worker app helps staff improve their job experience while also allowing citizens to report things like pot holes, graffiti or vandalism. To close off jobs the workers not only send a photo of the repair to the person who reported the fault, but include the team who fixed it, which humanises the work. This identification that local people were involved in the response and repair had a major positive effect in repeat usage of the app.

The app not only alerts workers about trouble spots such as potholes, graffiti, or broken street lights, in their respective coverage zones but also allows to workers to manage their caseloads remotely, and inform dispatchers when problems have been resolved.

City Worker is an extension of Citizen Connect, an app that the city unveiled in 2009. Citizen Connect gave smartphone-toting Bostonians the ability to use their phones to report nuisances throughout the city. The app helped city workers respond to problems faster, and communicate with residents more quickly.

Chicago City Council

The smart strategies that characterise the City of Chicago need to be put into context with its relationship with the State of Illinois. Chicago is the largest city in Illinois, a State which has been subject to financial and political scrutiny for the past decade.

Indeed, the study group heard seven of the past 10 Governors were in jail and that the State Budget had not been released for the past two years.

Chicago has strong links with former US President Barack Obama and his original chief of staff, Rahm Emmanuel. Both are from Chicago and much of Obama's initial victory was due to the value and insights obtained from data during the campaign. The chief of staff is now the current Chicago Mayor and the recognition of the value of data and the appreciation of transparency are hallmarks of the current city administration.

Chicago 311

As a result of that environment, there is a great focus on open and transparent government. The council boasts that more than 600 data sets are available on the city council portal. Start-ups, entrepreneurs, business and citizens are accessing this information for a variety of purposes.

Chicago City Council CIO Brenna Berman and LGAQ President Mayor Jamieson.

Data from Chicago 311, a one-stop-shop for access to all city services and non-emergency police services, is one of the main sources of data. Residents call 311 to report service needs, check the status of previous service requests, obtain information regarding city programs or events and file police reports. By combining one easy-to-remember number, a staff of highly trained operators and an enterprise wide software that automatically routes service requests to the correct Department, Chicago has aimed to make city government work effectively in several ways:

- A simplified and shortened time between a resident reporting a problem and resolution.
- The system has become and effective management tool, generating real-time reports that help departments manage staff, track trends, highlight and monitor performance, target efficiency needs and maximise it resources.
- Service requests can also be submitted to the city using several other channels – including aldermanic offices, community policing offices, the internet and remote city department facilities.
- 311 has also improved the 911 Emergency system by diverting non-emergency calls that could impede the city's emergency response.

The 311 service has been operating for more than 15 years and combined with the other miscellany of data that is created in the day-to-day operations of the council, massive amount of data, which is made public. However the number one data set is city employee salaries. Crime data is number two.

Open Grid

Because of the huge amount of data, which were essentially tabular lists enabled by an Application Program Interface (API), it was difficult for the lay person to use. An app sponsored by Amazon was created, called Open Grid.

The app has been used in other cities, including Seattle (the headquarters of Amazon) and Portland.

The app uses APIs to provide location based data. It captures all data like potholes, liquor licences etc for any geographic area.

The app puts analytics into the hands of mobile teams. Open Grid can be deployed to enable real-time situational awareness and let your organisation access historical events through a simple map-based interface. It is an excellent, low-cost business intelligence tool for governments, non-profits, and corporations.

Insurance – JLT

The study tour's inclusion of London presented an opportunity to receive a briefing from Jardine Lloyd Thompson (JLT). JLT are the appointed managers for three LGAQ schemes – LGM Assets, LGM Liability and LG Workcare. The London office of JLT is responsible for the placement of the schemes' reinsurance cover and associated claims processing.

Created in 2015, LGM Assets is the vehicle by which Queensland local government collectively manages its asset based risk exposures. As the manager of LGM Assets, JLT provides a comprehensive range of services and resources as part of LGM Assets membership including claims management, risk management, insurance placement, and associated fund management and consulting services

LGW has, since 1998, provided workers' compensation cover to local government entities in Queensland. The first workers' compensation self-insurance licence issued under the *WorkCover Queensland Act 1996* was granted to LGW. The scheme commenced operations on 1 June 1998, and members have since been able to collectively manage of their workers' compensation liability exposure.

LGM Liability exists for the sole purpose of benefiting Queensland local government by providing effective and appropriate coverage for the legal liability of members with a long term goal of achieving cost stability and minimising the impacts of volatility in the general insurance and financial sectors.

The opportunity to obtain a briefing from the parent in London and an update on some of the contemporary issues in the insurance industry as well as the deep dive into the re-insurance business provided valuable insights for the delegates.

Circular economy

Smart communities recognise the importance of the environment through sustainable business processes and improving the quality of life for citizens. Circular economy strategies aim to grow in a sustainable way. The study tour met the London Waste and Recycling Board which is working with London boroughs to minimise the use of resources and developing circular economy programs.

A circular economy is one in which communities keep resources in use for as long as possible, extract the maximum value from them whilst in use, then recover and regenerate products and materials at the end of their life. It is a more efficient and environmentally sound alternative to the traditional linear economy in which things are made, used and disposed of.

It is a strategy gaining greater appeal and is being adopted and implemented by many UK councils. The EU also has a circular economy framework. The Ellen MacArthur Foundation is a research body supporting councils, government and the private sector to develop strategies.

The London Waste and Recycling Board works under the auspices of the Mayor.

The purpose of the meeting was not to focus on technology associated with waste, but rather the programs and initiatives that are delivering benefits. This involves city planning, how we change culture, leadership in being efficient in the use of resources, job creation, etc which lead to improving the “liveability” of our communities due to the circular economy.

The London Waste and Recycling Board (LWARB) and Greater London Authority works with stakeholders to focus on making sure London benefits from a new circular economy. Targets are being set to measure progress on:

- New jobs and training opportunities for Londoners.
- Increasing the number of circular business start-ups, as well as existing circular businesses scaling up and more traditional businesses moving to a circular business model.
- Circular economy demonstration projects.
- Increased rates of product recycling, sharing, re-use and remanufacture in focus areas.
- Increasing the number of GLA group procurements that use circular economy principles.
- Greater understanding of how a circular economy can contribute to London’s greenhouse gas emissions reduction targets.

By adopting a circular economy approach, London can unite business interests with the city’s wider development needs. This will help London remain globally competitive.

Incubators/hubs/start-ups

A key lesson involved the relationships between councils, the private sector and academia in developing the businesses of the future. While the value of incubators and start-ups was recognised in the 2015 study tour, the meetings during the 2017 tour provided a greater focus on some of the strategies and the partnerships developed by councils to maximise opportunities.

Councils working independently or with the private sector have create a rich tapestry of models to turn ideas into new business and then assist in their longevity.

Paris

Ernst and Young (2015) has recognised Paris as the world's leader in start-ups that receive third-party funding and support. The city council has spent €1 billion on the digital economy to create the next generation of jobs through start-ups and incubators.

The Paris model looks at the relationship between five key areas:

- the availability of real estate
- financial support from third-parties
- the concept of the giant living lab
- strong research and development ecosystem
- and a range of networking partners.

It boasts 26 sites on approximately 130,000m^2 as part of its incubator program. Sites are determined by price of real estate and the local environment, especially where there is a culture of creativity.

The city also makes a significant investment in this area by allocating €6 million in grants for access by 200 start-ups each year. In addition that are various and numerous financial contributions which are also available to start-ups and SMEs. This includes funding for R&D projects, reduced rents on real estate, loans bank guarantees and research tax credits from the state.

Another key plank is the Giant Living Lab. Each year the council calls for applications for more than 60 experiments throughout the city. This provides mutual benefits as it provides exposure to solutions from companies or start-ups while providing an introduction to working with council, which include areas such as developing tools for public procurement. The experiments in the living lab is a key ambition for a smart and sustainable city.

Having a research and development reputation also contributes to a strong correlation for success in innovation. The city estimates that it has 105,000 researchers in Paris. It is also has the highest number of patents in the European Region; 16 universities and 60 elite schools and invests in new research centres, researchers projects, co-working spaces for students, renewing and developing universities' buildings.

Finally, a range of networking stakeholders supports innovative clusters and all kind of initiatives to bring closer big companies, start-ups, public researchers, students, citizens, and associations.

One demonstration of how the city has achieved this goal is through the support of financial benefactors. The Le Cargo project, which provides 30,000m^2 of floor space is using old factories located near transport hubs and is recognised as one of the best in the world. Three key themes operate at each of these incubators. They are Digital and Creative Arts; New industries for design, manufacturing and construction; and "smart" real estate products.

As a result of this approach and a well-developed marketing campaign, places in the incubator fill quickly. Paris measures the success of its incubator by using the following success measure: floor space; investments; number of start-ups; funding from the market and global ranking.

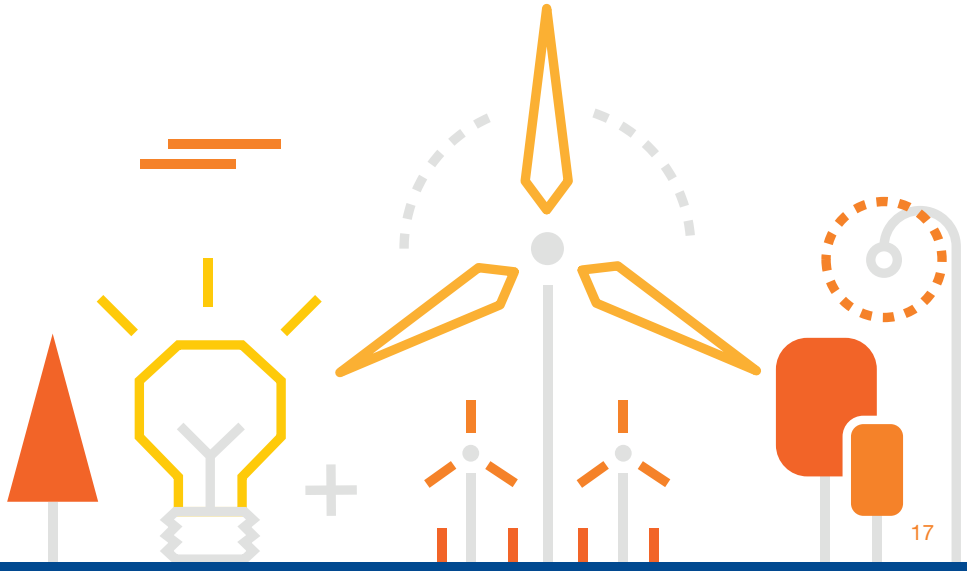
Boston – MassChallenge – accelerator

MassChallenge is a global non-profit start-up accelerator and competition with a focus on high-impact, early-stage entrepreneurs. MassChallenge was founded by John Harthorne and Akhil Nigam to promote innovation. To date, MassChallenge has accelerated 835 start-ups, which together have raised $1.3 billion in funding, generated more than $500 million in revenue and created 6,500 jobs across the world.

Each year, MassChallenge admits 128 finalists to its four-month accelerator program, which provides start-ups with free office space, mentorship and more. At the end of the program, the most promising start-ups are also awarded with equity-free cash prizes.

In addition to the original Boston location, MassChallenge runs accelerator programs in London, Lausanne, Jerusalem and Mexico City. The organisation's funding comes primarily from sponsorships from large corporations including Fidelity Investments, Verizon, Oracle, American Airlines and Microsoft, and from the Commonwealth of Massachusetts. MassChallenge has a presence in Australia (NSW, Vic and SA).

MassChallenge Global President Mike LaRhette and LGAQ CEO Greg Hallam.



New York – Microsoft Reactor

The New York City reactor is Microsoft's latest effort to connect with and empower possible future enterprise customers with the best services available from Microsoft, including cloud computing, developer tools, software, and open-source technologies

The Reactor allows small companies to realise their ideas and bring those to the next level. It helps create the environment by providing developers with networking events and other resources to help support the local tech community.

The New York City Reactor is a 4,000 square feet facility in the newly opened "Hub" at Grand Central Tech, which offers affordable office space for tech start-ups.

Microsoft hopes that the Reactor can serve as a community hub for business networking, creating jobs, and learning new skills. Ongoing Microsoft Reactor activities include hackathons, guest speakers, and office hours with SMEs (subject matter experts).

The Hub provides entrepreneurs with 50,000 square feet of affordable spaces to grow their companies and build the next great smart cities innovations. Joining the Hub provides access to a network of sponsors, strategic advisors, partners and mentors that make up the Grand Central Tech community.

Similar hubs in Boston, Copenhagen, Amsterdam and Singapore are leading the way which resulted in a Public Private Partnership being created with New York City. New York invested $250 million as their share.

There are now 72 incubators in New York across multi disciplines. But none were focussing on urban tech and the issues specifically associated with the city of New York. Hence the Reactor plays an important role filling that niche. Because of the high cost of real estate, a traditional inhibitor to start-ups leaving an incubator, incentives are available for up to three years of rent at significantly reduced rates as compared to normal co-working. Microsoft also provide tech infrastructure – cloud services, access to software for free without any claim to the start-ups Intellectual Property or equity

With the transforming urban landscape, Grand Central Tech and the New York City Economic Development Corporation work strategically to support the companies addressing the urban challenges in sectors such as energy, mobility, waste, built environment, food systems, water, and digital infrastructure.

The role of Microsoft is not only a sponsor of the reactor but also leavers it close relationship with New York City. By bringing the city's development corporation into the mix, it allows for a better understanding of council process and governance, such as regulations to assist in ensuring products and services are compliant. The city has a vetting process for procurement which have strict guidelines. There is a $20,000 discretionary limit which is allowing exposure to new companies, which are building track records before moving to $100,000 level and beyond.

The study group was hosted by Microsoft's Steve Ramsay and Reactor's Robinson Hernandez in New York.

Analytic based decision making

The understanding of financial data and observation by management have been the traditional cornerstone of determining the strategy for business. Financial trends, the ability to compare financial reports on a month-to-month or year-on-year growth has allowed trained managers to obtain insights into their business that has been used to make decisions for the best interest of their organisation – drive new growth, develop marketing and business strategy, and allocate resources – time, people, money to achieve those goals. However, while financial data has been vital in providing insights, it is characterised by a time lag. Weekly and monthly reporting is retrospective.

A logical argument then exists that suggests if data could be obtained, quicker and from a broader range of things, then organisations and in particular government can drive better outcomes in service delivery, efficiency, and productivity because decisions are based on insights which are collected and analysed from data in real time. The evolution of this process then becomes a greater predictability of events. The ability to accurately plan for an event before it actually happens becomes an important strategic tool.

High-performing companies make analysis an integral part of everyday business processes – the methods by which work gets done and value gets created. They achieve this by developing repeatable decision making processes that leverage data and analytical methods.

This is possible in the digital economy. The ubiquity of telecommunications and the on-going reductions in price of network and sensors, is facilitating massive amounts of data which is collected and centralised. The number of internet connected devices is expected to grow exponentially and include internet connected switches, monitors, pumps, lights and cameras. Based on global trends, Gartner believes the number of IOT devices will grow 30-fold during this local government term.

The actual outcome in Queensland could be higher because of better industry awareness and understanding based on a range of factors, including LGAQ's dedicated focus. Councils' existing and ongoing investment in areas such as vehicle tracking, smart meters, CCTV and smart lights means that it is reasonable to expect that there could be one million IOT devices operating in Queensland by 2020.

The LGAQ has recognised that not only does the concept of analytic driven insights benefit Councils at an individual basis, but much greater benefit could be obtained if the same concept could be applied at a regional or state level.

The study tour identified how Councils in cities such as Paris, Boston and Chicago are using analytics to make better decisions in running their cities. The decisions include operational decisions that are linked to cost savings and general efficiency and also quality of life decisions that improves health, safety and transport in communities. The blue chips – Accenture, Amazon and Microsoft are placing the collection and understanding of data from cities as one of their key strategic drivers in their business models.

Data and tech – awareness

One of the key themes with Amazon, Accenture, Microsoft and IBM was the relationship between government, citizens and problem solving. This recognises the complexity of systems that underpin communities, and the challenge in understanding where to start in applying technology that could solve problems.

While strong political leadership is critical, the implementation at the C or executive level can be interrupted in various ways that could be at odds with the actual political direction.

The process of understanding the problem, leading with design and follow through with technology, while seems obvious, was central to those discussions. The value of data in gaining insights from a historical perspective forms the building blocks of problem solving while having a processes to collect and interpret real-time data which allows better and timely decision making should goal of the modern council.

This involves understanding where are the data sets, what are the critical areas that are trying to be solved, and recognising that technology need to be the servant in the process.

In addition, a new model of raising awareness about the benefits of the digital economy which involving on-site meetings, technology trials, lab visits, and additional lobbying with the State and Commonwealth Government are already underway.

The LGAQ has recently commenced discussions with consultants to scope a body of work to identify data sets that would be relevant to local government that is held at other levels of government and regulatory body. This work would be a starting point in understanding how the LGAQ may be able to assist councils to manage and understand data. It also become a key starting point to reshape LGAQ services around data, which would be of benefit for councils that may have the resources to move in this direction by themselves.

The LGAQ is indeed posing questions to itself. What opportunities could a council drive if the right data was surfaced at the right time? How much more efficiently could council operations perform?

The potential for transformation with insights from data analytics already spans every industry, from healthcare to banking and transportation to manufacturing. For many early adopters, data is already reshaping their business, whether through new discoveries, improved products and services or better customer experiences overall, as they evolve from traditional business intelligence (BI) practices to more advanced analytics (predictive and prescriptive) that enable actionable insights.

Its an area that requires further question and exploration.

Analytic trends

Organisations like Accenture have identified public sector organisations are looking at their complex, data-driven environments and identifying significant opportunities to create value.

Accenture believes this occurs in the following areas:

- **Democratisation of Data and Data Discovery** – increased focus on enabling decision-makers throughout an organisation to independently explore and analyse data insights with flexibility, improved visualisation, and faster decision making.
- **New Data Sources** – organisations are dealing with more and more unstructured data sets such as social media, Internet of Things, etc.
- **Focus on Advanced Analytics** – organisational needs are shifting from structured reporting (what happened) to actionable intelligence and predictive insights (what will happen). Data-driven point-of-interaction decisions are shifting to the front line.
- **Big Data and Hybrid Architectures** – more complex analytics needs require Big Data architectures to work hand-in-hand with traditional architecture; hybrid is the new reality.
- **Changing Skills Requirements** – new and more complete skill-sets are being demanded from analytics professionals – a combination of business, analytics, visual aptitude, and technology. These skills are in tremendous demand in the marketplace.

Chicago Array of Things

The study group was exposed to numerous examples of how analytics were transforming cities. Perhaps the most significant was the Chicago Array of Things network. The Array of Things is an urban sensing project which involves installing about 500 nodes throughout the city.

The nodes measure data on air quality, climate, traffic and other urban features. In a way it is a “fitbit” for the city as it collects new streams of data on the environment, infrastructure and activity. This open data can help researchers, city officials and software developers study and address critical city challenges, such as preventing urban flooding, improving traffic safety and air quality and assessing the nature and impact of climate change.

The nodes contain sensors for measuring air and surface temperature, barometric pressure, light, vibration, carbon monoxide, nitrogen dioxide, sulfur dioxide, ozone and ambient sound intensity. Cameras associated with the nodes, will collect data on vehicle and foot traffic, standing water, sky colour and cloud cover.

A total of 500 nodes will be installed across Chicago by the end of 2018, and additional nodes will be shared with cities across the United States and in countries such as England, Mexico and Taiwan.

The project advances ideals by gathering a broad scope of data about the urban environment, in a form that researchers, policymakers and residents can use to develop innovative ways of improving city and urban areas. It is expected that the outcome of the network will provide the potential to make Chicago cleaner, healthier and more livable.

The rollout of the nodes involved community consultation and in some locations a different array of sensors will be used thereby collecting different data sets. In some parts of the city, nodes will contain sensors for tracking air quality and its relationship with asthma and other diseases.

The Array of Things is a community technology. It creates new streams of data that help researches, council and the community to better understand and address the most critical urban challenges. Array of Things will also support Chicago’s efforts to provide smarter and proactive services using predictive analytics and data-driven policy. For example, by tracking the weather conditions leading up to flooding at intersections, city crews can respond more quickly to floods or make infrastructural changes that prevent standing water from accumulating. City departments could also use data on heavy truck traffic and air quality to make decisions about commercial routing that preserves clean air and safe roads in residential neighbourhoods.

Data collected by Array of Things nodes will be open, free, and available to the public, researchers, and developers. After a brief period of testing and calibration, the project will publish data through the city of Chicago Data Portal, open data platform Plenar.io, and via application programming interfaces. As specified by the Array of Things privacy and governance policies, no personally identifiable information will be stored or released by sensor nodes.

Array of Things is funded by a $3.1 million grant from the National Science Foundation, with additional investments from academic and corporate sponsors.

The value of technology is being seamless for this to occur the process underneath also need to be seamless and this requires additional skills, in particular area of knowledge management, data professionals and data scientists. Chicago is able to access considerable resources to assist with their strategy, including the use of three data scientists pro-bono.

It does raise a significant challenge, which was raised every time during meetings between the blue-chips and the LGAQ, of the need for local government to have access to new skills sets around the management and understanding of data. It appears that the first Master of Data Science course has now been offered by a Queensland University, which will likely result in high demand of graduates. The LGAQ is already contacting universities who are offering Master in Data Science to explore opportunities for local government to develop relationships at a strategic or curriculum level to ensure the local government opportunity is understood.

The challenge of data

One of the challenges in creating platforms for the use of data involve both technology and business challenges. For example some data is stored in detached systems where enabling access could be cost prohibitive. Some incoming data often consume a lot of time before it can be consumed. The issue of trust also present a problem, especially when data will be consumed in compliance with its use policies. At the business level, existing model may not cater to the complexities of multi party data sharing. There could also arise issues involving the unbalanced data asset value where the current limits on use restricts and undervalues data and discourage sharing of data sets.

Artificial Intelligence (AI)
Watson and Alexa

The study group had exposure to different applications of artificial intelligence in a local government environment. The two most interesting applications were being created through IBM's Watson and Amazon's Alexa.

Artificial intelligence is intelligence exhibited by machines. In computer science, the field of AI research defines itself as the study of "intelligent agents": any device that perceives its environment and takes actions that maximise its chance of success at some goal. Colloquially, the term "artificial intelligence" is applied when a machine mimics "cognitive" functions that humans associate with other human minds, such as "learning" and "problem solving".

As machines become increasingly capable, mental facilities once thought to require intelligence are removed from the definition. For example, optical character recognition is no longer perceived as an exemplar of "artificial intelligence", having become a routine technology. Capabilities currently classified as AI include successfully understanding human speech, competing at a high level in strategic game systems, self-driving cars, intelligent routing in Content Delivery Networks, and interpreting complex data.

The topic of artificial intelligence was raised at a number of meetings and in different facets. In some discussions, the view that AI would had a negative impact of employment by making some jobs redundant was debated. While it was understood that AI would be applied to largely back-office functions, the front office and interaction with the community would grow as it seeks to convert the benefits of AI and machine learning into resources to the benefit of the council and the community.

An example of this could in areas of improved situational awareness, tourism or other informative services that are provided by councils.

Amazon – Alexa

As part of the meeting with Amazon, the opportunity to better understand Alexa and how it could be used by local government resulted in a storming session that identified possible applications in areas such as tourism, information kiosks, and other public areas where local information may be required by visitors or local citizens.

Alexa is an intelligent personal assistant developed by Amazon Lab126, made popular by the Amazon Echo. It is capable of voice interaction, music playback, making to-do lists, setting alarms, streaming podcasts, playing audiobooks, and providing weather, traffic, and other real time information. It can speak several languages and hence could be used where there are non-english speaking tourists. Alexa can also control several smart devices using itself as a home automation hub.

It is an open product and is able to connect with council APIs to create new services and value. For example, a visitor information kiosk could have Alexa linked to a council data base showing what's happening in the community or information on an events page. It could also be refined to provide information on places to see or stay in the region. This could happen by linking another data base to Alexa to create a unique value proposition.

This also supports the changing nature of jobs. Resources would be required daily to keep data bases up-to-date so that the most current information on what's happening in the shire, hotel vacancies, or special offers would be made available through Alexa.

The LGAQ is meeting with Amazon to better understand how this proposal and others could be developed for a local government market.

IBM Watson

Watson is a question answering computer system capable of answering questions posed in natural language, developed in IBM's DeepQA project by a research team led by principal investigator David Ferrucci. Watson was named after IBM's first CEO and industrialist Thomas J. Watson. The computer system was specifically developed to answer questions on the quiz show *Jeopardy!* In 2011, Watson competed on *Jeopardy!* against former winners Brad Rutter and Ken Jennings. [Watson received the first place prize of $1 million.

Watson had access to 200 million pages of structured and unstructured content consuming four terabytes of disk storage including the full text of Wikipedia, but was not connected to the Internet during the game. For each clue, Watson's three most probable responses were displayed on the television screen. Watson consistently outperformed its human opponents on the game's signaling device, but had trouble in a few categories, notably those having short clues containing only a few words.

Watson is very unique in that it is fundamentally reasoning over unstructured information. Traditionally, when finding information, the use of keyword matches, or parts of speech, or a variety of different techniques are used. Watson is a sum of all techniques.

What makes Watson unique is that instead of having one particular language or one particular technique, or one particular technology that would be used to find information, Watson picks the best techniques that working together will provide the right answer. It is a unique and novel in this way, and its many languages and its many technologies, and many algorithms all work together in a sort of a symphony to find information.

Hence the Watson use case are those when it the tasks would take a human an enormous time to do. If people today are taking an inordinate amount of time to look for information using various techniques and thinking through a problem, that becomes an ideal use case. A good example is a doctor looking at specific information, a patient record or existing guidelines or any information, and trying to figure out what the best treatment is for a patient. A human is spending tremendous time and effort doing cognitive reasoning over the information to give an answer, which is what makes it a good use case.

Again, when someone has to spend a tremendous amount of time looking for information, and Watson can augment their ability or replace their need to do that, it's a great use case for Watson.

Use cases for Watson featured:

- **Healthcare** – analysis of patient treatments and clinical trial data.
- **Shopping** – analysis of customer behaviour to target content at point-of-sale.
- **Property management** – smart buildings using IoT for energy control, security and maintenance.
- **Weather** – analysis and prediction using big data and IoT.
- **Investing** – stock pick recommendations based on Twitter feeds.
- **Application testing** – cognitive capabilities added to test suites to understand application behaviour.
- **IT Security** – analysis and machine learning of security threats.

IBM is adding cognitive features to many of their products including data analytics, application testing and IT security. IBM announced three new APIs at the show including voice tone, emotion and visual image recognition. Watson in the cloud accessed via APIs is proving the great potential of cognitive computing for IBM.

Smart Street Furniture

Soofa is a MIT spin-off company that makes smart street furniture and interactive information kiosks that are part of the infrastructure for smart cities. The study tour had the opportunity to meet the executives and design team in Boston to understand some of the technology advances that were occurring with infrastructure

The connected city is built on a platform feeding data from sensors. Soofa is approaching the challenge with connected infrastructure like the Soofa Bench and Soofa Sign. The Soofa bench features a solar powered battery and USB ports thereby allowing mobile devices to be re-charged, a key requirement for people who are moving through the city.

The Soofa Sign can also run on solar power and provides real-time information on local events and City services.

A plug and play solution, the Soofa Sign can be placed anywhere under the sun, reaching all residents through technology implementable even in the most demanding of locations. All it takes to install this smart urban display are four bolts fixing the sign in place – no access to the power grid or complex machinery is necessary.

This makes the Soofa Sign a useful component in the Smart City, where the focus is using technology to improve the quality of life for every single citizen.

Blue Chip insights

One of the most valuable experiences on the study tour was the opportunity to receive briefings from global leading companies that are helping councils solve problems through the use of technology. The meetings with Amazon, Accenture and Microsoft provided valuable case studies in how they were working with councils and regional governments throughout the world. The meetings brought together Group Technology Officers, Global Industry Leads and Global Managing Directors. It was a privilege for the LGAQ to have meetings with executives that are driving the future direction of local government.

While there has been significant reference already to Accenture, Amazon and Microsoft, it was thought that a brief background on each organisation would be useful.

Accenture

Accenture is a global professional services company and provides strategy, consulting, digital, technology and operations services. It is a Fortune Global 500 company. As of 2016, the company reported net revenues of $32.9 billion, with more than 384,000 employee serving clients in more than 200 cities in 120 countries. In 2015, Accenture had about 130,000 employees in India, more than in any other country, about 48,000 in the US, and about 50,000 in the Philippines. Accenture's current clients include 94 of the Fortune Global 100 and more than three-quarters of the Fortune Global 500. In 2016, Fortune magazine named it as the world's most admired Information Technology Services company.

For the meeting with the LGAQ, Accenture flew in its Group Technology Officer for Public Sector as well as its Managing Director for Australia and New Zealand. The Managing Director for Global Cities, the Managing Director for Mobility and the Managing Director of the State of Illinois also attended the briefing.

In Chicago, the study group met with Accenture's James Coleman – Managing Director Accenture Chicago Office (left), Daniel Lauderback – Group Technology Officer, Health and Public Service (middle) and Janine Griffiths – Managing Director Infrastructure, Cities and Councils Australia and New Zealand (right).

Amazon

Amazon is an American electronic commerce and cloud computing company, founded in July 5, 1994 by Jeff Bezos and based in Seattle, Washington. It is the largest Internet-based retailer in the world by total sales and market capitalization. Amazon.com started as an online bookstore, later diversifying to sell DVDs, Blu-rays, CDs, video downloads/streaming, MP3 downloads/streaming, audiobook downloads/streaming, software, video games, electronics, apparel, furniture, food, toys and jewellery. The company also produces consumer electronics—notably, Amazon Kindle e-readers, Fire tablets, and Fire TV—and is the world's largest provider of cloud infrastructure services (IaaS). Amazon also sells certain low-end products like USB cables under its in-house brand AmazonBasics.

Amazon has separate retail websites for the United States, the United Kingdom and Ireland, France, Canada, Germany, Italy, Spain, Netherlands, Australia, Brazil, Japan, China, India and Mexico. Amazon also offers international shipping to certain other countries for some of its products. In 2016, Dutch and Polish language versions of the German Amazon website were launched.

In 2015, Amazon surpassed Walmart as the most valuable retailer in the United States by market capitalisation, and is, as of 2016 Q3, the fourth most valuable public company.

Microsoft

When it comes to technology, Microsoft is one of the top ten tech companies in the world. With a market capitalisation of about $240 billion, it develops, manufactures, licenses, supports and sells computer software, consumer electronics and personal computers and services. Its best known software products are the Microsoft Windows line of operating systems, Microsoft Office office suite, and Internet Explorer and Edge web browsers. Its flagship hardware products are the Xbox video game consoles and the Microsoft Surface tablet lineup. As of 2016, it was the world's largest software maker by revenue, and one of the world's most valuable companies.

It rose to dominate the personal computer operating system market with MS-DOS in the mid-1980s, followed by Microsoft Windows. The company's 1986 initial public offering (IPO), and subsequent rise in its share price, created three billionaires and an estimated 12,000 millionaires among Microsoft employees. Since the 1990s, it has increasingly diversified from the operating system market and has made a number of corporate acquisitions. In May 2011, Microsoft acquired Skype Technologies for $8.5 billion, and in December 2016 bought LinkedIn for $26.2 billion.

Microsoft's global presence is on a similar scale. The company has an annual research and development budget in excess of $10 billion, more than 10 million teachers through its partners in learning program, a network of 640,000 local partners, and donates $900 million in cash and software to NGOs each year.

Microsoft's approach to local government and the role of cities is also on the same scale – substantial. It strategy for local government is titled CityNext and aims to partner with councils and regional government to create a livable future for cities and urban environments.

The strategy recognises the complexity of cities such as growing populations, the challenge of outdate infrastructure, challenges in health and education, and high energy consumption. CityNext recognises the complexity in solving in these issues, but with dedicated teams, technology solutions, an impressive list of partners and a global presence, it is able to develop the strategies that allow cities to move forward.

One of the most recent major signings for Microsoft in their CityNext strategy was with the government of Singapore. The partnership will explore opportunities in co-creating next-generation digital government services for a Smart Nation. Singapore Government will explore next-gen government services based on chatbots for selected public services where appropriate. These chatbots will function as digital representatives, simulating human behaviour in order to make interactions simpler, more efficient, and more consistent.

The POC, which will be implemented in three phases, will involve intelligent chatbots, where users are able to converse with and call upon any applications within a single website to complete tasks. It will also explore potential future scenarios, including services that cater to a multi-lingual and multi-generational population.

- Phase One will see chatbots drawing from a vast database to answer simple factual questions from users of selected public services.
- This will transit into Phase Two, where chatbots expand their capability to help users complete simple tasks and transactions within government websites.
- Following this, Phase Three will see chatbots responding to personalised queries from users, further enhancing user engagement by providing an interactive conversational experience.

Their model involves four key components:

- **Engage Citizens** – provide timely, high quality, and personalised information and services to citizens.
- **Improve Efficiency** – improve collaboration and productivity of city employees, automate processes and reduce costs.
- **Gain Insights** – understand citizens and the city ecosystem to support better planning and decision making as well as command and control.
- **Increase transparency** – provide for greater transparency and improve compliance.

Microsoft investment in NextCity is considerable. It seemed that in every part of the world, Microsoft was involved in a broad range of solutions that filled all areas of interest that would be of interest to any council or regional government involved in smart city strategies.

New Library Models

Libraries have always played an important role and are a core community service for local government. For many people the libraries are the regular contact point between council and community and for that reason play an important strategic role in projects and strategies associated with smart communities.

The evolving role that libraries play reflects the changes to our communities which is occurring through digital disruption and is impacting how people acquire awareness, knowledge and skills. There is a need for core competency of skills to participate in the digital economy to address possible gaps that are created because of social demographic factors (age, race, physical or mental impairment, unemployment etc).

This is important as some commonwealth agencies charge more for over-the-counter transactions (ie visa applications) as compared to electronic lodgements. This unfortunately has the potential to impact those that can least afford the additional costs.

There is a strategic benefit for councils to ensure citizens are able to participate in the digital economy. This recognises the value of digital inclusion for the individual and also the benefits in how councils interact and engage with all elements of the community.

The study tour had arranged to meet with representatives of the Chicago Public Library (CPL), but unfortunately due to logistical changes had to cancel its meeting. However, CPL was generous to provide some insights into its strategy – particularly its “maker place” model and this is included in this report.

The Chicago Public Library system is considerable. It has a budget of more than $130 million for an urban public library system that serves more than 10 million visitors annually through a network of 80 libraries. CPL is the largest and most visited civic institution in Chicago and is among the largest urban public library systems in the world.

CPL has been recognised as a top US urban library and has won numerous awards and accolades including the National Medal for Museum and Library Service and being named the best urban public library in the United States.

The vision for CPL belongs to its commissioner Brian Bannon. The fundamental view is that libraries are “spaces for learning,” but what is their purpose when knowledge no longer is stored on bookshelves? The partial answer is a maker lab. The lab is equipped with 3D printers, laser cutters and other DIY-manufacturing equipment, which attracted almost 20,000 visitors since in the first three months that it opened.

Some of the technology already is making its way to neighbourhood branches for “Maker Weeks”.

The CPL strategy is using the library as a centre of social innovation and modelling, which is helping cities and communities move forward in the knowledge economy.

This maker-lab model provides a hands-on collaborative environment where citizens come together to share knowledge and resources to design and create items. This was in response to their research which identified that the role of libraries is changing as a result of digital disruption. The Chicago model was an initiative to increase the organization’s focus on defining, measuring and improving its social impact.

The library first defined its purpose as nurturing learning, supporting economic advancement, and strengthening communities for the benefit of all citizens. Then, CPL decided to focus on key outcomes that fulfil this purpose:

- Build basic literacy.
- Build digital, information, and cultural literacy.
- Advance critical thinking and problem solving.
- Advance creativity and innovation.
- Foster communication and collaboration.

The Maker Lab plays host to multiple types of sessions: “Digital Toolbox” workshops, in which patrons learn how to make a simple object using digital design, “Special Sessions” in which patrons undertake non-digital crafting and art projects, and “Open Shop” where more experienced makers can work on personal projects. The primary purpose of the Lab is to serve as an introductory point for patrons to experience new technologies, test their making skills and learn about further opportunities. By offering introductory-level courses, Chicago Public Library is able to introduce a new segment of the public to the development of 21st-century skills. Additionally, through strong partnerships the library has brought together a growing and diverse community of makers and is able to introduce novice makers to more advanced programs around the city.

Geothermal/renewable energy

The LGAQ and its business subsidiary, LGIS, has a large interest in the development and production of geothermal power. This interest has developed over the past five years but its beginnings were quite humble.

Presented with a challenge from Winton Shire Council to find ways that would increase the life and efficiency of their water assets, which was the result from pumping heated bore water (80 degrees) through their network, LGIS identified an opportunity to convert energy from the heat. The outputs would be water that was cooled thereby reducing damage to the pipes and at the same time providing a reliable energy source that could be generated and used locally.

Winton and indeed other communities on long transmission lines in rural and regional Queensland are subject to fluctuations in voltage in their electricity power supply. The term "brown-out" comes from the dimming experienced by incandescent lighting when the voltage sags. With modern appliances, brownouts can also damage the electronics, sometimes severely which requires replacement.

LGIS is at a stage of building its first renewable power plant at Winton. The plan is to build in stages – the first being geothermal with the energy produced being used to power the council's administration offices, depot and other facilities. Additional stages will be added involved concentrated solar, solar PV, and storage.

The study tour had an opportunity to inspect the Stillwater power plant at Nevada. The Stillwater hybrid facility is the world's first renewable energy project that pairs geothermal power's baseload generation capacity with solar power's peak capacity. The plant is on a much larger scale than what is planned for Winton, but provided an outstanding opportunity to gather insights and challenges in the production, management and operation of a power plant.

The Stillwater plant was inaugurated in May, 2012. It has a 26-MW solar plant which is integrated with the adjacent 33-MW geothermal plant, which began operations in 2009, and provides energy to run the geothermal plant's auxiliary loads. Enough energy is produced at the plant to power 45,000 homes. Hence the building of geothermal first, then solar is consistent with the Winton plan.

Combining the best of two renewable energy technologies, the Stillwater hybrid facility balances the continuous generation capacity of geothermal energy with the peak capacity of solar energy. The solar plant's photovoltaic (PV) panels cover 240 acres next to a geothermal plant in Churchill County, Nevada.

How Geothermal power works

Geothermal energy is the only non-hydro renewable energy source able to provide baseload power because it relies on the continuous flow of heat from underground water sources rather than depending on the availability of wind or sun. In many geothermal reservoirs, however, the water temperatures are moderate (below 400°F) and not hot enough to produce steam with the force needed to efficiently turn a turbine. Nonetheless, such moderate temperature reservoirs can generate electricity using a binary system.

The Stillwater geothermal plant uses a medium enthalpy binary system. The facility uses the system because of the moderate temperature of the nearby geothermal reservoir. The plant's binary system uses two fluids: hot water from underground wells heats isobutane and causes it to flash into vapour, which then turns the turbines to generate electricity.

In addition, the facility uses proprietary technology that increases efficiency by minimizing the parasitic load—energy losses that occur from operating the various pumps and fans required in the power generation cycle. The plant has a closed-loop system that continually replenishes the geothermal resource. Once the geothermal fluid has passed through the plant, it is pumped back into the ground. Therefore, there are zero intentional emissions from the process and virtually nothing is emitted to the atmosphere.

An electric combination: geothermal and solar technologies

Adding the solar component to the Stillwater geothermal facility was a management decision based on the understanding to continue to explore synergies between geothermal and solar energy.

As Stillwater proved the concept of a commercial-scale application, it also provided valuable insights in to ways to address key drawbacks for both geothermal and solar technologies: resource risk/parasitic load and generation intermittency. The geothermal plant also provides auxiliary power to the solar plant when there is no sunlight thereby eliminating the need for backfeeding power from the utility.

Currently, a number of utilities use renewable energy sources like solar power during hours of peak consumer demand and combine it with a baseload coal or natural gas plant to ensure a steady power supply. In contrast, the Stillwater facility combines two renewable energy technologies to produce electricity at the same location and thereby increases the generation of zero-emission electricity.

Combining geothermal and solar energy at the Stillwater plant also makes it possible to use the same infrastructure, further reducing environmental impacts. That integration includes the control system, electrical protection and island mode capability, fire detection/protection schemes, electrical interconnection, and the use of a common operations and maintenance staff.

This innovative hybrid power plant demonstrates that the strengths of these different renewable technologies combine to create a better whole. Together, they:

- Enhance the thermal efficiency in the geothermal unit when it is lowest, typically during the hottest and sunniest times of the day or year.
- Stabilise production during the day, enabling a more load-following production profile.
- Reduce investment risk due to the uncertainty of the geothermal resource and compensate for geothermal reservoir temperature depletion without reducing production.

The Stillwater hybrid plant has been recognised as a trendsetter in the renewable energy sector that will probably encourage future hybrid projects. On June 28, 2012, the Geothermal Energy Association (GEA) recognised the Stillwater Solar-Geothermal Hybrid Project for advancing geothermal technology. The GEA singled out the Stillwater facility for being the first hybrid power plant of its kind. The association pointed out that “this technology may help to allow future projects that would otherwise have been unfeasible as stand-alone geothermal or solar projects to be more economically and technologically viable”.

The learning and briefings with the staff from Stillwater and their enthusiasm to be involved with LGIS will be an important alliance as the projects in Queensland mature and evolve.

Extract of Stanford Research Paper on the Stillwater model

Because of the uniqueness of the Stillwater plant, it has been subject to academic research. The Stanford paper recognises the efficiencies of the innovative strategies at the power plant. Stillwater’s innovative strategy was to combine several renewable sources at the same location to fully utilise and capitalise on already installed assets to maximise return on investment. In this case, combining several renewable power generation technologies increases output without increasing emission or environmental impact through the sharing of existing infrastructures such as electrical interconnection substation and transmission lines, access roads, control building and other common facilities. Other benefits have been recognised because of co-locating multiple renewable generation types at a facility including having access to more accurate resource and environmental data, reductions in shared O&M costs and the efficient harnessing of “institutional capital” or the knowledge resources of a capable team (i.e. owner/operators, engineers, contractors, government agencies) already familiar with the intricacies of power development and project management at a particular site (Harvey, 2008). Synthesis of this sort into a combined “resource park” may be possible at many existing installations and may be especially attractive at locations with time-of-day pricing.

The solar thermal plant at Stillwater will be capable of generating approximately three million kWh per year, to be added to the power currently being generated by the existing hybrid plant. Combining all three generation technologies is expected to produce approximately 200 GWh of electricity per year. Overall capital investment and installation cost of the solar thermal addition was estimated at $15 million (Enel Green Power, 2013).

Stillwater provides a proven model for LGIS to build, maintain and operate combined renewable energy power stations.

Concentrated Solar PV at the Stillwater power plant, Nevada.

Silicon Valley/San Francisco

The study tour completed its 16-day study tour with meeting in San Francisco and had the opportunity to meet with Silicon Valley based start-ups business that are developing products that are applicable to local government.

Silicon Valley is a nickname for the southern portion of the San Francisco Bay Area in California. The word "silicon" originally referred to the large number of silicon chip innovators and manufacturers in the region, but the area is now the home to many of the world's largest high-tech corporations, including the headquarters of 39 businesses in the Fortune 1000, and thousands of start-up companies.

Silicon Valley also accounts for one-third of all of the venture capital investment in the United States, which has helped it to become a leading hub and start-up ecosystem for high-tech innovation and scientific development. It was in the Valley that the silicon-based integrated circuit, the microprocessor, and the microcomputer, among other key technologies, were developed. As of 2013, the region employed about a quarter of a million information technology workers.

Silicon Valley – Simple Emotion

The study tour had the opportunity to meet the CEO and co-founder of start-up company Simple Emotion. The company created by Stanford and MIT University graduates have developed algorithms that can be used in call centres to detect acoustic features in speech which are analysed in real time to identify fraud or call centre conversations which provide insights in areas such as customer service.

To date the company has patented two algorithms and has another three pending. It was of interest to the group because it demonstrates how computers and software are being used to understand and provide insights on human-to-human dialogue. The start-up is already providing services to a growing number of financial and insurance companies to reduce fraud by analysing voice calls. The analysis provides "flags" for future investigating, thereby avoiding the traditional random process, based on a sample size of two percent of calls.

While the concept of using algorithms in this way is not unique to the insurance or call centre industry, the high level of accuracy (70-80 percent) obtained from the Simple Emotion process differentiates the solution from others currently on the market. Another benefits of the system is that it can be trained in any voice data in any language.

Its high accuracy is due to Simple Emotion's algorithm which scrapes data directly from the source: voice. Other systems convert the speech to text first, and identify emotions by searching for certain keywords in the script. (A customer that swore a lot is probably angry, for example.) Call centres can also improve their customer service response by paying a human to listen to a call once it's been recorded and make an evaluation based on quality assurance standards, but doing so is expensive.

From a local government perspective, call centres are an important interface between councils and the community. The opportunity to introduce algorithms to better understand the customer experience in dealing with council becomes a useful tool in maximising customer service. Often, the worst part of a customer service experience is speaking to an agent or robot that cannot empathise with a caller about the situation that led him or her to complain. This tension can cause hair-pulling frustration for a customer.

Insights on how the citizen or customer feels following a conversation with a call centre is the Holy Grail nugget of information that a call center manager requires to determine how the service is being delivered.

From an insurance perspective, or those other conversations that rely on the truth or fact being the key component of the communication to council, having the technology to better manage calls of this nature could reduce fraudulent behaviour.

For those call centres that are using techniques to reduce fraud, vetting is undertaking based on a randomly selected two percent of calls or when the telephonist has reason to believe the other party is not genuine a process is commenced for further investigation.

Silicon Valley – Zimperium

The purchasing and use of smart phones and electronic tablets continue to grow in the Queensland local government market. With more than 20,000 devices in operation throughout the State, the area of internet security for mobile devices is of interest for the LGAQ. It is imperative that security exists on mobile devices, as it should on other internet connections throughout the organisation.

Because of the reliance on smart mobile devices within local government, profound changes are occurring in how business occurs, what is also creating new risks.

Indeed, the vast majority of Android phones could be hacked by sending them a specially crafted multimedia message (MMS). The MMS attack vector is the scariest of all because it doesn't require any interaction from the user; the phone just needs to receive a malicious message.

For example, attackers could send malicious MMS when the victim is sleeping and the phone's ringer is silenced. After exploitation the message can be deleted, so the victim would never even know that his phone had been hacked.

Fortunately, when the problem and necessary patches were presented to Google they responded very quickly. The company took the issues very seriously and applied the patches to its internal Android code base within 48 hours.

Since then, there has been significant industry growth in protecting personal and business information stored on smartphones. According to Zimperium, they recognise that all smartphones, as computers, are preferred targets of attacks. These attacks exploit weaknesses inherent in smartphones that can come from the communication mode—like Short Message Service (SMS, aka text messaging), Multimedia Messaging Service (MMS), WiFi, Bluetooth and GSM. There are also exploits that target software vulnerabilities in the browser or operating system. And some malicious software relies on the weak knowledge of an average user.

The study tour heard about the security counter-measures that are being developed and applied to smartphones. This involves security being deployed in different layers of software to the dissemination of information to end users. There are good practices to be observed at all levels, from design to use, through the development of operating systems, software layers, and downloadable apps.

Zimperium offers enterprise class protection for mobile devices against the next generation of advanced mobile attacks. According to Zimperium it is the first and only company to provide a complete mobile security system that continuously runs on the device to provide visibility, security and management for iOS and Android devices.

In 2016, the company partnered with Blackberry. The partnership consisted in integration of zIPS by Zimperium for enhancing Mobile security on iOS and Android platforms. Zimperium has raised over $50 million from private investors including Samsung, Telstra, Sierra Ventures, Stephen Northcutt and Warburg Pincus. The company has also partnered with several other technology companies including Softbank Group.

The LGAQ is working with LocalBuy to engage suppliers to understand what options are available to improve the smart device fleet in Queensland. The work will also explore options to include similar offerings on future panels.

Silicon Valley – OpenGov

Open Government was founded in 2012 as a result of the financial crisis affecting many US states and local government. At that time in California, 12 councils were approaching bankruptcy. CEO and Co-founder Zac Bookman worked with councils to try to analyse trends and quickly realised that councils were unable to share data and hence had limited capability to understand data.

Bookman discovered that reporting, planning, transparent and insights were unable, which resulted in the development of a performance management system. Since then, OpenGov states that its mission is to revolutionise how governments analyse and allocate public money. To advance this mission, OpenGov has built the Smart Government Platform – which according to OpenGov is the world's first integrated cloud solution for government budgeting, reporting and open data.

In the US, more than 1,400 governments across 47 State and the District of Columbia, use OpenGov to collectively manage more than $1trillion in expenditures.

Governments are using OpenGov internally to craft data-driven strategic plans and budgets, report on financial and non-financial results, and inform elected officials and government leaders.

OpenGov offers four products – OpenGov Budget Builder; OpenGov OpenData; OpenGov Transparency; and OpenGovt Intelligence.

Thought Leaders Network

While the study tour provided insights in to a broad range of solutions and processes, it was the people behind those projects through their leadership, communication and vision which provided significant value to the group. Their openness to meet and share their experience provided the insights that were treasured.

Local government has been characterised by the quality of its people and this appears to be a global phenomenon. As a result, the executive level of the LGAQ has an expanded network of internationally recognised practitioners and leaders which will result in reciprocal benefit for not only the association, but also member councils.

It is also important to recognise that the conversations which were held were not one sided; indeed some of the areas that the LGAQ and our subsidiaries have invested in have resulted in opportunities where global leaders are looking at aspects of the LGAQ to learn from as much as them LGAQ is looking at them.

It is intended that these relationships will be sustained and opportunities to bring these globally recognised thought leaders and experts to LGAQ Conferences when opportunities arise.

One of the most valuable aspects of the tour, was of course the relationships and connections that were made. While the tour allowed the LGAQ to firm relationships with people like Boston's Nigel Jacob, it also allowed new relationships to be created such as Chicago CIO Brenna Berman, MassChallenge President Mike LaRhette and brought National Managers from Amazon and Accenture closer to the LGAQ family.

Conclusion

Technology continues to evolve rapidly. This affects how organisations work and how they solve problems. From a local government perspective, where financial sustainability is the number one issue affecting Queensland councils, the opportunity to introduce technology to solve local problems is vital for councils to grow and meet ongoing operational and community expectations.

LGAQ research shows that the most councils recognise the benefits of introducing a technology in terms of efficiency, cost reduction and service delivery which improves productivity. But, like many of us, councils are challenged with the complexity and rate of change.

The adoption of IOT devices is adding to this complexity as it is producing data that needs to be understood. Based on global trends, Gartner believes the number of IOT devices will grow 30-fold during this local government term. The actual outcome in Queensland could be higher because of better industry awareness and understanding based on a range of factors, including LGAQ's dedicated focus.

Councils' existing and ongoing investment in areas such as vehicle tracking, smart meters, CCTV and smart lights means that it is reasonable to expect that there could be one million IOT devices operating in Queensland by 2020.

The 2017 study tour provided insights in several areas including the need to create platforms that could benefit both individual councils and the broader industry.

Linking both structured and unstructured data sets creates the need to understand new patterns and relationships within that data so that better decisions can be made.

An environment that allows faster and secure transactions to occur through distributed ledger technology, such as blockchain, would also provide benefit many councils in terms of validating and authenticating transaction and contracts. The LGAQ is already taking steps in these directions following the 2017 study tour.

While technology creates threats in terms of jobs and the future of work, new skills sets are being sought to assist in the analysing, interpreting and presenting of this data. In a broader sense, whole new industries are emerging as a result of these changes in interactions and processes, the reliance on devices and other disruptive technologies.

While the nature of work and the future of jobs within local government are subject of a separate research paper, a key focus of the study tour was to see opportunities to encourage, nurture and support new businesses.

The relationship between start-ups, incubators and accelerators reinforces the need for councils, other levels of government, the private sector and academia to combine in ways that will help create the next generation of blue-chips or at least an environment of thriving small businesses at a local level. Both are important for local economies to grow.

Similarly the opportunity to generate and distribute power at the local level is important for many regional councils. The opportunity to see firsthand energy being produced at the world first working renewable energy powerplant, combining geothermal, solar, concentrated solar, is pertinent as LGIS invests in solutions that will ultimately result in similar power stations being built in remote Queensland towns.

The visit not only provided the opportunity to understand how the infrastructure comes together, but also provided insights into management and operational requirements, including the software, and workforce combinations to create an efficient plant.

Within in the next 12 months, Winton will be the first local government in the State to start producing renewable geothermal energy with another five councils expected to follow a similar path in the next year or so.

The tour also provide the opportunity to receive presentations from three global cities – Boston, Chicago and Paris. And while each have different approaches to solving specific problems, all focussed on the citizen as a cornerstone in their smart city strategy. The Paris example of dedicating five percent of the Paris budget – ($138 million) for community-led innovation projects is one end of the spectrum.

Overall, the tour gave a rich insight into future directions of how disruption is affecting councils. Importantly, it demonstrated what companies like Microsoft, Amazon and Accenture are doing to support councils to navigate this journey. It also allowed councils to share their strategies and exchange ideas. Insights and validation of models around smart lights, renewable energy, big data and blockchain are steering the LGAQ in a new direction to ensure that the Association and our member council will continue to evolve.

Recommendations

A broad and diverse study tour like this contains many lessons which need to be captured as action points for the LGAQ and subsidiaries to consider as part of policy or in their business operations. What follows areas which requiring either new consideration or ongoing action.

Connectivity

Remote communities (eg Barcoo, Burke and Diamantina Shires) have made significant inroads to gain improved telecommunication infrastructure. However, the LGAQ needs to continue to lobby the State and Commonwealth to ensure councils and their communities have robust and scalable telecommunications to allow participation in the digital economy. This infrastructure needs to include both core and access infrastructure.

Connectivity also needs to recognise the human component, or the need to ensure people (in council and the broader community) have the awareness and skills to participate in the digital economy. Hence the following areas need to be considered:

- Continue to implement the findings of the LGAQ telecommunications audit of council administration centres by raising awareness and lobbying to find solutions to improve telecommunication core and access networks in remote communities.
- Use industry funding to create innovative solutions with councils that can provide low-cost outcomes that will improve access infrastructure (ie exchange upgrades, low-cost radio hops to provide capacity, mobile phone stations micro cells). For example, industry funds have been used to improve capacity at the Yarrabah, Boulia, Aurukun, Palm Island exchanges that has allowed delivery of faster ADSL2+ broadband and additional exchange capacity.
- Continue to support councils in applying for funding through State and Commonwealth schemes that can be used to improve telecommunication infrastructure.
- Continue to lobby the State and Commonwealth for additional funding to improve telecommunication infrastructure in rural and remote communities. In particular, ensuring that the administration centre of councils can access robust and scalable telecommunication infrastructure.

Blockchain

Blockchain is a distributed ledger technology that once established assists in the validation and providence of transactions. It can be applied in both 'high-value low-volume' transactions and 'low-value high-volume' transactions. Its value is reducing risk in transactions, better controls over contracts, and faster transactional speeds.

The LGAQ has been exploring blockchain for 18 months and while it is recognised as a rapidly evolving technology, there is a need to ensure that the LGAQ is involved in the development of the technology to ensure its impact on local government is managed and applied in a positive way at the industry level. There could also be benefit for our business subsidiaries to be involved in areas such as contract and asset management.

It is understood some councils in Queensland and Australia are also working on blockchain proof of concepts to resolve specific transactional issues. At the same time, greater consideration at the Commonwealth or even State levels could result in actions that may affect hinder or otherwise affect its development.

Previous LGAQ papers have considered the role of the organisation using blockchain technology and there is an opportunity to show leadership in a number of different ways.

- Encourage and support the trialling of a blockchain pilot either at the LGAQ organisational level or with individual councils.
- LGAQ to consider membership of national blockchain industry group (eg Australian Digital Currency and Commerce Association) to ensure that local government is aware of trends and also influencing conversations that occur between the industry and other levels of government.

Analytic Based Decision Big Data

- Changing Skills Requirements – New and more complete skill-sets are being demanded from analytics professionals – a combination of business, analytics, visual aptitude, and technology. These skills are in tremendous demand in the marketplace.
- Explore opportunities to develop strategic relationships with universities in regard to the opportunity that local government data.
- Identify opportunities for LGAQ to work with councils, State government and other bodies that hold local government data (structure and unstructured) to create new platforms that allows better insights to be obtained from data.

Smart connected streets

Street lighting underpins smart cities. The role and function of streets light and their central role in smart city projects, such as the Array of Things, reiterates the need for the LGAQ to take leadership to ensure Queensland councils are able to have access to this infrastructure.

- Implement findings in the LGIS feasibility report on street lighting.

Artificial Intelligence

As part of the meeting with Amazon the opportunity to better understand the Alexa product and how it could be used by local government resulted in a storming session that identified possible applications in areas such as tourism, information kiosks, and other public areas where local information may be required by visitors or local citizens.

- Raise awareness on how artificial intelligence can be applied to local government and include in programs that are focus on elected leaders and executives in councils.

Geothermal Power

LGIS is currently at the stage where it is about to break dirt on the first geothermal power station in Queensland at Winton. Geothermal will be the first stage of a multi-stage solution that will ultimately include concentrated solar and battery storage to ensure continuity of supply and where possible opportunities to sell back in the grid.

- Explore opportunities to bring some of the expertise identified at the Stillwater plant at Nevada to assist with the establishment and operation of the site and the overall renewable energy platform.

Legislation

With an ever-growing number of solutions involving new and evolving disruptive technologies, part of the implementation process that needs to considered by a council, is does it align with existing legislation or regulation.

With more than 6,000 line items on the LGAQ regulatory platform there is a need to understand whether the proscribed regulation actually encourage disruptive solutions or hinder councils to be innovative.

This could also involve areas such as start-ups supplying product and services to local government when they are “commercially unknown” from a diligence perspective.

- Continue to include the need to have regulations in place that encourage digital disruption to occur.

The Living Lab

The concept of the living lab provides opportunities to bridge the gap between innovation and problem solving. The models for the living lab vary from the notion of creating the “playground” that takes solutions from the production stage to implementation but in a controlled real environment with a council area – ie CBD blocks, streets or suburbs. The other area is embedding the research and development area from a supplier directly into the local government office. This allows for an exchange of views – from better understanding of the specific nuances that characterises the problem to council having a better understanding as to the breath and depth of the technology.

- Consider providing areas for the suppliers to conduct research and development on site with council teams or through the LGAQ – ie LGAQ House.

Thought Leaders Network

As recognised in the report, while the study tour provided insights in to a broad range of solutions and processes, it was the people behind those projects through their leadership, communication and vision which provided significant value to the group. Their openness to meet and share their experience provided the insights that were treasured. Indeed, one of the admirable characteristics of local government has been its people and this appears to be a global phenomenon. As a result, the executive level of the LGAQ has an expanded network of internationally recognised practitioners and leaders with will result in reciprocal benefit for not only the association, but also member councils.

It is also important to recognise that the conversations which were held were not one sided; indeed some of the areas that the LGAQ and our subsidiaries have invested in have resulted in opportunities where global leaders are looking at aspects of the LGAQ to learn from as much as them LGAQ is looking at them.

There is a need to maintain those networks of communication and collaboration is a valuable outcome. It is recommended that the following points be considered:

- Recognising the value that these leaders can bring to local government in Queensland through invitations to speak at future conferences. Co-ordinate their visit to Queensland with regional or individual council meetings through a pro-active body of work that ensures maximum awareness outcomes can be obtained.

Silicon Valley – start-ups

The opportunity to meet and be briefed on new products that are being developed by three start-ups in Silicon Valley provided additional insights into solutions that could be applied to the local government market.

The solutions from Simple Emotion, Zimperium, and OpenGov have offerings that could be of interest to Queensland local government.

Zimperium, which provides security on mobile devices, has received funding from Telstra and is expected that their product set should be available in Australia.

Raise aware with local government of new products and services. Look at options during contract review to include products onto existing suite.


LGAQ