The 2014 Review of Smart Metering and Intelligent Water Networks in Australia & New Zealand

The second annual study of Australasian urban water utilities activity in smart metering and intelligent water networks, the challenges they face and the business cases justifying investment as we move towards the digital water utility.

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The Smart Water Research Centre is a strategic partnership that builds, shares and applies new knowledge to improve water cycle management.

Our membership consortium combines the strengths of a growing number of respected universities with an increasing network of industry partners providing a wealth of accumulated knowledge and expertise to meet the research needs of the water industry.

From our hub on the Gold Coast, our state-of-the-art research facility offers cutting-edge water research focused through five Core Capabilities. We also provide a program of education and training directed towards emerging industry needs as well as commercial laboratory services.

We invite you to tap into the shared knowledge and experience of Australasia's vendors, utilities and researchers exploring smart metering and intelligent water networks by joining our 'Smart Metering & Intelligent Water Networks' group on LinkedIn. The Group provides free access to a shared library of business case tools, case studies and a discussion forum.

We would welcome the chance to talk to you about the breadth of skills available to assist you and the benefits of membership to your organisation. Contact us at www.smartwaterresearchcentre.com

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Executive Summary

The Smart Water Research Centre was engaged to assist WSAA develop a deeper understanding of the state of smart metering and intelligent water networks in Australian urban water utilities. Building on the baseline established in the 2013 study, the Smart Water Research Centre conducted an online survey of 48 water businesses, servicing more than 6.2 million connected properties across Australia and New Zealand. A follow-up detailed telephone interview was conducted with those water businesses that had undergone significant effort in either pilot or operational roll-outs of Smart Metering (SM) or Intelligent Water Network (IWN) projects.

The objectives of the survey and in-depth interviews were to: gauge the penetration of SM and IWN projects, describe the 'who, how and why' of SM & IWN in Australian water businesses; identify outcomes and challenges faced, undertake a Business Case Review and highlight emerging trends.

Key insights were:

Smart meter and intelligent water projects continue to grow

80% of respondents were actively pursuing smart metering or intelligent water network projects, with 66% having projects underway or starting in the next 12 months, demonstrating that the momentum for SM/IWN projects in Australasia continues to grow.

Extending asset life and deferring investment the key business case driver

Improving infrastructure planning and deferring infrastructure augmentation by extending the life of assets through better peak demand management was the single most frequently cited business case driver for the deployment of smart metering technology.

Improved accuracy in meter reading the 'surprise' benefit

For the utilities who had progressed to operational rollout, the theoretical business case benefit that was being met or exceeded most often in practice was improved meter reading accuracy.

Uncertainty around communications selection

Many utilities are trialling a number of communication systems, suggesting this important choice is seen as having a level of uncertainty. Two way communications are emerging as the most popular (51%).

Smart meters a growing component of Intelligent Water Networks

In the last 12 months there has been a doubling in the number of utilities that are pursuing IWN – the integration of intelligent devices including water meters, pressure sensors, meter data, into all relevant business processes and systems and using this information to guide strategy and investment.

Digital water knowledge systems: for customer choice and utility efficiency

There was an evolution by many utilities in conceptualising the utility wide application and benefits that can be achieved from pursuing digital metering technology. There is evidence that utilities in 2014 have an increased awareness of how digital metering and applying analytics of various data sets in near real-time, can benefit utility efficiency and customer service excellence. Aligned with data analytics was a clear shift towards the customer satisfaction (e.g. greater focus on web portals, leak alerts, two-way communications and customer consultation).

A need for better integration with communication systems and the IWN concept

There was consistent mention of technological difficulties concerning the incompatibilities with the meter, data storage and communication systems. This area may be surpassed by the emerging 'internet of things' protocols and highlights a need for deeper vendor and utility discussions.

Customer needs usually not valued in the business case

Of the utilities operating smart meters, the most successful business case benefit being achieved, or on track to being achieved, was "Customer engagement and timely signals to customers, e.g. leaks". This insight is typically gained after installation and often doesn't form a tangible input into the business case. It highlights a disconnect between the business case logic, where customer benefits prove elusive to include and value financially.

Two-paced momentum and knowledge in industry

Some utilities had well-advanced trials or operational roll-outs, together with a similarly advanced understanding of the wider benefits of SM and IWN, while others were constrained by a lack of overall understanding and awareness of developing a business case, technology options, applications of data and the wider benefits of smart metering.

Theoretical business case benefits being achieved operationally

Water businesses that are rolling out large scale smart metering projects, and that were interviewed in depth last year (e.g. Mackay Regional Council and TasWater), remained largely on track with their business case driver outcomes and reported ongoing water demand reductions (e.g. >10% reduction in residential demand), long-term CAPEX savings (e.g. deferring augmentation of networks and associated capital expenditure NPV savings) and excellent customer service improvements (e.g. significant reductions in customer complaints).

2

Background

The role that digital water metering technology, i.e smart metering (SM) and intelligent water networks (IWN), including information/communications technology (ICT), has in terms of operational efficiency, demand management, customer service, and staff resource optimisation is becoming increasingly recognised by water utilities, research institutes and governments in developed nations (Stewart *et al*. 2013). However, in practice this does not necessarily translate into a solid business case, especially for many of the smaller water utilities. Nor does it translate into an understanding of the benefits of the technology by the fundamental end-users of this technology: the customer.

As Stewart *et al* (2013) observe, the conservative nature of the water industry and the inherent difficulties in establishing such a complex new paradigm into existing systems, has (thankfully) subdued the potential "fever pitch" expectations of this technology. However, moving toward the digital age of water management appears an inevitable reality and in order to most effectively adopt ICT as an enabler for smart water management we need to understand the practical, economic, social and environmental implications of implementation. The 2013 WSAA review of SM/IWN projects across Australia identified that SM/IWN technology needs to keep up with the variable business and site specific challenges and limitations (Beal and Flynn 2013). There is a limited knowledge of the capabilities of current and future technology in the digital water technology space. The field is still young in this sense and a consistent limitation or challenge identified in 2013 was the lack of knowledge and expertise in designing and rolling out large SM/IWN projects. In some cases, there were well-financed projects without the capacity for roll-out due to incompatibilities with meter, data storage and communication systems. This is especially so in regional areas.

The WSAA 2014 Australasian Review of Smart Metering, underpinned by the online survey, aims to identify the key challenges, benefits and complexities faced by water utilities who are at the coal face of embarking on this relatively unchartered digital age of water management. As mentioned above, perhaps the most important group: the customers, are potentially the most unengaged and misinformed about the need, benefits and applications of the ICT-enabled water management. This review also seeks to understand some of the limitations and hurdles that utilities have faced in getting engagement and thus subsequent benefits, by the customers of the various pilot trials and project roll-outs that are occurring across Australasia.

3

Study Approach

3.1 Objectives

The Smart Water Research Centre was engaged to assist WSAA with the aim of building upon the knowledge gained from the 2013 Review by:

1) gauging the change in penetration of SM and IWN projects across Australian water businesses;
2) undertaking a comparative analysis of 2013 and 2014 survey data to identify the current critical areas requiring further understanding
3) identifying the key outcomes and challenges typically faced in conducting SM/IWN projects; and
4) recommending future areas where the water industry may be able to support organisations in their eventual move 'toward the digital water utility'.

3.2 Methods

The methods were similar to those employed in the 2013 Review and are illustrated in Figure 1 and described below.

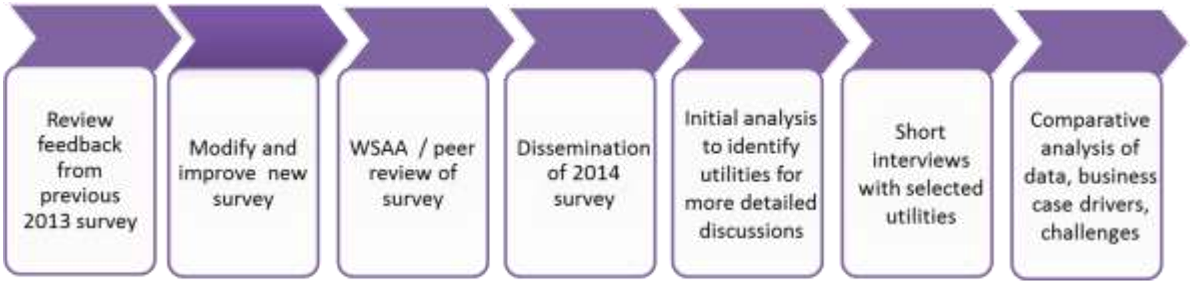


Figure 1 Steps undertaken to complete review

- **2013 survey review:** Using the feedback from the 2013 Review and Workshop, along with comments from the WSAA Smart Metering group, the existing survey template was modified and enhanced to provide a greater focus on obtaining quantitative as well as qualitative responses to the business case driver priorities.

- **2014 online survey:** Water business managers were strongly encouraged, via email invitation, to take part in a 20 minute online survey. The scope and purpose of the research were outlined, and a copy of an exemplar completed survey was provided to each respondent to assist in informing them of the nature of information that would be required.

- **Telephone surveys:** During August and early September 2014, the Smart Water Research Centre conducted a telephone survey of 9 water businesses (in NZ, WA, QLD, NSW and VIC) that had either:

  1) undergone significant effort in either pilot or operational roll-outs of SM/IWN projects, or
  2) indicated a lack of business case drivers for implementing such projects.

  By engaging with both groups, a clearer picture was obtained on the complexities that are faced with water utilities with adopting digital water technology, if not now then most certainly into the future.

- **Results analyses:** This included a comparative analysis of the 2013 v 2014 responses of the survey and interviews to ultimately build upon the knowledge, benefits and way forward for SM/IWN implementation in Australia.

- **Presentation of results and reporting:** The results were summarised and presented to WSAA and to the wider water networks at the WSAA Toward the Digital Water Utility workshop held in Melbourne on 10-11th September, 2014. They will also be available from the LinkedIn Smart Metering Group network and through WSAA shared folder resources.

4

Online Survey Results

A summary of the results is shown below. Where verbatim customer responses are quoted, these are shown *in italics*.

4.1 Response Rate

A total of 49 organisations completed the online survey (Figure 2). Some of the organisations completed the survey more than once as they were involved in more than one major project (e.g. Sydney Water). This was a good response rate and represented an almost doubling of participants compared to last year, due mainly to the wider dissemination of the survey, beyond the WSAA workshop attendees. The majority of respondents were middle or senior managers with a background in engineering (Figure 3) in the areas of asset/network management, demand and infrastructure planning and metering management (Figure 4).

Figure 2 Steps undertaken to complete review

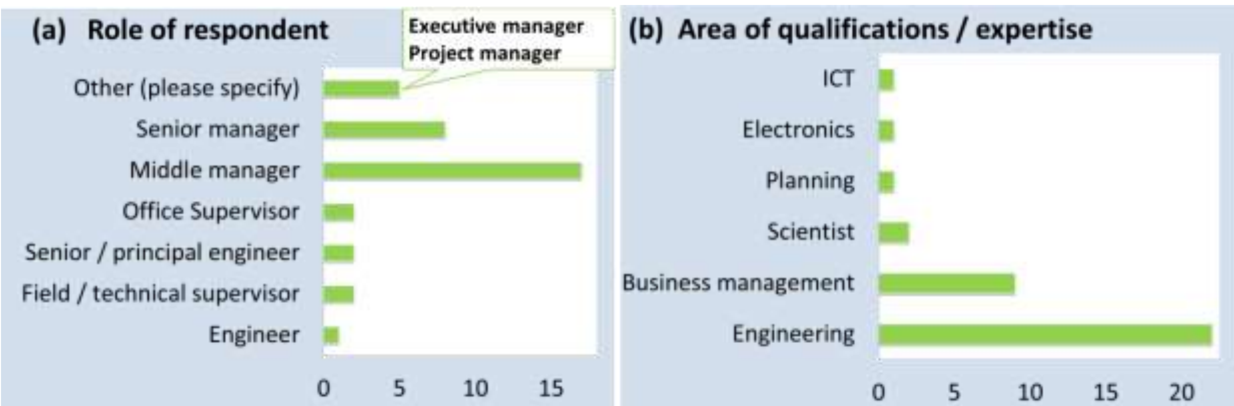


Figure 3 (a) Role and (b) qualifications/ expertise of respondents

Figure 4 Area of organisation most describing respondents

4.2 Timing and drivers of project

Around 78% of survey respondents were actively pursuing SM/IWN projects (Figure 5), with 55% either currently in the roll-out phase (46%) or will be within 1 year (11%). The 10 "unsure" respondents (22%) were typically in the exploratory phases only, or had yet to determine the timing but had advanced the business case and technical scoping.

	Unsure	1 year	1 - 2 years	2 - 3 years	3 - 5 years	5+ years	Project underway
2014 Review	10	5	4	2	2	2	21
2013 Review	2	9	4	1		1	10

Figure 5. Current status of projects

The main issues driving utilities to pursue digital metering were centred around customer-focussed benefits (17%), deferring network upgrades (10%), and reducing manual reading (8%) operating costs (8%) (Figure 6). Interestingly, very few responses related to water conservation or other altruistic environmental benefits. This may be a reflection of the strong economic focus (e.g. need for a clear ROI) for a viable and strong ICT business case.

Also indicated in Figure 6 is the number of smart metering projects that are either underway, commencing within the year or have just been completed. The data here shows that for the projects that have been successful in receiving funding and approval for completed, current or impending roll-outs typically have the key business case drivers of customer service improvement, deferring network upgrades, reduced meter reads/Opex costs and addressing OH & S. Demand management/forecasting was also a common driver in those projects that have current or impending implementation.

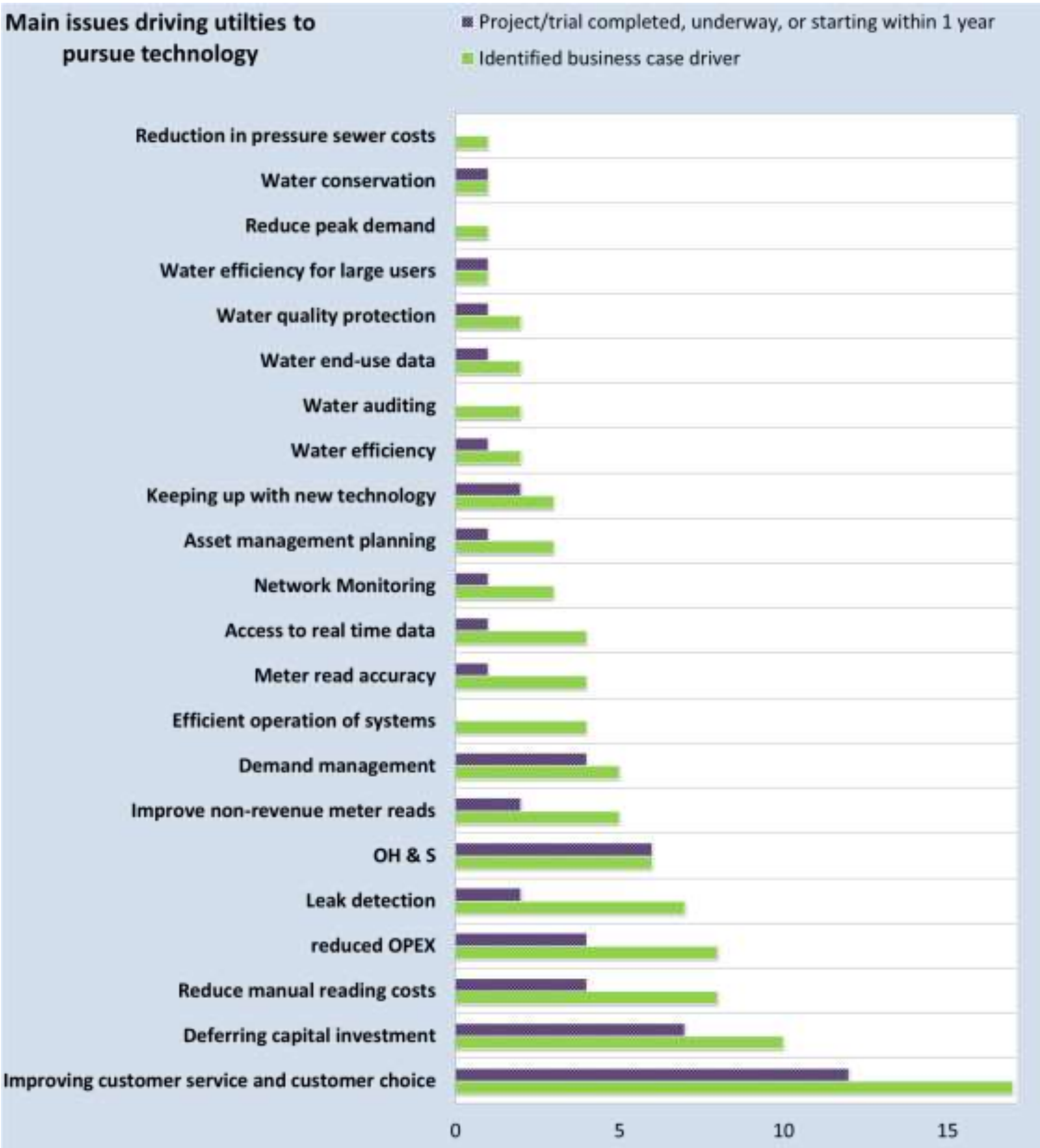


Figure 6 Key business case drivers and project timing comparison

4.3 Project source funds and costs

Costs ranged from $5,000 to over $9.5 million dollars, depending on the size of the project and the existing status of the meters (e.g. some areas were not even metered prior to trial) (Table 1). Many utilities fully funded their project, with some federal funding being the main source of supplementary funds. There were minimal discrepancies between the projected and actual project costs for completed projects. Given that unexpected costs and out-of-scope budget adjustments were commonly selected in the top 3 challenges during project roll-out phases (see Chapter 5), some water businesses indicated that they had come under budget, although many were ongoing at the time of the survey. This further highlights that the benefits and limitations of such projects are very utility-specific and business cases are not a 'one-size fits all'.

Table 1. Project source funds and costs

State	Funding Source/s	Projected cost (AUD)	Actual cost (AUD)
NSW	State and federal funding	$1.2 M	$900,000
NSW	Property developers	N/A	N/A
NSW	100% utility for Public Works program and variable funding to the schools (100% to less than 50%).	Costs sunk - same as last year - @ $10,000 pa ongoing costs	approx. $50,000
NSW	Federal (ARC Linkage), university, utility	$250,000	$250,000
NSW - North	Council and vendor (prototypes)	$5,000	$5,000
NZ	100% Utility	$289,000 (NZD)	$250,000 (NZD)
QLD - North	100% Utility	TBC	Currently slightly under budget
QLD - North	100% Utility	$200,000 per annum	$200,000
QLD - North	Townsville Water	150K	150K
QLD - SEQ	Confidential	Overall $20,000 for 30 meters includes meters initial software outlay and reading devices	N/A
QLD - SEQ	Trial 100% federal government. Extension project 100% Utility	N/A	N/A
QLD - SEQ	100% Utility	$60,000 (not incl salaries)	$60,000 (not incl salaries)
QLD - SEQ	Meter vendor and utility	Suppliers providing products and services for free. In-house costs are quite small for these small-scale trials.	The trials are ongoing.
QLD - SEQ	100% Water Utility	$100k	$25k
SA	Research Institute 25%: University 25%: Utility 50%	Unknown	Unknown
TAS	100% Utility	$5 M	N/A
VIC	Unknown	N/A	$316,000
VIC	100% Utility	$250, 000	$250, 000
VIC	Commonwealth, State and Utility	N/A	N/A
VIC	100% Utility	$600,000 over 5 years	$370,000 to date
VIC	100% Utility	Unsure	$125,000
VIC	100% Utility	Unknown	Unknown
VIC	Funded by Riverina Water	N/A	N/A
VIC	Funded by most Victorian water corporations	N/A	N/A
WA	Large projects jointly funded by federal government and utility, other projects %100 utility	Approx $9.5 M	$9.5 M
WA	Jointly funded	1.5 M	TBC

4.4 Technology

4.4.1 Technology definitions

WSAA have previously developed a set of definitions relating to smart water metering, and these are the standard definitions used throughout the survey, interviews and this report:

AUTOMATED METER READING (AMR) – the automated collection of meter reads but still requiring a meter reader to visit the property or be nearby.

ADVANCED METERING INFRASTRUCTURE (AMI) – installation of fixed wireless collection network and the backhaul of metering data to a metering data management (MDM) system.

SMART WATER METERING - (SWM) the integration of meter data into business systems (e.g. Billing System) and the sharing of information with customers (e.g. Customer Portal/Web).

INTELLIGENT WATER NETWORKS (IWN) – the integration of intelligent devices including water meters, pressure sensors, meter data, into all relevant business processes and systems and using this information to guide strategy and investment.

4.4.2 Technology applied or proposed to be applied

The technology applied or proposed to be applied by organisations is shown in Figure 7. Many organisations identified as having more than just one type of technology; explaining why the quantum of technologies identified are well above the 49 respondents. The majority of respondents, 51%, are pursuing 2 way communications (AMI or SWM). Business system integration and sharing information with customers make up 12%, i.e. these are the organisations that are not only actively pursuing digital water metering but are developing the system as an IWN. Importantly, this point of difference is substantial (double) compared with the 2013 review, where the same proportion of IWN to other technologies selected was only 11%. Notwithstanding the larger sample size and ability to select more than one technology in the survey, the increase observed in 2014 suggests an evolution in conceptualising the overall 'bigger picture' that can be achieved from pursuing digital metering technology.

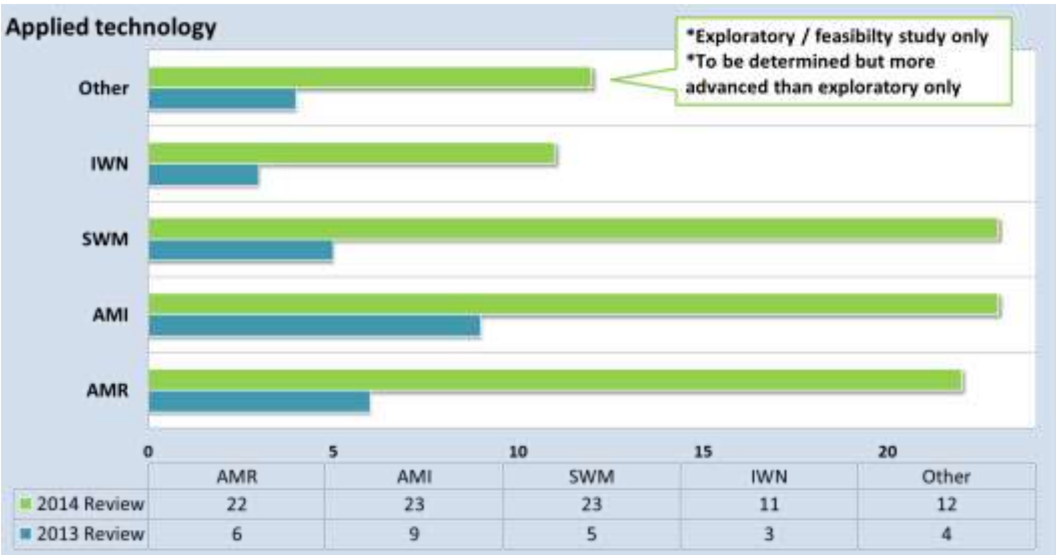


Figure 5. Digital metering technology breakdown

4.5 Number of end-points in project

The end points (number of meters, including sub-meters) ranged from less than 10 for a small pilot trial to over 57,000 in a previously un-metered region in Tasmania (Figure 8). The smaller projects with low numbers of end points were typically related to trial or pilot studies. In organisations where end point numbers are different than the previous year, usually signifies the updated number of actual /planned meters to be rolled out.

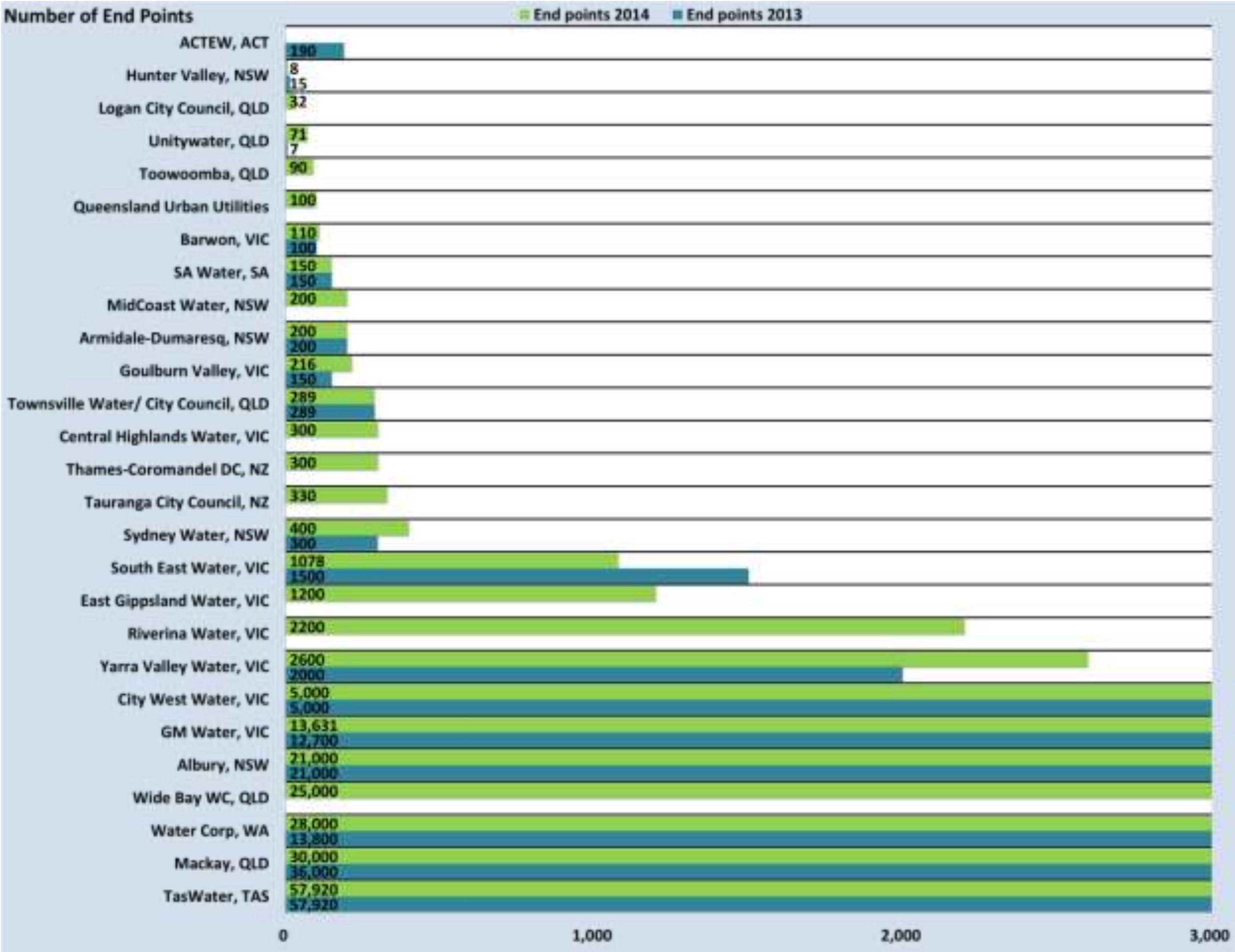
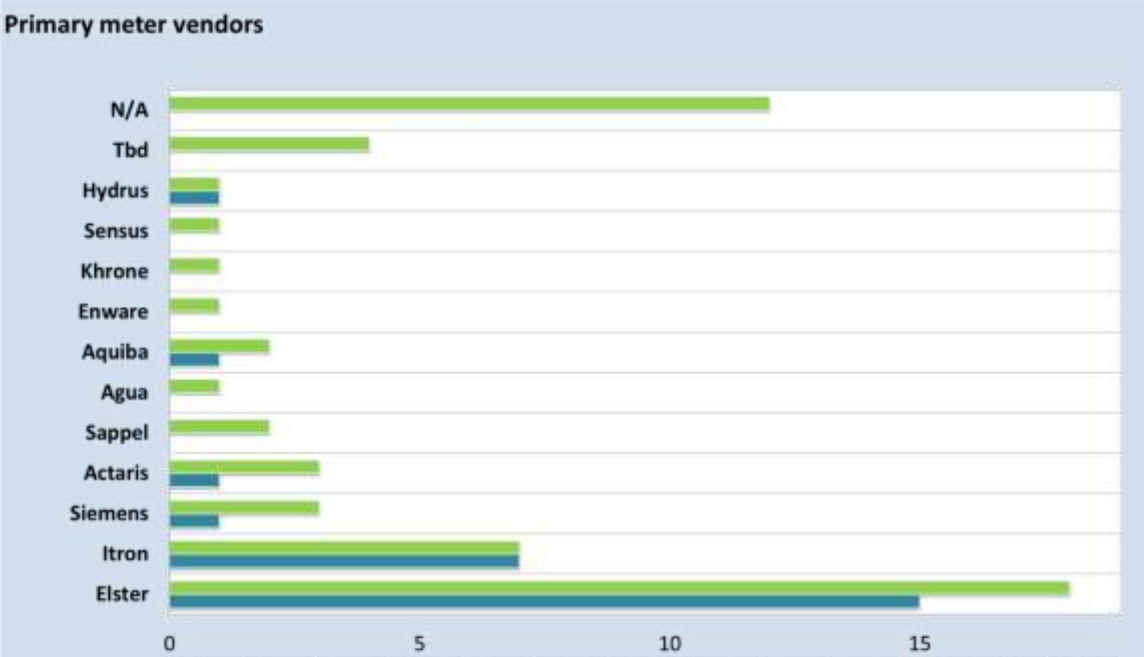


Figure 6. Number of end points for project

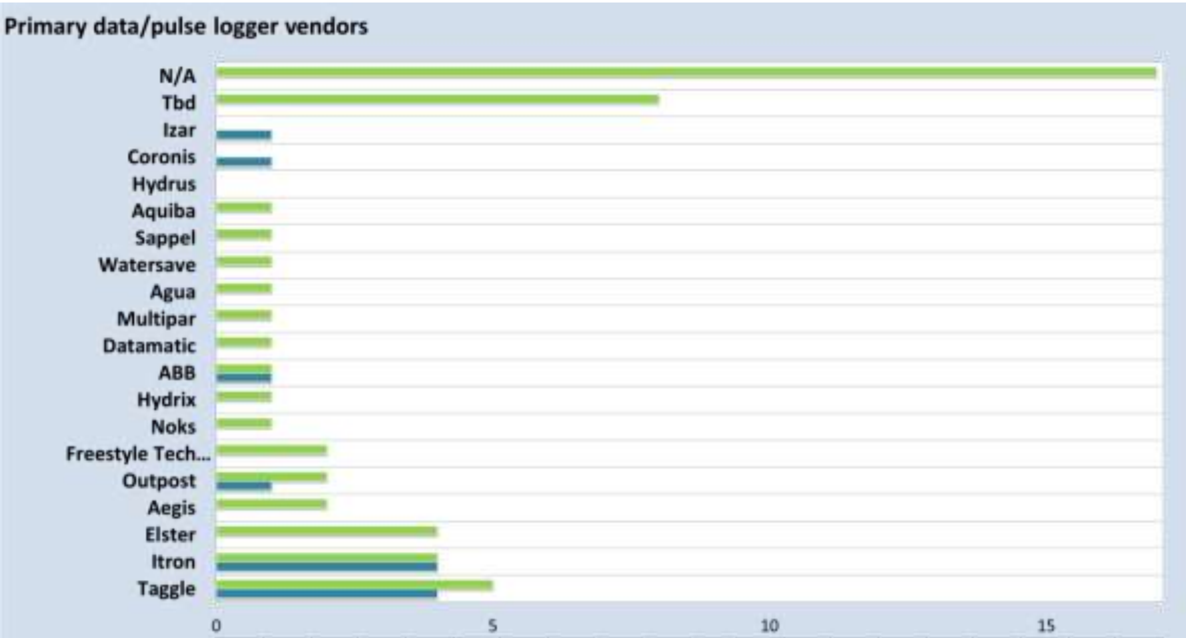
4.6 Digital water technology vendors

The digital water technology vendors for 2013 and 2014 are shown in Figure 9. The increase in variety of 'smart meter' vendors from 6 to 11 is apparent and expected, largely due to the greater number of survey participants, but also due possibly to the rapidly increasing number of such vendors in the market place. Elster and Itron continue to have the dominant share of the market to date, but given the number of 'to be determined' responses, this could change over time. In terms of data (pulse) loggers there was an even greater increase in the number of different vendors (Figure 10). Unlike the meter technology, utilities appeared to diversify a little more in selecting data logging equipment, demonstrating less tendency to stick with just one or two vendors, but rather choosing fairly evenly across a pool of 18 vendors.



	Elster	Itron	Siemens	Actaris	Sappel	Agua	Aquiba	Enware	Khrone	Sensus	Hydrus	Tbd	N/A
2014	18	7	3	3	2	1	2	1	1	1	1	4	12
2013	15	7	1	1			1				1		

Figure 7. Primary meter vendors



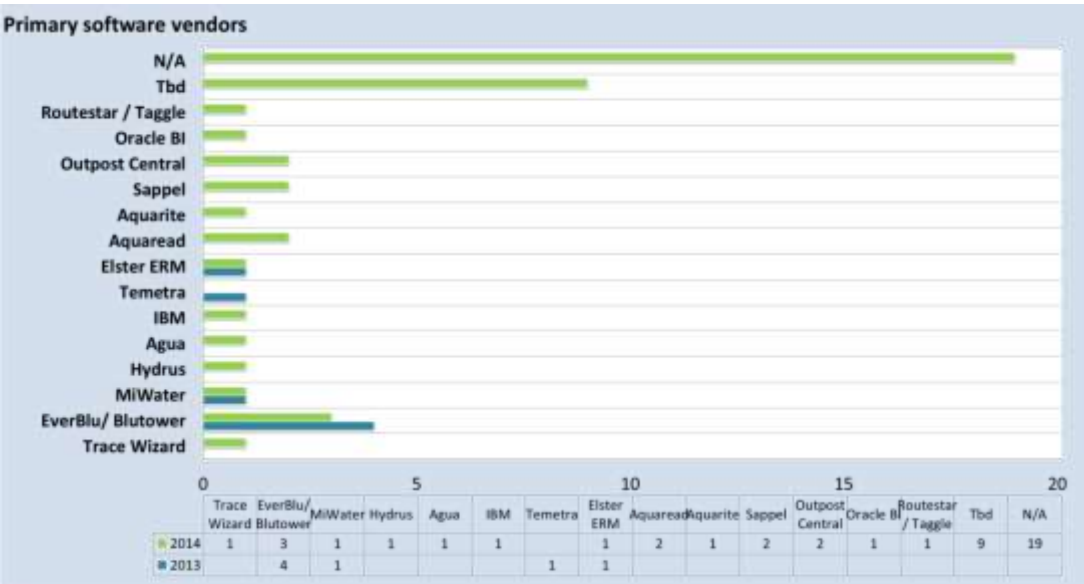
	Taggle	Itron	Elster	Aegis	Outpost	Freestyle Tech (ZigBee)	Noks	Hydrix	ABB	Datamatic	Multipar	Agua	Watersave	Sappel	Aquiba	Hydrus	Coronis	Izar	Tbd	N/A
2014	5	4	4	2	2	2	1	1	1	1	1	1	1	1	1				8	17
2013	4	4			1				1								1	1		

Figure 8. Primary data/pulse logger vendors

Water utility's choices in primary communications network vendors were also fairly evenly distributed (Figure 11), although some of the communications network protocols were specific to the meter and data logger technology, such as Itron-EverBlu technologies. This also applied to software vendors where several technology vendors had developed their own software programmes (e.g. Outpost Central, Elster and Itron) (Figure 12). Judging by the interest and extensive discussions at the 2014 WSAA workshop regarding communication and software options, it is likely this area will be very 'organic' and rapidly evolving in the next few years as utilities become more aware of the options and applications of 'big data', and gain a more intimate knowledge of the options and processes involved in this quite complex component of the digital water space.

	Digimesh	Freestyle Tech (ZigBee)	Outpost	Ausgrid WiMax	Gridnet	Itron	Blutower	National mobile network	Agua	Taggle	Izar	Watersave	Tbd	N/A
2014	1	1	2	1	1	3	2	5	1	5			7	20
2013			1	1		5				2	1	1		

Figure 9. Primary communications network vendors



	Trace Wizard	EverBlu/ Blutower	MiWater	Hydrus	Agua	IBM	Temetra	Elster ERM	Aquaread	Aquarite	Sappel	Outpost Central	Oracle BI	Routestar / Taggle	Tbd	N/A
2014	1	3	1	1	1	1		1	2	1	2	2	1	1	9	19
2013		4	1				1	1								

Figure 10. Primary software vendors

4.7 Automated meter reading interval

Most respondents read meters at least hourly as shown in Figure 13, with the remainder typically opting for shorter read intervals ranging from 15 seconds to 30 minutes. Meter read intervals are usually reflective of the intentions of how the data will be ultimately used. Thus, hourly will provide valuable information on diurnal and peak consumption patterns without draining the batteries or posing too much of a communications issue. However, if the application of the data is intended to be for more high resolution applications such as determining water end-use disaggregation, (see discussion in Beal and Stewart 2011) more frequent meter reads (< 15 seconds) may be required. Again, in parallel with a greater understanding of the range of applications that digital water networks can provide, a corresponding increase in meter read frequencies of less than 1 hour may become quite commonplace in the future.

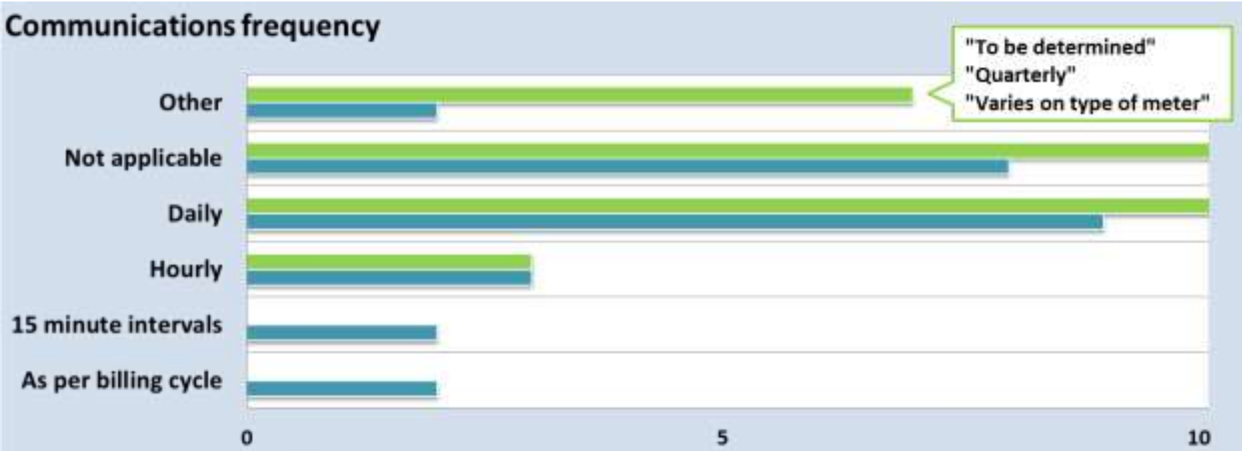
Figure 11. Intervals used for automated meter readings

4.8 Communications and frequency

In terms of communication systems, low power radio frequency (either meshed or non-meshed) was the most common type (Figure 14). Mobile phone networks were typically 3G with the 4G option become increasingly popular. As with the previous section, the type of communication systems were sometimes dictated by the end-use of the data, the technology and/or software used (e.g. ZigBee). Daily communication frequency was the most common interval (Figure 15).

	Power line comms (PLC)	Low-power radio frequency (RF) mesh	Low-power RF (but NOT mesh)	Wireless wide-area network (WAN)	Mobile phone network (3G)	Mobile phone network (4G)	Drive-by or walk-by technology	ZigBee via Freestyle Tech	GPRS	Not applicable	Other
2014 Review		10	10	2	9	3	8	1	4	15	4
2013 Review	1	6		3	10		5			5	4

Figure 12. Communication systems used for SM/IWN projects

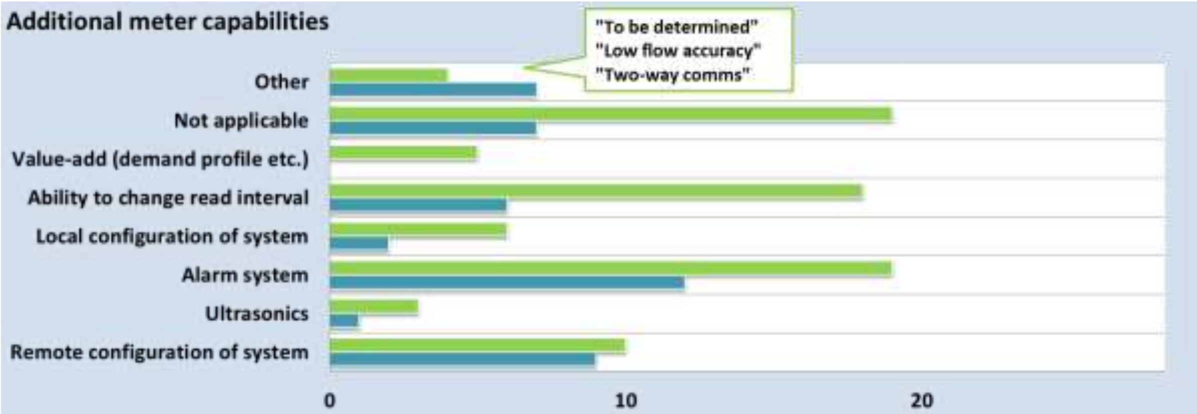


	As per billing cycle	15 minute intervals	Hourly	Daily	Not applicable	Other
2014 Review		0	3	20	21	7
2013 Review	2	2	3	9	8	2

Figure 13. Communication frequency

4.9 Additional meter capabilities

Reflecting the increasing recognition of smart metering as an integrated water network system, there were several options chosen by utilities, with many utilities opting for at least one or more additional meter capabilities (Figure 16). The option of developing or using their own in-house data management system was also popular. Other additional meter capabilities included the ability to change the meter read interval (21%), alarm systems (23%) and remote configuration of system (12%).



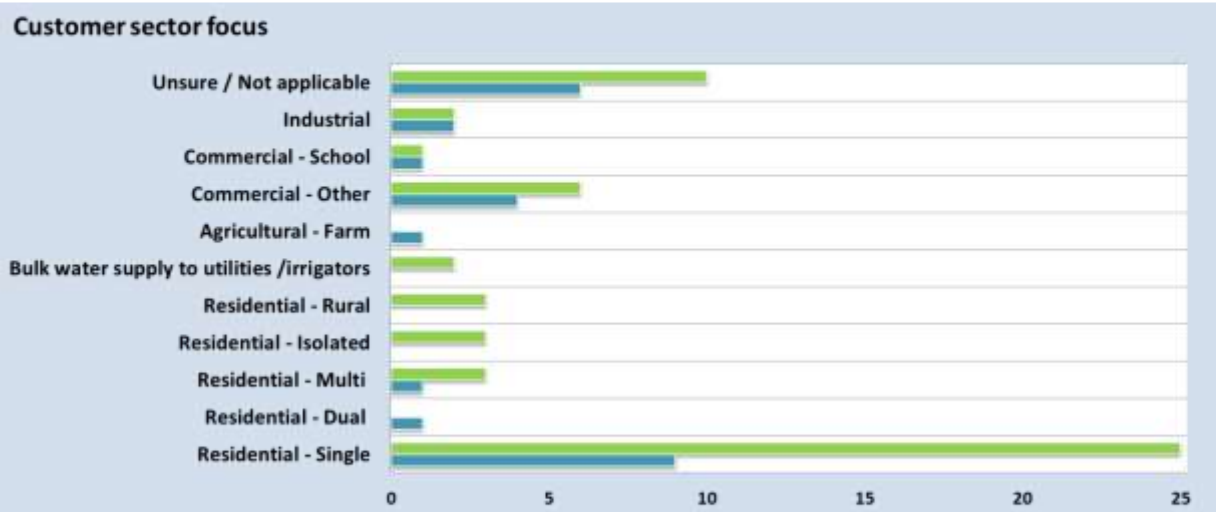
	Remote configuration of system	Ultrasonics	Alarm system	Local configuration of system	Ability to change read interval	Value-add (demand profile etc.)	Not applicable	Other
2014 Review	10	3	19	6	18	5	19	4
2013 Review	9	1	12	2	6	0	7	7

Figure 14. Additional meter capabilities

4.10 Customer service and engagement

4.10.1 Customer breakdown

As with the 2013 data, residential properties comprised a majority (45%) of the project target sector focus (Figure 17). Some projects focussed on both commercial and residential properties, while others focussed solely on high water users in the commercial sector. Again for 2014, of the total respondents, only two projects are currently smart metering industrial water consumption (Figure 17). A noteworthy difference between the 2013 and 2014 sector focus is the variance within the residential sector, with some utilities concentrating on non-urban areas, where water infrastructure construction, operation and maintenance costs are typically more costly than for urban areas.



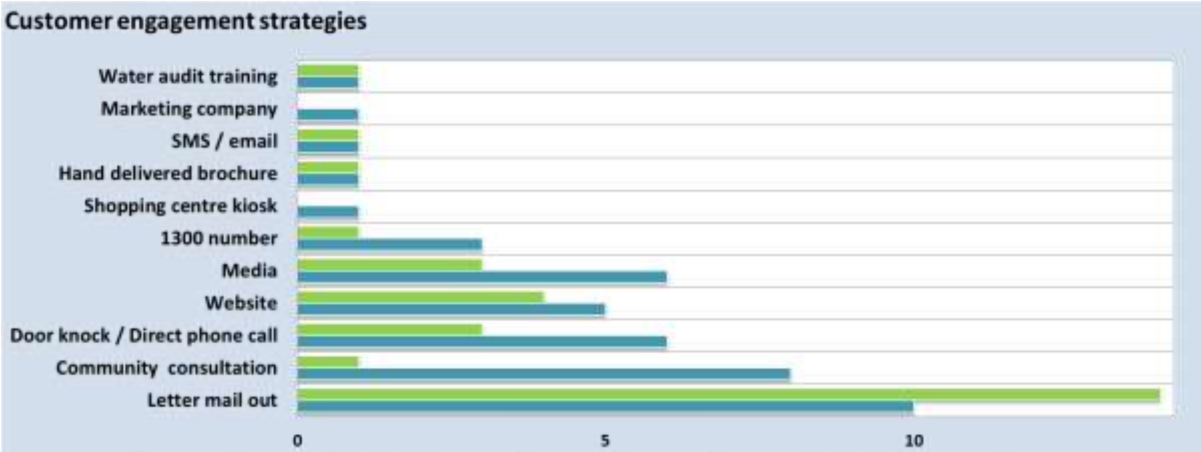
	Residential - Single	Residential - Dual	Residential - Multi	Residential - Isolated	Residential - Rural	Bulk water supply to utilities /irrigators	Agricultural - Farm	Commercial - Other	Commercial - School	Industrial	Unsure / Not applicable
2014 Review	25		3	3	3	2		6	1	2	10
2013 Review	9	1	1				1	4	1	2	6

Figure 15. Customer sector breakdown for projects

4.10.2 Customer engagement approach

Utilities were asked to describe their customer engagement approach to rolling out their SM/IWN project. Customer engagement is a critical step for the water utilities to take, as research shows that it directly influences the degree of 'buy-in', awareness and acceptance of new projects by customers (e.g. Fielding *et al*. 2013, Darby 2010).

A number of customer engagement and customer project recruitment strategies were adopted (Figure 18). Consistent with the 2013 data, older media channels were the more popular customer engagement approaches, with letter mails outs clearly the preferred method (48%) but also the use of direct phone calls, websites and media were popular.

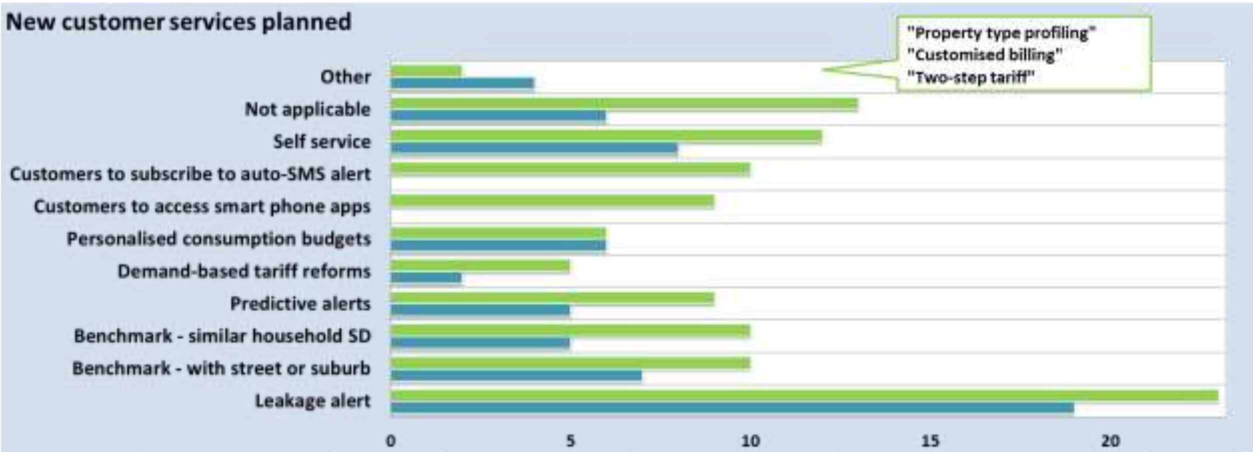


	Letter mail out	Community consultation	Door knock / Direct phone call	Website	Media	1300 number	Shopping centre kiosk	Hand delivered brochure	SMS / email	Marketing company	Water audit training
2014 Review	14	1	3	4	3	1		1	1		1
2013 Review	10	8	6	5	6	3	1	1	1	1	1

Figure 16. Frequency distribution of customer engagement strategies used

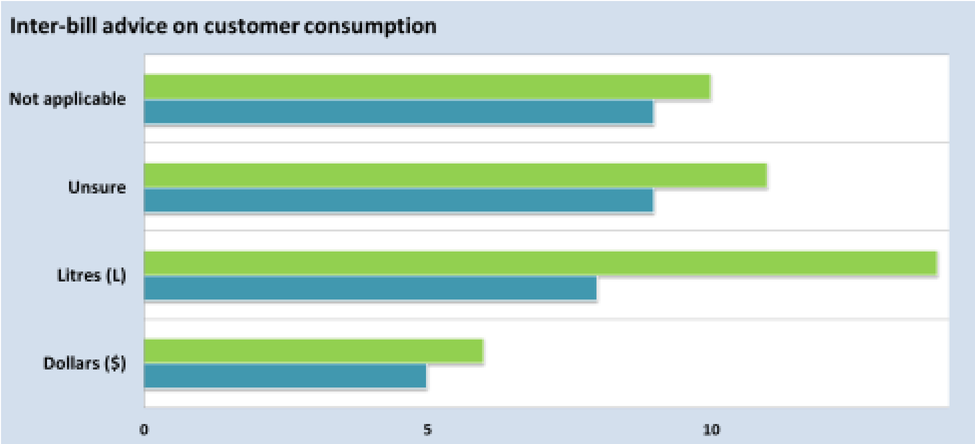
4.10.3 Other customer services and benefits from project

Leakage alerts accounted for 24% of new services planned for the customer (Figure 19). Several utilities intended to use the smart metering data to develop benchmarking features on future customer accounts based on both socio-demographics and location. 13% of respondents also indicated that they would offer a "self-service" feature where customers are given the opportunity to access their data, via a utility website, at their own discretion. The majority of respondents indicated that any inter-bill advice to the customers would generally be in the form of water consumption data (in litres) and to a lesser degree, costs ($) to the customer for their current water usage (Figure 20). Almost a third (27%) of utilities had yet to consider the concept of inter-bill advice as an option.



	Leakage alert	Benchmark - with street or suburb	Benchmark - similar household SD	Predictive alerts	Demand-based tariff reforms	Personalised consumption budgets	Customers to access smart phone apps	Customers to subscribe to auto-SMS alert	Self service	Not applicable	Other
2014 Review	23	10	10	9	5	6	9	10	12	13	2
2013 Review	19	7	5	5	2	6			8	6	4

Figure 17. New customer services planned

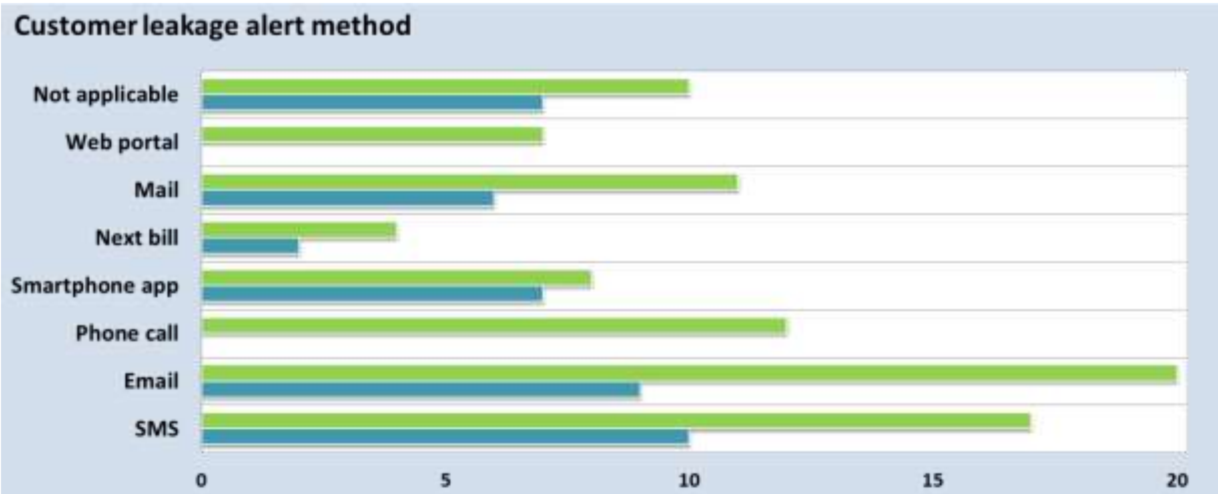


	Dollars ($)	Litres (L)	Unsure	Not applicable
2014 Review	6	14	11	10
2013 Review	5	8	9	9

Figure 18. Inter-bill advice on customer consumption

4.10.4 Customer leakage alert system

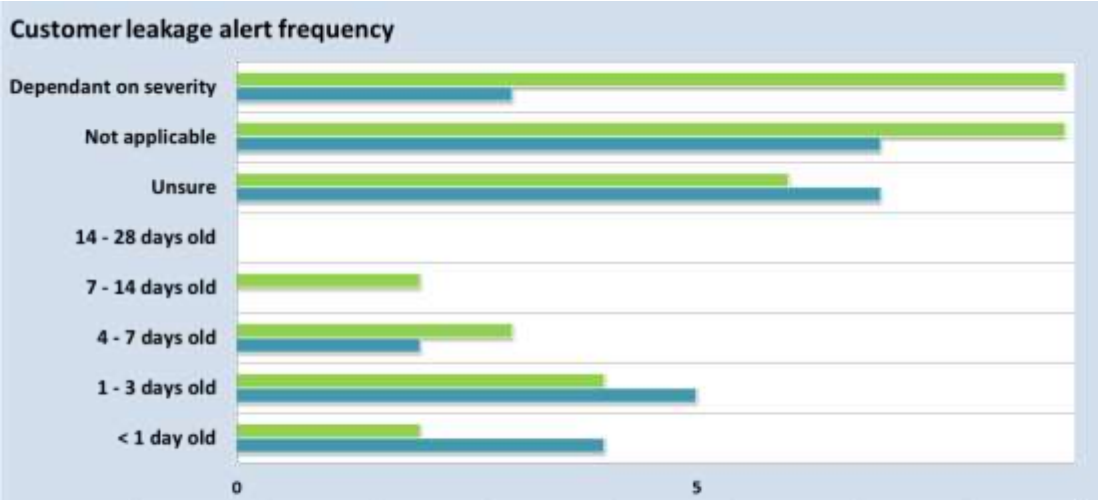
For those utilities intending to offer a leakage alert service, 66% were using, or intended to use, electronic methods of alert, including email, web portals and smart phone apps (Figure 21). As observed from the 2013 review, there appears somewhat of a disconnect between methods of communicating the benefits of smart metering and the methods of implementing such benefits e.g. elderly householders may be aware of the benefits of leak alerts (from mails outs and phone calls by the utilities customer service staff), but may not be able to access such benefits if they are not connected to the internet or are not web 'savvy' customers.



	SMS	Email	Phone call	Smartphone app	Next bill	Mail	Web portal	Not applicable
2014 Review	17	20	12	8	4	11	7	10
2013 Review	10	9		7	2	6		7

Figure 19. Customer leakage alert methods

The frequency of customer leakage alerts was most commonly determined by leak severity which represented 35% of the responses. Other options ranged from <1 day to two weeks (Figure 22).



	< 1 day old	1 - 3 days old	4 - 7 days old	7 - 14 days old	14 - 28 days old	Unsure	Not applicable	Dependant on severity
2014 Review	2	4	3	2	0	6	9	9
2013 Review	4	5	2	0	0	7	7	3

Figure 20. Leakage alert frequency

4.10.5 Project delivery goals for customers

Respondents were asked to choose a standardised project delivery statement relating to customer service. Respondents most identified with the Future Focus (clever solutions for a sustainable future) statement (Figure 23). This is somewhat surprising as it is in contrast with the business drivers (Figure 5) which were more in line with the Price Controllers statement, and had only very limited focus on the water conservation / sustainable future focus.

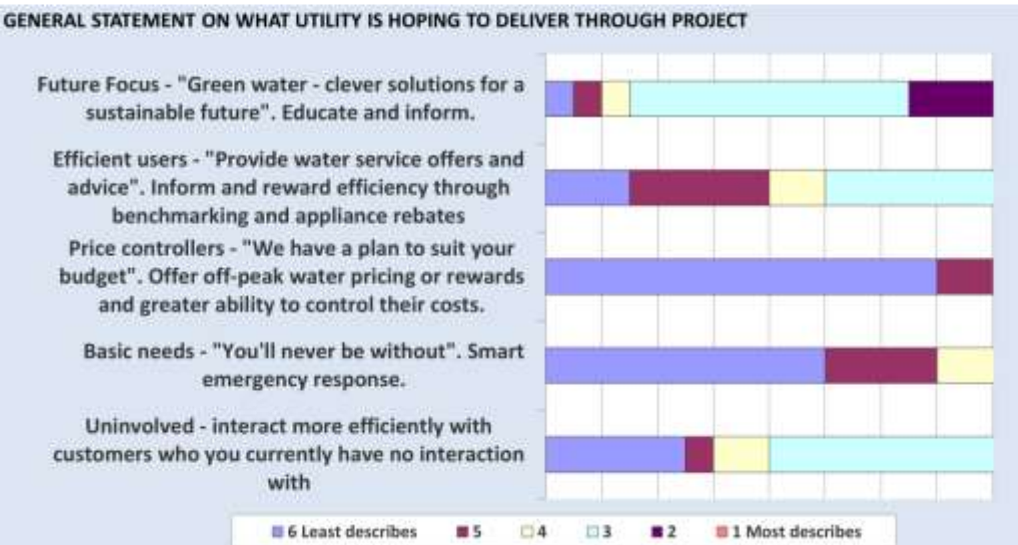


Figure 21. Project delivery goals for customers identified in the survey

5

Priority areas to facilitate successful SM/IWN projects

5.1 Introduction

There were a number of drivers, challenges and outcomes of SM/IWN projects that were consistently identified by the respondents in 2013. These were used to develop the survey questions presented in this section. This section examines the major outcomes and challenges that water businesses have faced during their planning, design and/or roll-out phase of their projects in 2014. Respondents were asked to rank pre-existing business case drivers (developed by the authors based on 2013 responses) in order of priority, with the top 3 priorities required to be ranked as accurately as possible.

5.2 Priority business case drivers

Survey response data presented in Figure 24 illustrates the number of times each that predefined business case driver was selected as the top priority (green) or as a top 3 priority (orange). The data demonstrates that costs drivers (reducing non-revenue water, deferring infrastructure and reduced manual meter reads) were seen as higher priorities overall than customer service related business drivers (Figure 24).

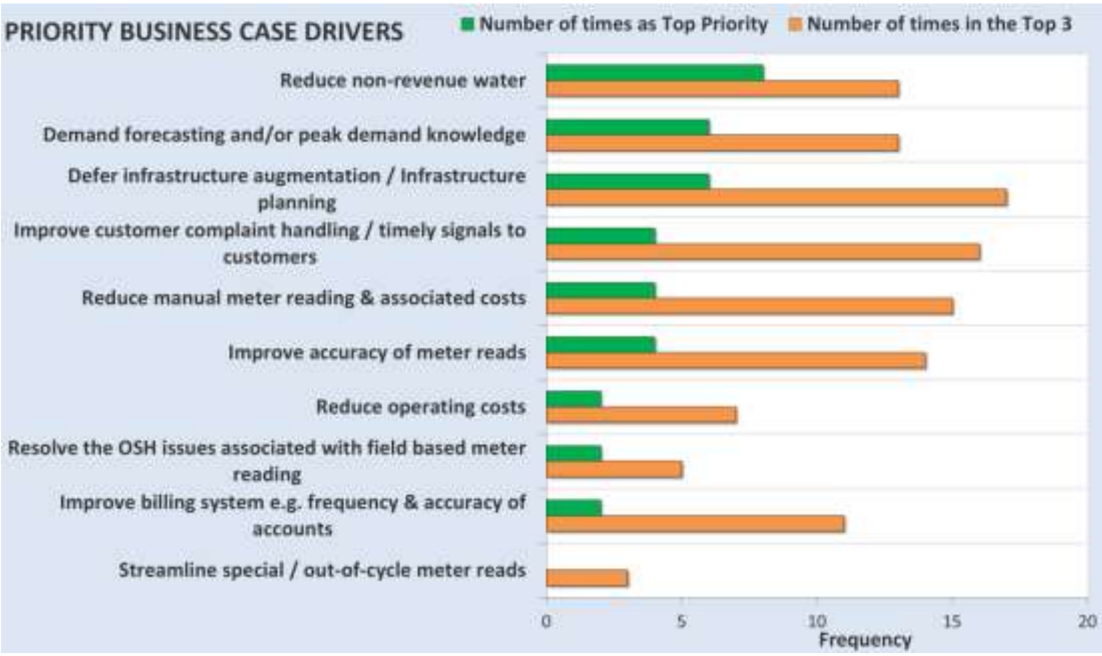


Figure 22. Priority ranked business case drivers for SW/IWN project implementation

To gauge the success and progress of projects, in terms of achieving the key business driver goals, utilities were asked to rate the success of some predetermined business drivers (modelled on the previous survey question shown in Figure 24). While many of the respondents indicated that a success rating was not yet applicable, there appeared a trend toward the business goals being at least on track, if not achieved or exceeded (Figure 25). This also related to the ease of which some drivers could be quantified compared to others. For example, reduced labour costs, increased accuracy of meter reads and demand forecasting knowledge were all reasonably easy to quantify (i.e. hours of reduced read time, identifying outdoor water use flow volumes more accurately). In the cases of the business drivers not being achieved or on track, the reasons were stated as primarily technical issues relating to the "*wireless communications technology*" and "*transponder reliability issues*".

Figure 23. Success rating in achieving business driver goals

Some of the comments relating to the business case goal “on track” or “exceeded” are provided in Table 2 to provide an idea of how the success rating nominated by the utility was qualified.

Table 2. Respondent feedback relating to the business case goal “on track” or “exceeded” option

RESPONDENT COMMENTS
“Meter reading now only takes 4 hours in the Alpine Region. Less reports of frozen meters and leaks.”
“Identification of significant leaks on private property, customers non-supportive of radiation, customers complaining of head-loss through meters, decrease in operating costs to collect data.”
“Leaks identified in 6% of participants; 10% reduction in average household water use realised; customer behaviour pattern identified allowing for interventions to be targeted more effectively”.
“Water use bills are now generated from smart meter data”
“Major water users are slowly becoming more interested in managing their water use…. reviewed data and concluded that data loggers had reduced water lost to leakage by about quarter.”
“Leaks on private connections and internal leaks identified, read efficiency and accuracy and time savings very good. Reading efficiency on drive by was impressive (15 mins to read 320 meters), as was identification of leaks. Consumption patterns didn’t change but there was very limited customer interaction undertaken to inform them of the project - intentionally as the trial was primarily focussed on technology and business case initiatives.”
“The functionality is being expanded beyond metering.”
“OSH has improved significantly; Customer enquiries have reduced, meter reading costs eliminated, raised awareness of customer leakage, improved non-revenue water, organisational interest in metering data”
“Timely address costumer issues: -Leaks attended to in timely manner once reported to customer - Network leakage reduced once data correlated”
“Able to convince customers of their water consumption patterns.”
“Less complaints from Key Customers…..would also have login capability to monitor usage patterns and drive efficiencies”
“Project has so far identified typical indoor water use needs. Next phase will seek to better identify outdoor water use habits.”
“Peak hour demand for recycled water use has been measured to be higher than what we've been designing for. Older homes have been using more water on a daily basis than newer homes.”

5.3 Priority challenges and limitations

In the same survey question format as described in Section 5.1, respondents were asked to rank challenges and limitations of undertaking SM/IWN projects in order of priority. These were separated into the planning and operational phases as challenges faced can be unique to each phase.

Planning Phase

The planning phase top priorities centred around the lack of precedent showing a positive return on investment (ROI), positive outcomes and limited existing industry knowledge from previous smart metering projects (Figure 26). These issues featured both as top priorities (84%) or were in the top 3 priorities (69%) for a majority of utilities. It is likely that, over time, these will become lower priority limitations as more positive ROI evidence, case study outcomes and depth of knowledge of the overall management of the 'digital water age' becomes more apparent and widely documented. This point emphasises the need for ongoing and relevant knowledge sharing through various fora (e.g. workshops, webinars) to establish and maintain a strong future in this rapidly growing area. Costs associated with the technology and roll out phases were also highlighted as a limitation, which is consistent with the issue of demonstrating a positive ROI for high capital projects such as smart metering.

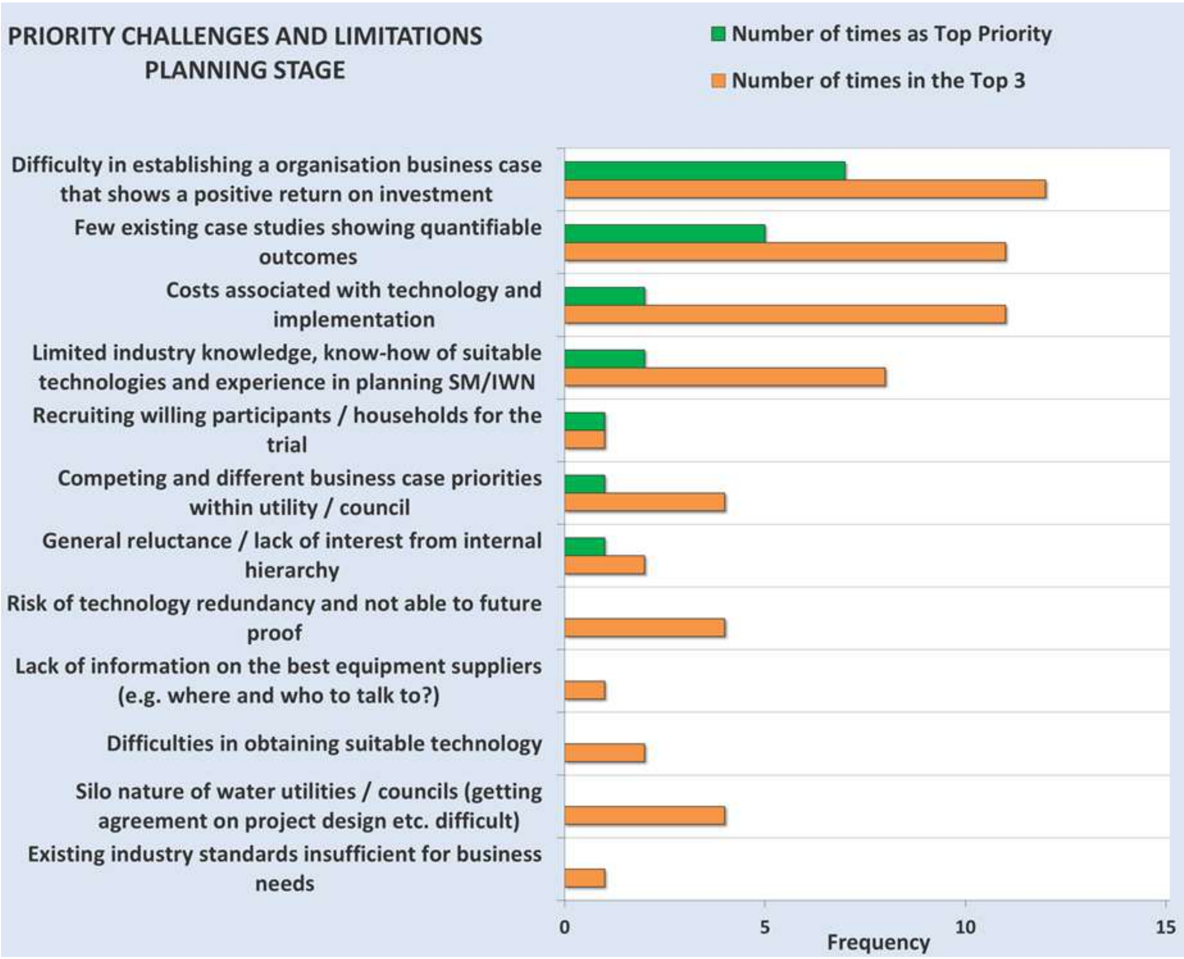


Figure 24. Priority ranked challenges and limitations during the planning stage of projects

Implementation / Roll out Phase

The implementation or roll-out phase priority challenges and limitations were a little less clear with the top priority responses not always aligning with the priorities frequently selected in the top 3 (Figure 27). For example, outdated technology and lack of knowledge and length of time to acquire suitable technology all featured strongly as top 3 priorities (combined 44% of sample) but were not often selected as the most critical challenge or limitation (combined 25% of sample).

Limited industry knowledge and experience in rolling out smart metering was selected as the top priority challenge, comprising a quarter of the total responses, with the compatibility of meter-communication systems also featuring highly as a top priority challenge (Figure 27). This latter point confirms the point made in Section 5.2 that technical issues relating to the "wireless communications technology" and "transponder reliability issues" were the main reasons cited for project business case drivers not being achieved or not considered as 'on track' (Figure 25).

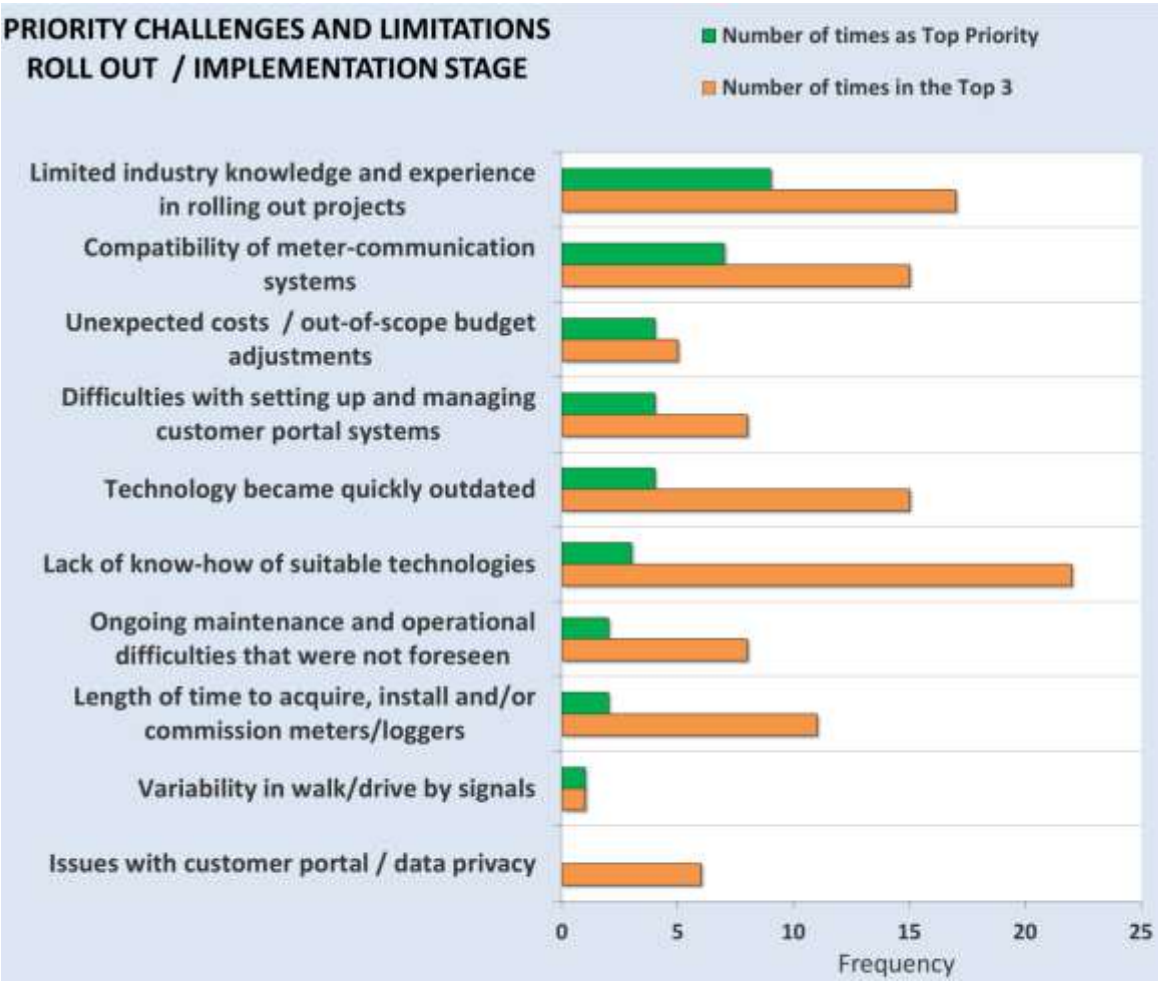


Figure 25. Priority ranked challenges and limitations during the implementation stage

6

Key outcomes and challenges

6.1 Introduction

Chapter 5 has presented the *priority* outcomes and challenges identified in 2014 by water businesses either planning or deploying smart metering projects. Last year, the 2013 Review first presented the key outcomes and challenges that were consistently identified by the respondents and it is reproduced here as all remain as relevant and ongoing today as they did last year. Therefore chapter presents a *broader overview* of the major outcomes and challenges that water businesses have faced during their planning, design and/or roll-out phase of their projects for both 2013 and 2014.

6.2 Key outcomes from SM/IWN projects

There were four main outcome themes that were captured in the both the 2013 and 2014 surveys as shown in the figures below (Figure 28): water savings, cost savings, increased revenue, customer satisfaction and general social / community engagement. Some quantification, where possible, of these outcomes are reported in Section 7.

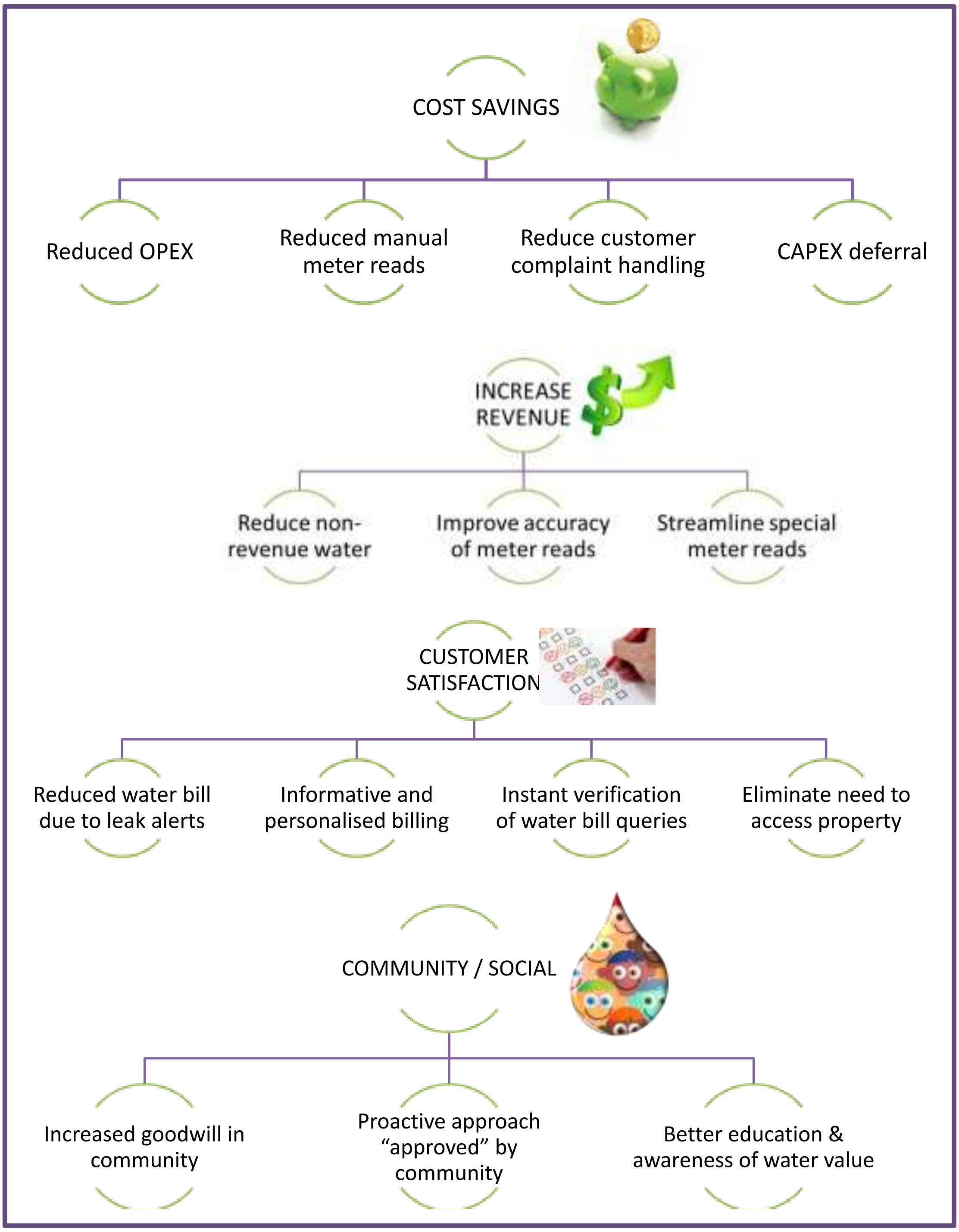


Figure 28. The four main outcome themes from the survey

6.3 Key challenges from SM/IWN projects

As with outcomes and benefits of the projects, several themes were identified associated with to the challenges and limitations of undertaking SM/IWN projects attract. These related to technical and practical challenges, knowledge limitations and difficulties with developing, and getting support for, a business case within the water utility itself (Figure 29).

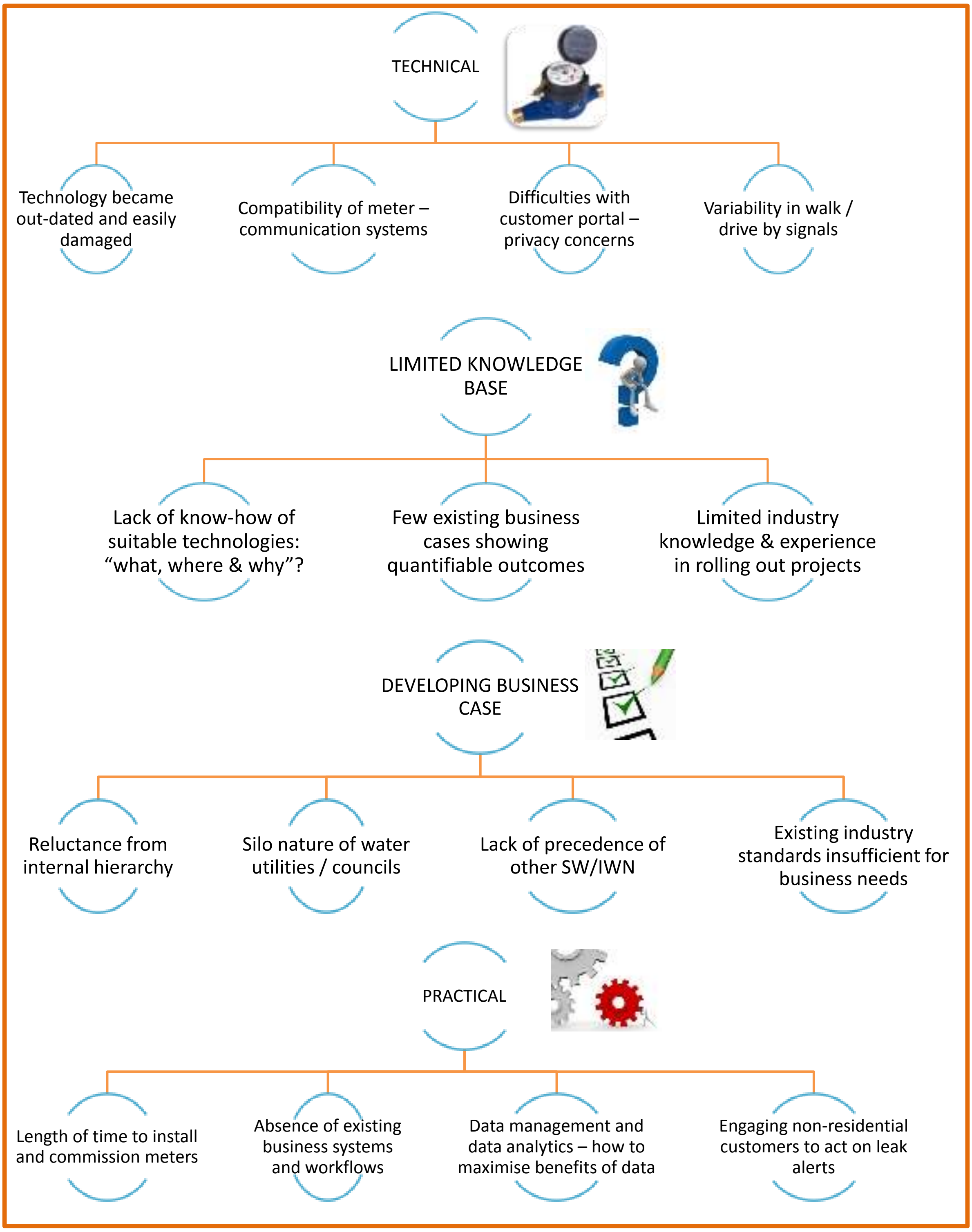


Figure 29. The four main limitations and challenges themes from the survey

7

Business Case Review update 2014

In depth interviews were undertaken last year to provide an insight into the progress and outcomes to date from four utilities that were well advanced in their smart metering project roll-out. The chief purpose of the interviews was to capture some examples, including metrics where possible, of the benefits from SM/IWN projects. This year the representatives from these organisations were again approached to provide an update on how the business case drivers for the projects were aligning with the actual outcomes that were being realised as projects progressed.

The breakdown of key business case drivers for four case studies for both 2013 and 2014 are presented in the following tables. The authors gratefully acknowledge the time and available information that was again given to us by the interviewees for the preparation of this report.

BUSINESS CASE REVIEW FOR KALGOORLIE SMART METERING TRIAL (WATER CORPORATION, WA)

Key background points for Kalgoorlie Smart Metering Trial (KSMT):

- SWM technology applied (Itron meters with Everblu Wireless data system)
- 13,800 end points over a two-year trial - 2010-2012 and $4M project cost

Other smart metering projects: Pilbara Smart Metering Project, Smart metering in Aboriginal Communities, Fitzroy Crossing, Camballin and Wellstead Smart Metering Roll-out

- Business case drivers for these remote metering projects include:
    - Peak demand management (e.g. identifying % of homes contributing to peak use)
    - Irrigation (sprinkler) roster compliance
    - Customer-side leakage - aim to reduce the 1:5 homes leakage ratio
    - Capital deferral opportunities

Business Case Driver (KSMT)	Outcome relating to drivers for KMST		Comments
	2013	2014	
Reduced operating costs	• Modelled over 5 years: ▪ Total NPV for traditional meter installations = $19.6M compared with a total NPV for AMI = $7.7M • **$3M saving** of water supplied by AMI	• Reductions equate to **$4.5m/year savings** off government operating subsidies (e.g. WA community). • Equates to around **a one year payback** of investment ($4m) • Energy costs and GHG reductions have also been calculated.	The business case benefits based on reduced operating costs were very strong for the Kalgoorlie-Boulder project due mainly to the remote location and associated costs to supply.
Water efficiency and conservation	• Water supplied to town had **reduced by almost 834 ML** (2010-2012). • This equated to over **10% reduction** in water supplied over the two year trial. • Residential water use **reduced by 11%** to 310 kL / year in 2011-12. • Residential leak reduction	• Water supplied to town had **reduced by almost 1.5 GL**. • Since final year of pre-installation, **reduction of 18.5% of total bulk water** supplied • Residential water use **reduced by 13%** • Increased organisational interest in meter data – leading to improved demand management planning	Majority of water reduction occurred in the residential sector. While the exact quantum of water saved through rapid leak detection offered by AMI is not known, this is built into the 13% overall reduction.
Address OHS issues related to field based meter reads	Reducing field incidents of meter reads. Improving safety of field officers.	Continued reduction of field incidents for meter reading and **OHS has "improved significantly"**	While OHS issue were an initial driver for the project, other drivers such as operating costs, water conservation and customer benefit became clearly apparent.

BUSINESS CASE REVIEW FOR MACKAY REAL TIME WATER METER READING ROLL OUT (MACKAY REGIONAL COUNCIL, QLD)

Key background points:

- AMI technology applied (Elster meters & Taggle system)
- 2010-ongoing with 36,000 end points, 10,000 properties in 2013 ⇨ 30,000 in 2014
- MiWater software developed and being tested in Nov 2014
- $2.5M project cost which remains well on target in 2014 (wholly self-funded)

Business Case Driver	Outcome relating to driver		Comments
	2013	2014	
Deferring network upgrades	• By reducing monthly peak demand by 10%, can defer $100M infrastructure for 4 years, representing **savings of $20M NPV**	• Early indications indicate 10% demand reduction (adjusting for weather variations). **Savings of $20M NPV** continues to be well on track	Water infrastructure relates to WTP, new water reservoir, trunk pipelines and mains. **10% reduction in peak monthly** demand deliberately conservative.
Improved customer knowledge and relations	• Show customer how an excessively large bill is broken down and how much water attributed to leak (e.g. constant night-time minimum flow) • **Increased customer appreciation** of water use feedback and knowledge of what is contributing to high bills.	• Water is seen as much more of an issue facing Mackay residents (**>20% increase in this awareness since 2012**) • Leak notifications have been issued to clients in last 2 years - **~400/month at average volume of 30L/hr**, representing a significant savings (see inset graph below) • Reduced complaints and large increase in complimentary feedback	**MiWater software soon to be user-tested.** 20% of properties appear to use 60% of discretionary use. 
Enhanced knowledge of network operation	• **Reduction in unaccounted for water** • Deferred capital network investment by using smart metering **data to optimise design** e.g. sizing industrial estates is likely to be overestimating demand currently.	• Receiving 750k meter reads per day compared to 40k twice per year. • **Leak detection in network has improved significantly**. 	MRC starting to pick up water meter errors that would have occurred historically – particularly in the sub-metering component. For example, differences between bulk and sub-meters have been identified and rectified, representing a significant reduction in non-revenue water losses.

BUSINESS CASE REVIEW FOR SOUTHERN RESIDENTIAL METERING PROJECT (TasWater, TAS)

Key background points:

- AMR (from WSAA definition) technology applied (Elster meters & Coronis)
- 55,518 residential meters and 2,600 non-residential meters
- To date 46,000 new meters installed, although cessation of bulk meter program at the moment in order to review budget and technology advances
- Planning to undergo pilot trails on AMI technology in remote areas to reduce meter read costs and improve OH&S issues.
- $29.5M residential project and $6.5M non-residential project costs
- A majority of the end points were new and required capital works in these previously unmetered areas, thus significantly increasing cost / end point.

Business Case Driver	Outcome relating to driver		Comments
	2013	2014	
Water savings	• **Bulk water reduced by over 3 GL** • WaterSense campaign and polling indicated 75% of customers likely to change behaviour toward water use	• A **37% reduction in costs** to supply water • **10% reduction** in consumption • Reduced losses due to better leak detection	Reductions compared to 10 year average.
Equity for customers	• Customer billing now includes trending data and comparative benchmarks for water usage for average households • Before and after survey **showed customers clearly happier with greater focus** on them and a more equitable price structure.	• **Customer complaints remain very low** compared to pre-metering where there was a perception of inequity in the billing system • Plans to incorporate customer access to smart phone apps and opportunities to subscribe to SMS alerts for leaks. .	TasWater employed market research company and strong media campaign for project. Resulted in high acceptance and awareness of project and water usage.
Defer network upgrades/ investment	• Deferring $20M WTP upgrade for 7 years, representing **capital efficiency savings of $7.9M.** • Deferring $5M pipeline upgrade for 5 years, representing capital **efficiency savings of $1.6M.**	• Remain on track for capital efficiency savings of $7.9M and deferring $5M pipeline upgrade for 5 years, representing capital efficiency savings of $1.6M.	The pipeline upgrade relates to the Margate Stage 3 works. Currently large-scale meter installations have ceased. Pilot trails on AMI technology.

BUSINESS CASE REVIEW FOR MULTI-LEVEL DEVELOPMENT AMI PROJECT (CITY WEST WATER, VIC)

Key background points:

- CWW already had in the field 10k AMR meters, (walk-by remotes). This has been part of CWW remote metering strategy for a number of years and is still being rolled out for single meters that are deemed as inaccessible.
- 6-month trial for Everblu AMI was on 100 endpoint development, which after successful trail, a decision was made to purchase Everblu hardware installed at site. Included in $45k purchase price was a software licence for a further 5000 endpoints, to be implemented for new developments.
- CWW AMI Strategy is now that any application for a development that exceeds 4 levels will need to have an AMI installed (Everblu), with the costs being met by the developer.
- AMR meter are being used for multi-unit dwellings that are > 2 but <5 storeys.

Business Case Driver	Outcome relating to driver		Comments
	2013	2014	
More accurate meter reads	• Identified previously that approximately **50 kL of water underestimated** for several years.	• All new multi-unit dwellings > 4 storeys required to have AMI to enable more accurate and regular reads • **Reduction in non-revenue losses also anticipated** • 3,000 new end-points approved in 2014 for new development	Assuming 440 L/meter at Step 1 (1.78c/kL). Conservative estimate.
Reduced operating costs	• Estimate **$45k annual savings** associated with improving manual & special read efficiency • If 50kL now accounted for = **$89k savings** in future. • Reduced customer contact calls due to accurate and remote reading	• **Remaining on track for estimated savings** calculated from 2013 • Once 2,000 AMI installed then becomes cost neutral for CWW (e.g. savings from lost revenue exceeds software licence costs)	Based on costs of scheduled reads, $0.70c, and out-of-cycle (OOC) reads, $7.00 (approx. costs), with 5000 endpoints on Everblu and 20% of meters requiring an OOC read (understanding CWW bill tenants directly for usage): 5000 x 4 reads p.a. = $14k 1000 OOC reads = $7k Totals cost of reads = $21k Cost of annual Everblu licence = $4.5k
Leak detection and improved customer services	• Internal **leaks detected more regularly** and informed customer. • **Reduced customer queries** and complaints due to inaccurate billing – from 270 to almost none.	• As per last year – **more leaks being detected and repaired** • **Reduced customer queries** continue from last year and less requirements for CWW to enter buildings for reads.	Customer service improvement through leak detection and alert, more so a secondary driver. CWW intend to integrate AMI data into billing system software.

8

Interview Results and Building on CBA Case for SM/IWN

8.1 Introduction

Further to the 4 managers that undertook the follow up 2014 interview as detailed in the previous Chapter, another 9 in-depth interviews were conducted with utilities that had either moved onto the implementation stage of trial or main phase, or had considered and rejected a smart metering project. By engaging with both groups, a clearer picture was obtained on the complexities that are faced with water utilities with adopting digital water technology.

As with the four showcased utilities, senior managers or project co-ordinators were chosen to be interviewed as they had the most intimate knowledge of their project and had been central in developing the business case for their project. The authors gratefully acknowledge the time and available information that was given to us by each of the our interviewees.

The water businesses that were approached for further discussion are shown in Table 3, along with the key features of their project. Some clear themes emerged from the discussions which will be discussed below.

Table 3. Overview of Interviewed water businesses

Location of water business	Overview of Project	Key points from discussion
Eastern North Island, New Zealand	• 320 res & 10 commercial AMR/AMI/SWM • Drivers: water demand management, test technologies & net benefits	• Reduction in leakage • From 1 day to 15 min only meter read per DMA with 100% accuracy • After a number of trials over the years still yet to "settle" a viable business case: where is technology going? Open or closed comms system? Vendors v client relationships not yet stabilised.
Far North QLD	• 289 res AMI / SWM • Drivers inc. improve demand management, customer empowerment, defer CAPEX • Vendor in-kind support	• Optimisation of irrigation systems tested with 10% reduction in irrigation demand (40-50 kL/hh/yr) compared to control group • Visual display and web portal for customers • Feedback of water use as well as technology (low flow sprinklers etc.) deemed important in reduced water use • Strong stakeholder / customer relations focus
Mid Coast NSW	• 120 res & 80 commercial AMI / SWM • Drivers inc. demand management, customer management (leaks etc.) • Test influence of SWM on householder attitudes and behaviours	• Feedback / alarm system for high use commercial • Research collaboration with university allowed good analysis of data and business case review • Not a lot of people engaged in the web portal, 'self-service' opportunity to review their use • Difficult to assess behaviour change from feedback technology with low uptake • Observed improved leak detection (not always addressed by customers though!
Southern WA	• Drivers: accuracy, potential water auditing, customer engagement • No trials just scoping stage and observing industry and vendor trends	• Watching technology and industry directions in this space before continuing • Will wait for the right internal environment before developing business case (e.g. water supply insecurity, willingness from management, strong ROI case, more confidence that technology options have stabilised.
South East VIC	• 2 x 2013 & 2 x 2014 trials, IWN, single & multi res • 5,000 – 20k AMR/AMI/SWM planned in mid 2015, • Drivers: defer CAPEX, improve fleet and network management, reduce meter read times & costs	• Trials to test ZigBee comms. efficacy, customer leak profiles, customer portals and feedback, and comms. network feasibility in high-rise buildings • Challenges inc. battery failure and water damage, engaging with multiple parties during planning and implementation phases, • Some reluctance observed for customers to interact with portal, follow-up leak alerts and/or provide feedback to SEW
Central coast, NSW	• 7 industry & 70 schools, AMI • Part of Watersave program • Drivers: improve efficiency for high water users, leaks in school buildings	• Estimated 45% avoided leakage post meter installation • Difficulties getting customers engaged in benefits, e.g actioning leak alerts and using visual screens, web portals Difficulties with maintaining internal interest for project (not seen as a 'core business' item), some reluctance to continue
Central coast, NSW	• Sub metering in high-rise res., 254 AMR/AMI, • Smart grid, Smart City trials, 155 AMI, multi res., • Drivers: customer service & equity, trialling technology	• Set up trial in buildings for EOI from potential vendors to demonstrate their technology can work in high-rise conditions • Estimated 80-90% water more accurately paid for by customer • Accuracy dependent on source of hot water (centrally or non-centrally controlled) • No significant drop in demand (indoor mainly = usually steady)
South eastern, VIC	• No current or future trials envisaged at this stage	• Very difficult to establish a good business case for a small water utility, few existing case studies for similar sized utility
Southern VIC	• Bulk water provider • Drivers: defer CAPEX, protect waterways	• Very difficult to establish a good business case due to considerable spare capacity in the network (peak day infrastructure design) • Complex institutional overlay in rolling out smart meters

8.2 Technology is only half the story

There was an agreement from the interviewees, that a co-ordinated approach was needed to ensure technology was suitable for the desired outcomes, that is it was better to have a thorough understanding of the outcomes and goals of the project and then work backwards with technology selection, i.e. avoid the situation of the tail wagging the dog.

Choosing the right technology was generally considered to be only half the story as is was evident from survey results and subsequent interviews and workshop discussions that digital water technology is only as smart as the user and the user environment (e.g. communications network, software, storage and analytics). Additionally, there may not always be the need to get the "bells and whistles" technology, depending on the desired purpose of the data. If the purpose of the smart meter retrofit is to reduce manual read time and costs only, then an AMR system may be adequate. However, returning to one of the themes of the report, given that there is more evidence demonstrating that a SWM or IWN system is likely to yield the most cost effective and efficient total water supply management plan, consideration needs to be given to the long-term application of digital water metering, thus ultimately, an AMI system may be more cost-effective. Therefore the planning and vision for how a digital water network can "work" for a utility is just as important as the technology itself.

8.3 Timing and opportunity

The concept of "lining up all the ducks" was evident with most of the interviewees, even the ones that worked within businesses that had decided not to progress with smart metering projects – precisely for that reason. For example, in one case, where there was available funding for the technology, the drive for change was simply not there, within the organisation or some parts of the organisation. The uncertainty around suitability and cost of technology, the failure to develop a strong business case and the presence of a significant spare capacity in water infrastructure (e.g. over-design for future peak demand was already addressed) were also reasons cited for prolonging smart water projects.

Interviewees of utilities where successful smart water projects that were in the implementation stages or were well advanced in their planning, all confirmed that not just one, but several factors had contributed to a strong business case, beyond purely economic drivers. Furthermore, the drivers tended to resonate across the silos in the utility or council (e.g. billing, customer service, asset management, demand management and planning). Thus, a successful business case tended to have not only a positive economic balance sheet but also captured other 'softer' benefits of digital water metering such as customer engagement and empowerment, integration of management systems across the business, perceived community water supply security and so on. It is noteworthy to add that the links between water and energy were more frequently discussed this year compared to the 2013 review, with utilities acknowledging the benefits of water demand management translating into lower energy consumption and costs (e.g. reducing peak water demand = reduction in energy use during peak electricity tariff times).

8.4 A business case for the customer too

A strong theme that emerged from the survey responses and interviews, and the subsequent WSAA workshop, was the customer focus and the benefits to the customer that digital water networks could deliver. Nevertheless, interview discussions revealed that the eagerness of utilities to engage customers has to be matched with the customers own understanding and willingness to participate, in order for the benefits of smart metering to be realised. For example, several utilities communicated their frustration with the lack of uptake from customers to engage in using the web portal, responding to SMS texts regarding leaks, modify behaviour based on feedback on high water use, and generally engage with the two-way process that SWM/IWN can offer.

Therefore, it appears that in order to fully maximise the benefits of SWM/IWN to the customer (thus also to the utility), the following points were gleaned from the interviews:

1. The SWM/IWN must offer a services that the customer actually wants or needs, not just what the utility thinks that the customer wants/needs, thus a genuine consultation stage will be crucial to achieve this.

2. The SWM/IWN must be appropriate and relevant to the community perceptions of:
    a. water supply security, i.e. where rainfall has been plentiful and water supply sources are healthy, there will be a lack of momentum to change behaviour and attitude (e.g. adopt technology and participate in two-way engagement) if there is no perception of drought, water supply scarcity, or a need to conserve water etc.;
    b. water pricing equity, i.e. a perception of high and /or inequitable water tariff structures will more likely prompt customer engagement (NB. In multiple occupancy dwellings where customers pay a uniform price despite how much water they use);
    c. acceptable current consumption trends, i.e. similar to point a.) above, if customers generally think that their water consumption is acceptable in a current climate, then there will be less impetus to engage in activities that aim to reduce consumption.

3. To fully engage customers (residential, commercial, industrial etc.) a business case needs to be developed for them also. Similarly to a water business, if a business case is not persuasive or relevant to a customer, they will be unlikely to be convinced by the argument. For example, three utilities mentioned that despite the leak alert system (SMS texts, emails and web portal communications) informing customers of a leak, in many cases the leak was not repaired with the excuse that "*it would cost more to fix than to just pay for it in our water bill*". Clearly the business case for them did not "stack up". Therefore it is the role of the utility to clearly communicate all the advantages of fixing leaks (e.g. water conservation, long-term v short term cost outlays, increased water pricing).

8.5 Communicating the benefits beyond the smart meter

Finally, the benefits of digital water network beyond just a smart water meter was clearly being recognised by utilities and this was being woven into the business case story more and more. However, considering all the points mentioned above, this was not always recognised by the bean counters or other managers across a water business, or indeed the customer. Some interviewees expressed frustration in getting upper management to see the 'vision', especially those from smaller utilities, which is understandable. Therefore communicating the benefits of investing in digital water technology needs to take on a co-ordinated approach across departments within businesses.

Ultimately though, the message from utility managers remained consistent from last year, in that there needed to be more evidenced-based precedents from other projects showing clear economic benefits to such a high capital outlay venture that digital water network inherently represent.

8.6 Building on the existing WSAA CBA model

The Business Case review table (Table 4) shown in the following pages and previously presented in the 2013 Review, builds on the Cost Benefit Analysis spread sheet model (Figure 30) that was developed by the WSAA Metering Program Group in 2012. The table was developed from the WSAA Cost Benefit Analysis model and concepts presented in Flynn and Little (2012). The aim of the table is to:

1) present some background to each main water business driver relating to SM/IWN projects;
2) to offer some relevant questions to consider when developing a business case for each driver;
3) to relate each questions to relevant data input parameters that maybe available to assist in modelling NPV business case (Table 5); and
4) to provide an exemplar business case statement for each driver.

The tables below seek to provide more context and assistance in generating compelling and project specific examples for business case development. It is anticipated that, over time, the information in Tables 4 and 5 will be further refined and populated with real metrics from case studies such as these presented in Section 7.

SWM NPV Analysis

Costs	PV($,000)
Meter and installation Cost	142,788
IT Capex costs (refresh 5 years, replace at 10 years)	16,832
IT Opex Costs	15,324
SWM Project Management	6,125
District meters (for use in detecting Network leaks)	4,012
Promotional campaign	2,800
Comms Infrastructure Capex	-
Comms Opex	-
DNSP meter read costs	19,407
TOTAL	**207,288**

Water Company Benefits	PV($,000)
Avoided cost of water meters and installation	68,387
Avoided routine reading	5,283
Avoided cost of special reads (charge to customers)	5,283
Reduction in billing and collection costs with monthly electronic billing and collection	26,304
Reduction in Call Centre (and walks in, emails) costs	1,184
Reduction in Network leaks	36,607
Reduction in Water Restrictions monitoring	6,040
TOTAL	**149,088**
BENEFIT COST RATIO	**72%**

Customer Benefits	PV($,000)
Reduction in Customer leaks	15,527
Reduction in water use through data feedback to customers	27,891
TOTAL	**43,418**
BENEFIT COST RATIO	**93%**

Societal Benefits	PV($,000)
Avoided societal cost of asset failure & unplanned rectification	169,117
TOTAL	**169,117**
BENEFIT COST RATIO	**174%**

Reduction in Water Quality audits	4,195
Customer information - detailed consumption, bill prediction, selection of billing date, messaging (eg: alerts of mains bursts/maintenance)	
More Flexible Tariff offerings	
Reduction in energy costs through better management of pumping	
Deferal of network augmentation with better information on real loading	
Improved network planning	
Water quality monitoring	

Note: Please disregard $ values. They reflect a particular straw man scenario analysed by the WSAA Metering Program Group in 2012.

Figure 30. WSAA Metering Program Group Costs Benefits Analysis model (2012)

Table 4 – Template for Identifying and Developing Business Case for Smart Metering Projects

	Water Business Benefits	Explanation	Questions to Consider	Potential Input Data (Table 5, p53)	Indicative Range of Savings and/or Revenue Increase
1	**Avoided network operating costs - pumping and treatment**	Reduce customer consumption when presented with timely and actionable information, leading to reduced electricity pumping costs, and, reduced chemicals and sewage treatment cost.	• What was, or is projected to be, the reduction in total network demand? • What is the $/kL cost for supplying water to the area now serviced by smart meters?	• Refer to item numbers: 4,50	*If 1 GL was saved and avoided pumping costs of 70c/kL and treatment costs of 5c/kL, this would equate to $750k annually.*
2	**Deferred cost of water meter replacement**	Meters traditionally replaced by age, can be replaced according to monitoring of performance, typical flow rate and accumulated throughput of water, delaying unnecessary meter replacements where threshold conditions haven't been reached, or increasing meter replacement frequency where threshold conditions have been reached and accuracy is declining.	• How many meters are usually replaced per year? • Has there been, or is there forecast to be a reduction or deferment in annual meter replacements?	• Refer to item numbers: 1,2,25,26,27,28	*If a $5M meter replacement program was deferred 5 years, this would equate to the NPV of $3.4M over 10 years, discounted @ 6.5%.*
3	**Reduction in network leaks**	In addition to post-meter leak detection, network detection can be further enhanced by installing pressure sensors on the wider network to give almost real-time feedback, reducing the number of pressure-induced bursts, backflow and impacts on customer service.	• Have you observed a reduction in the % of water lost in network leaks. • Have you been able to optimise pressure in your network or DMA to reduce average and peak demand? • Have you observed a reduction in main bursts?	• Refer to item numbers: 1,3,11,12,13	*If 1 GL was saved from reduced leakage, and avoided pumping costs of 70c/kL and treatment costs of 5c/kL, this would equate to $750k annually.*
4	**Reduction in labour costs associated with leak detection**	Less wasted time in attempts to pinpoint the size and source of leaks and breaks.	• How many FTE are used for leak detection tasks? • Have you observed a reduction in FTE for leak detection tasks?	• Refer to item numbers: 9,11	*A 1GL reduction in leaks per year resulted in X% less FTE at a cost of X$/month per FTE, resulting in X$ savings.*

Table 4 - Business Case Drivers (continued)

	Water Business Benefits	Explanation	Questions to Consider	Potential Input Data (Table 5, p53)	Indicative Range of Savings and/or Revenue Increase
5	**Defer network capital investment**	A reduction in customer demand (through leak detection & reducing total and peak network demand) can result in a deferral of network capital infrastructure such as upgrading treatment plants, building new sources of supply (e.g. desalination plant) or increasing network capacity).	• Did the project allow a deferral of network capital investment? • If so, was it supply side / treatment system upgrade / network capacity upgrade? • What were the $ saved? • Capital $/m pipe / trunk increased pipe capacity and years deferred • $/kL for new supply option / upgrade	• kL/yr of reduced consumption • No. of years deferred	If a $20M upgrade was deferred 5 years, this would equate to the NPV of $13.7M over 5 years, discounted @ 6.5%.
6	**Reduced manual meter reading costs**	Replace cost of manual meter reading (salary, super, vehicle, meter reading transfer technology) with smart meters with 15 year guaranteed life and comms network.	• How many customers? • How many times do you read meters / year? • What is annual cost (or other time unit) of manually reading meters?	• Refer to item numbers: 1,29,30, 52	*A X % increase in smart meters resulted in an X % reduction in manual meter reads, equating to a savings of X$/month*
7	**Avoided costs of special reads**	Special read costs can be avoided with AMI. Obtain off-cycle, "final" meter reads and connects/disconnects for customers moving or leaving the area. This is typically a cost borne by the customer, so by improving reading efficiency and replacing cost of manual meter reading, the customer will directly benefit & improve customer-client relations.	• How many manual special reads pa do you do? What is the cost per special read? What % reduction in manual special reads are you experiencing or predicting? • Note: There is a customer service improvement to instant final reads (see below)	• Refer to item numbers: 1,30, 31,32	*A X % increase in smart meters resulted in an X % reduction in special meter reads, equating to a savings of X$/month (year?)*
8	**Reduced bulk water charges**	In most cases a pass through cost but can have major impact if price to Customer does not fully recover the purchase and delivery cost of water.	• How much do you pay for your bulk water? • Have you been able to quantify the reduced or avoided bulk water charges	• Refer to item numbers: 3,4,50	"XX kL of wholesale water didn't have to be purchased therefore X $$ have been saved"

Table 4 - Business Case Drivers (continued)

	Water Business Benefits	Explanation	Questions to Consider	Potential Input Data (Table 5, p53)	Indicative Range of Savings / Revenue Increase
9	**Reduction in billing and collection costs with monthly electronic billing and collection**	Customers receiving electronic bills and having to opt out of it to receive a paper bill, reduces the cost of postage, printing, processing manual payments, etc.	• Do you know the % customer now receiving automated bills and avoiding postage, printing and processing ? • What is the diference in cost to process a manual bill versus and AMI bill (and collect payment)? • Have you observed a reduction in bad debts?	• Refer to item numbers: 1,22,23	*A 10% reduction on paper billing resulted in X $$ less processing (e.g. total costs of labour, printing, postage costs.)*
10	**Reduction in Call Centre (and walks in, emails) costs**	Improved metering and billing accuracy, eliminating bills based on estimates. Customers being informed in near real time of their consumption, both in $ and litres, creates less customer queries; Service agents responding to Customer queries armed with rich visual information including heat maps of where calls are coming from, and near real time data of how much water and when a Customer is using, ($ & L), means faster first contact resolution.	• Do you keep a record of the number of calls per month / year? • How many staff (FTE) do you have in call centre & reception OR estimated cost per call/walk-in?	• Refer to item numbers: 1,47,48,49	*The average number of customer calls received per month wrt to billing per 100,000 customers is XXX, equating to a X$$ reduction in labour hours. (estimated time per call x average labour costs per hour)*
11	**Reduction in Water Restrictions monitoring**	A reduction in water demand through smart metering may avoid the often unpopular alternative demand management strategy of enforcing water restrictions, which requires resources to implement and monitor and can be viewed as a negative for utility- customer.	• Do you have data on water savings during restrictions? • Known costs associated with implementing these restrictions?	• Refer to item numbers: 1,50, 51,52,53	*The removal of water restrictions resulted in 1 less FTE at a cost of X$/month per FTE, resulting in X$ savings.*
12	**Detect revenue losses caused by declining or failed meter accuracy**	Ensuring that all meters are recording water flow following repair of a break in a main. SM and IWN network tools such as 'critical slowing down' allows proactive identification of pending failures of metering systems, without knowing the actual condition of the meter. Corrective action can be taken, maintaining revenue integrity	• Did you identify any failed meters or meters performing below acceptable standards, that would have previously been undetected? • What was the annual volume of water that was being under recorded? How many years may have elapsed before this was identified through traditional meter audits or replacement programs?	• X/kL non-revenue water now billed at $x/kL.	*A X% reduction in non-revenue @ x$/kL/year (or month?), has resulted in a savings of X$ / year (or month)*

Table 4 - Business Case Drivers (continued)

	Water Business Benefits	Explanation	Questions to Consider	Potential Input Data (Table 5, p53)	Indicative Range of Savings and/or Revenue Increase
13	**Reduce residential non-revenue water data errors / losses**	By eliminating data errors such as lost meters, incorrect meter reads, incorrectly installed meters, meter information recorded against wrong Customer, incorrect metering units (such as L or kL) recorded in billing system, meters being read but not billed, incorrect parameter definition such as consumer class, meter size, or ancillary attributions such as sewer or rates, revenue can be increased and non-revenue water reduced.	• Has smart metering allowed you to identify previously undetected billing errors? How many households and what was the annual $ value of the error? • What is the % of $/kL assumed for non-revenue water losses? • Have you seen this percentage drop?	• Refer to item numbers: 3,4, • % non-revenue water	*A % reduction in estimated non-revenue water loss through data / billing errors has resulted in a savings of $/kL.*
14	**Reduce non-residential non-revenue water data errors / losses**	Non-residential sector water meters can offer significant improvements in meter reading accuracy based on more accurate sizing according to flow demand and placement of meters. Other sources of data errors include lost meters, incorrect meter reads and information recorded, incorrectly installed meters.	• As above • Have you identified any non-residential water meters that had undetected data errors or were incorrectly sized? • What was the revenue improvement?	•	*A % reduction in estimated non-revenue non-residential water loss through data / billing errors has resulted in a savings of $/kL.*
15	**Faster detection of theft and unauthorised usage**	Near real time monitoring allows illegal usage such as consumption at disconnected properties and restrictions enforcement to be monitored.	• Do you know the number of illegal connections per 100,000 properties? • Have you observed an increase in the number of illegal connections identified?	• 3,4,13	*An increase of X illegal connections identified resulted in an increase of X$/kL in revenue (assuming X kL/month [year is consumed by the "illegal" households?])*

Table 4 - Business Case Drivers (continued)

	Customer Benefits	Explanation	Questions to Consider	Potential Input Data (Table 5, p53)	Indicative Range of Savings and/or Revenue Increase
16	**Reduction in customer leaks**	Nearly-real time monitoring via smart meters can alert the customer to often costly leaks, thus improving customer relations and satisfaction through reducing customer costs and reducing network demand.	• Do you have before and after figures on customer leaks? • What are the annual costs associated with leaks $/kL including leakage refunds or relief.	• Refer to item numbers: 1,6,7,9,10,13 Note: This can be a utility benefit if it reduces leakage relief costs	*A 80% reduction in significant leaks = a savings of 100 kL/household/year = $280 /year (assuming $2.80/kL)*
17	**Reduction in water use through data feedback to customers**	Reduce customer consumption when presented with timely and actionable information.	• How many customers have indicated they are willing to use this feedback system / new billing system?	• Refer to item numbers: 1,5,13,50	*A 25-30 % reduction in water use = a savings of 45 - 53 kL/household/year = $126 - $148 /year. (assuming $2.80/kL).*
18	**Avoided costs of special reads**	This is typically a cost borne by the customer, so by improving reading efficiency and replacing cost of manual meter reading, the customer will directly benefit & improve customer-client relations.	• How many manual special reads pa do you do? What is the cost per special read? What % reduction in manual special reads are you experiencing or predicting?	Note: There is also a utility benefit as special read costs can be avoided with AMI.	*Avoided reduction in special reads can save a customer $7.5/read.*

Table 5. Data input parameters to assist in modelling NPV business case

Data Area	No.	Data required
Customer base	1	Number of customers
	2	Growth in customers pa %
Water costs	3	Wholesale water cost ($/kl)
	4	Retail water Cost ($/kl) – Normal (use pricing at the marginal pricing tier impacted by reduced demand, eg. $/kL at 50kLl: / quarter threshold
	5	Retail water Cost ($/kl) -incl Sewage charges Blended SA, NSW, VIC
	6	Retail water cost ($/kl) - high rate (leaks) -
	7	Escalation of water cost (real) (%)
	8	Growth in water use per customer (%)
Water leaks	9	Proportion of water lost in leaks at customer premises (%)
	10	Reduction in customer leak loss (%)
	11	Proportion of water lost in network leaks (%)
	12	Reduction in network water leaks (%)
	13	Average household water use pa KL
Billing and collection costs	14	Billing cost - per bill ($)
	15	Billing - multiplier for Red notices/disconnection notices
	16	Billing frequency per annum
	17	Collection cost per payment average
	18	Direct debit cost ($)
	19	Electronic billing cost ($)
	20	New Billing frequency per annum
	21	Reduction in Working Capital cost ($)
	22	Proportion of net saving provided back to customer (%)
	23	Proportion of customers taking up the offer (%)
Current meter costs	24	Meter Price (each) ($)
	25	Meter Cost escalator (real) (%)
	26	Installation cost ($)
	27	Installation cost escalator real (%)
	28	Meter replacement period (years)
Meter reading charges	29	Routine meter reading costs ($)
	30	Special Reads ($)
	31	Proportion of customer with spec read pa
	32	Meter reading cost escalator (real) (%)
Network leak detection	33	Number of customer meters per district meter
	34	Cost of district meter (inc. installation cost)
	35	Comms cost of district meter ($ pa each)
Bursts costs	36	Number of bursts per 100,000 customers
	37	Average burst fixing cost ($)
	38	Planned fixing cost ($)
	39	Societal cost ($)
	40	Reduction in bursts (%)
Customer education	41	Promotional Material ($)
	42	Bill Inserts ($)
	43	Demonstration centre ($)
	44	Advertising ($)
	45	Visits to community centres($)
	46	Total PR campaign ($)
Call centre	47	Per call cost (inc. supervision, IT, comms cost & accommodation cost) ($)
	48	Number of calls pa wrt billing per 100,000 customers
	49	Reduction in calls (%)
Water use	50.	Water use reduction (%)
Water restrictions monitoring	51	FTEs to monitor restrictions per 100000 customers
	52	Cost per FTE (incl Vehicle) ($)
	53	Proportion of years when restrictions in force (%)

9

Conclusions and Key Insights

While many of the conclusions and insights from the 2013 survey remain applicable for the 2014 survey, there are some notable additional insights that have also emerged from the 2014 survey.

Smart meter and intelligent water projects continue to gain momentum in 2014

Of the 48 organisations that participated in the survey, almost 80% were actively pursuing SM/IWN projects, demonstrating that the momentum for SM/IWN projects in Australasia has continued strongly from 2013. While many of the respondents indicated that a success rating was not yet applicable, there appeared a trend toward the business goals being at least on track, and in some cases achieved or exceeded.

Two-paced momentum and knowledge in industry

The momentum defined in the previous point appeared to be “two-paced”, that is, some utilities had well-advanced trials or main phase roll-outs, together with a similarly advanced understanding of the wider benefits of SWM and IWN. Additionally, their level of engagement with customers and other sections of their organisation was strong and ongoing. In contrast, several smaller utilities were keen to gain more knowledge and wanted to develop projects but were constrained by a lack of overall understanding and awareness of technology options, applications of data and the wider benefits of smart metering. One suggestion for a solution to addressing these two paces of understanding was to trial a series of post workshop webinars aimed at the “fledgling utilities” and delivered by the utilities that were advanced in their smart metering roll-outs. The first webinar was conducted in late October, 2014.

Economic drivers remain critical in 2014

Aligned with the point above, the survey data demonstrates that costs drivers (reducing non-revenue water, deferring infrastructure and reduced manual meter reads) were seen as higher priorities overall than customer service related business drivers. The return on investment argument remains critical given the inherently high capital costs associated with smart metering technologies.

Similarly to the 2013 survey, there was an absence of environmental drivers from a majority of water businesses. Again, despite environmental benefits typically being implicit in the water savings accounting, they were rarely nominated explicitly as a factor in a business case.

Digital water knowledge systems: for customer choice and utility efficiency

There was an evolution by many utilities in conceptualising the utility wide application and benefits that can be achieved from pursuing digital metering technology. There is evidence that utilities in 2014 have an increased awareness of how digital metering and applying analytics of various data sets in near real-time, can benefit utility efficiency and customer service excellence. Aligned with this latter point was a clear shift towards the customer satisfaction (e.g. greater focus on web portals, leak alerts, two-way communications, and customer consultation). The successful business cases tended to have not only a positive economic balance sheet but also captured other 'softer' benefits of digital water metering such as customer engagement and empowerment, integration of management systems across the business, perceived community water supply security and so on.

A need for better integration with communication systems and the IWN concept

There was consistent mention of technological difficulties concerning the incompatibilities with meter/data and storage/communication systems. This area clearly needs to be addressed through targeted discussions between vendor and utility (and possibly even customers) to improve the awareness of the options and potential limitations associated with this complex component of smart metering. Open versus closed protocols, compatibility of software/comms vendors and difficulties in transmission in regional area were features of this discussion. These issues need to be fully identified and addressed in order for all the benefits of SWM/IWN system to be realised, and in some cases, for the business case to become convincing to upper hierarchies and decisions makers.

Realising the benefits of SWM/IWN requires sustained customer engagement

Interview discussions revealed that the eagerness of utilities to engage customers has to be matched with the customers own understanding and willingness to participate, in order for the benefits of smart metering to be realised. To fully engage customers (residential, commercial, industrial etc.) a business case needs to be developed for them also. Similarly to a water business, if a business case is not persuasive or relevant to a customer, they will be unlikely to be convinced by the argument.

Theoretical Business case benefits being achieved operationally

Water businesses that are rolling out large scale smart metering projects, and that were interviewed in depth last year (e.g. Mackay Regional Council, TasWater, Water Corporation of Western Australia, and City West Water), remained largely on track with their business case driver outcomes and reported ongoing water demand reductions (e.g. >10% reduction in residential demand), long-term CAPEX savings (e.g. deferring augmentation of networks and associated capital expenditure NPV savings) and excellent customer service improvements (e.g. significant reductions in customer complaints).

10

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