

The purpose of innovation

Do Utilities 'get it'?

Tom Fryers

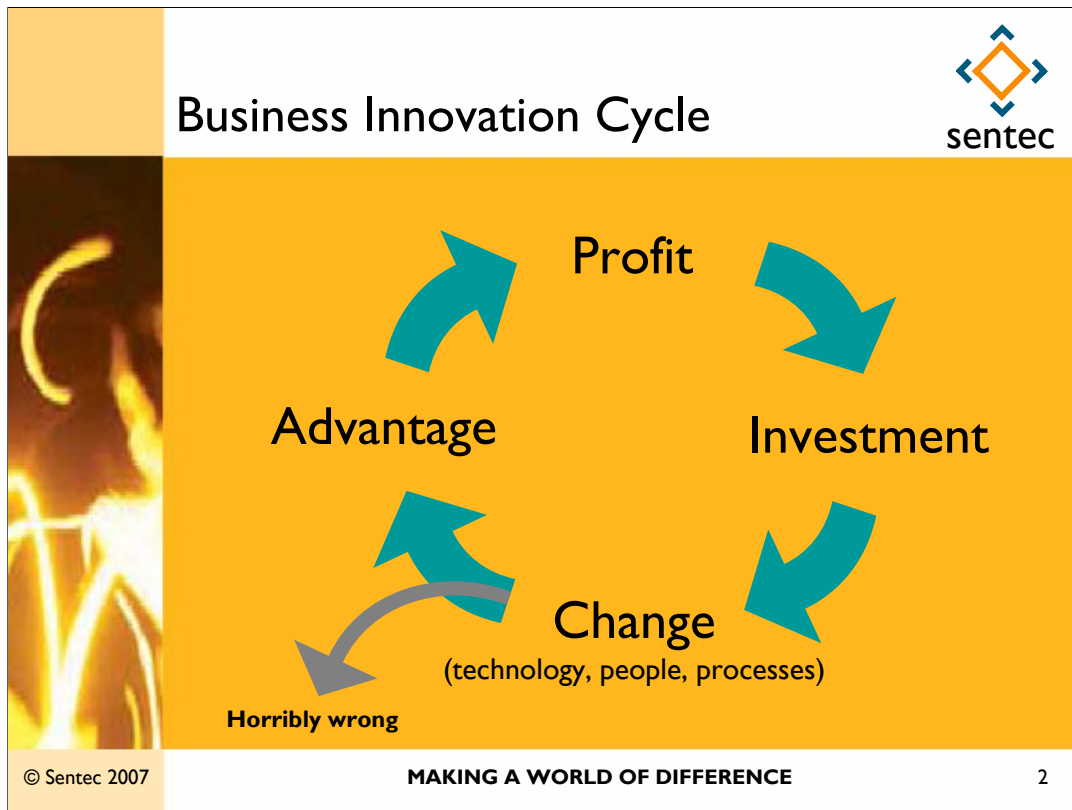
Water Industry Flow Club

20th September 2007

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Good morning. I'm going to talk about the overall process of innovation in business, the (very poor) track record of utilities worldwide in comparison with other business sectors and the reasons that are usually given for the huge disparity. Then I'm going to see if there are lessons to be learned from other sectors that have faced similar problems. Finally, I'm going to relate all this to water metering and the opportunities that modern technology provides for innovation in this area.



This is a classic model of business innovation. Generate profit, invest a portion of it in innovation to give yourself market advantage (or not if you get the investment wrong). Exploit the advantage to generate more profit and grow the business.

But do UK water companies need to innovate?

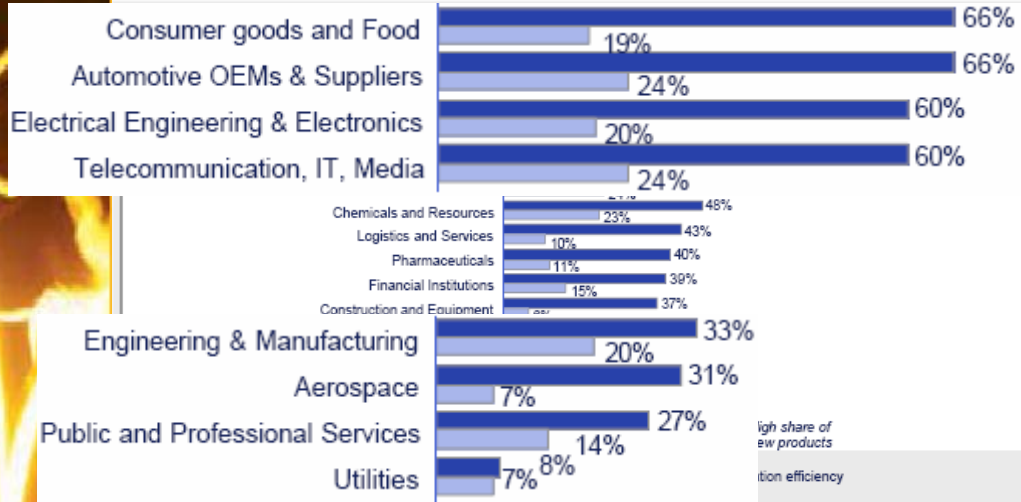
- Only their core businesses are regulated monopolies, and the government would just love to introduce competition even here. Just look at the market re-structuring undertaken in electricity and gas to get an idea of the inventiveness of politicians and management consultants
- Shareholders want ever increasing returns
- Water companies can be bought, and a successful business is harder to buy
- OFWAT changes its requirements and imposes fines if those requirements are not met
- Customers see innovation in other public services and expect the same from water companies.

My point is that, even in a nominally non-competitive business, innovation is still necessary. It's not the Darwinian 'survival of the fittest'; it's more to do with improving the outcomes for stakeholders, whether they are shareowners, consumers, environmental activists or policy makers.

Before looking at barriers to innovation and the best ways to innovate, I would like to look at track record in innovation.

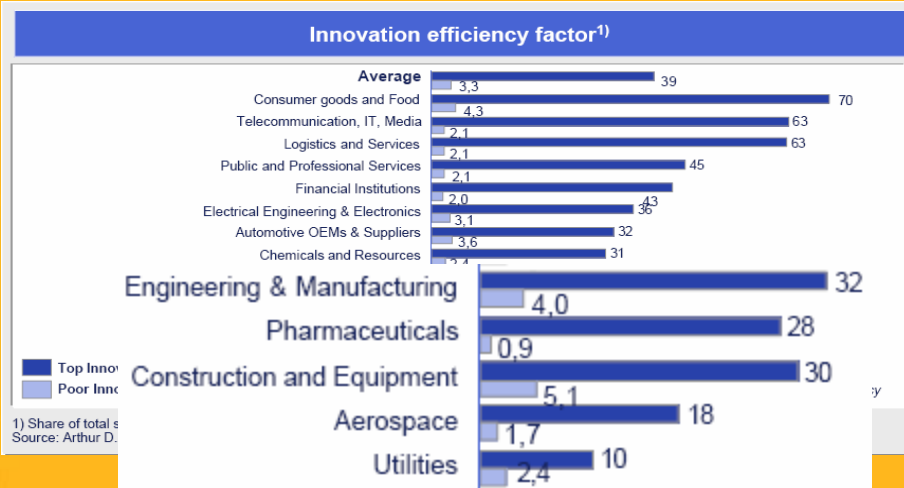
I couldn't find any useful data on water companies themselves, but I did notice a very interesting report from Arthur D Little from 2005. It compares Utilities in general with 12 other industry sectors, on a worldwide basis, looking for the total amount of innovation and the bang per buck they get from that innovation. It makes startling reading.

Amount of innovation



This slide shows amount of innovation. The measure is the percentage of total sales that are generated by products that are less than 5 years old. At the top of the league are sectors with fast changing markets. It is, arguably, easy to innovate in these sectors because nothing has to last very long because it will go out of fashion before it fails. But let's look at the bottom of the league.

'Bang per buck' invested



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Now let's look at how well money is invested in innovation. This chart is simply the total % of sales derived from new products divided by the % of total sales that went into R&D. So, it is a crude measure of bang per buck invested. Where do Utilities come in this league table?

So, in summary, Utilities invest very little and do it badly, by comparison with other sectors.

I'd just like to point out that these two charts relate to water, gas and electricity utilities. Do you think that water companies do more or less innovation than gas and electricity companies? So where would you put water companies in this league?



So, will water companies
invest in smart metering?

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I don't want smart meters because:

- Water is a public service
- It's a low value commodity
 - can't afford technology
- Reliability is everything

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In talking to water companies around the globe, I typically get objections like these:

“We are a public service, and access to clean water is a basic human right. Our job is to provide water, not make profits”.

“The unit price of water is low. The costs are nearly all fixed costs, invested in the infrastructure. It doesn't make sense to invest in expensive technology to measure and report units consumed”.

The final argument is nearly always: “We need 20 years service life. You can't prove the in-service reliability of new technology, except by years and years of testing. So, it's always old technology by the time we get it into service”.

I'd like to answer these objections by looking at other industry sectors that have faced the same obstacles to innovation.

Let's start with the 'public service' argument.

Water is a public service



19th Century



- Control
- Local crime
- Simple tasks
- Small teams

21st Century




- Provide help
- National and international crime
- Complex tasks
- Big teams

The police are a public service. Their job is to catch criminals, right? Well that may have been true in the 19th century, but it's not anymore. This gentleman has a camera mounted over his ear and probably has a sophisticated radio system on his belt. Modern police forces use technology to enable them to do so much more than was possible by the autonomous bobby on the beat. Comprehensive databases, command and control systems and forensic techniques allow multi-disciplined crime solving teams to work quickly and effectively. The police have also evolved new services such as giving crime prevention advice and performing social duties, rather than simply imposing control over the population. They have clearly invested in technology, people and processes.

Could we run our modern society if we only had 19th century bobbies?

I don't want smart meters because:



- Water is a public service
- It's a low value commodity
 - can't afford technology
- Reliability is everything

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So let's take a look at the 'low value commodity' objection.

It's a low value commodity



c. 1900:

- Labour intensive
- Exclusive clientele
- Inflexible services
- Not secure
- Local



2007:

- Highly automated
- Extremely high coverage
- Highly flexible, targeted services
- Converging with other industry sectors
- Secure enough
- Global



When telephones were first introduced, it cost a lot to set up an exchange and install the wires. Appliances were relatively simple and cheap. Most of the costs were in the infrastructure, and still are. The marginal cost of 'another call' is and always has been, quite low. But this industry sector has grabbed the technology and process levers firmly and pushed them to full throttle. The average amount spent by households on telephony in 1900 was tiny. Telecommunications is now a vast industry delivering all sorts of services to all sorts of customers, and the services are getting better and cheaper all the time.



I don't want smart meters because:

- Water is a public service
- It's a low value commodity
 - can't afford technology
- Reliability is everything

Let's deal with the last objection: reliability.

Reliability is everything



1903



- No regulations
- Slow, short range
- Very small payload
- Dangerous
- Small revenues & profits

21st
Century



- Highly regulated
- Fast, long range
- Huge payload
- Extremely safe
- Litigious clients
- Huge revenues & profits

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The airline industry has grown from nothing to a forecast of \$5.1Bn global profits in 2007 in the last 70 years. On top of that there's been huge growth in the supporting aircraft manufacturing industry and in all the ground operations. Airlines have done this in the face of reliability and safety objections, and the extremely high R&D costs necessary to overcome them. They now transport huge payloads over vast distances, quickly and cheaply. And they are, arguably, too safe.

Engineering reliability

- Engineering is a science, not an art
 - Electronics, materials and processes understood
 - Excellent design and modelling tools available
- Typical service lives
 - Central heating controller: 15 years
 - Television: 10-15 years
 - Communications satellite: 8-17 years
- Service life can be designed in
 - Just depends on investment in product development

Let's look at the engineering behind reliability. I sometimes think that water companies need to second some of their engineers to consumer product companies, just to see the level of competence achievable in designing for a given service life. Engineers now understand the materials they work with and have excellent tools that help ensure that best practice is made widely available. If something is learnt in one industry, it is built into the design tools and the knowledge is transferred. CAD systems are no longer simple drawing packages. They provide modelling of all sorts of engineering phenomena. No longer does the engineer build something, test it until it fails, diagnose the cause and fix it. He can, to a large extent, predict the faults and design them out before they occur. I'm not promising zero failures, but I do promise that, if you set a sensible service life and are willing to invest in the necessary engineering effort, you can reduce the risk to just about any level you want.



How does this apply to water metering?

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Now, instead of looking broadly at how other sectors handle innovation, let's look at how another sector handles the business function that a water meter performs. So, what is the function of a water meter?

A meter is a Point Of Sale system



c. 1910



21st Century

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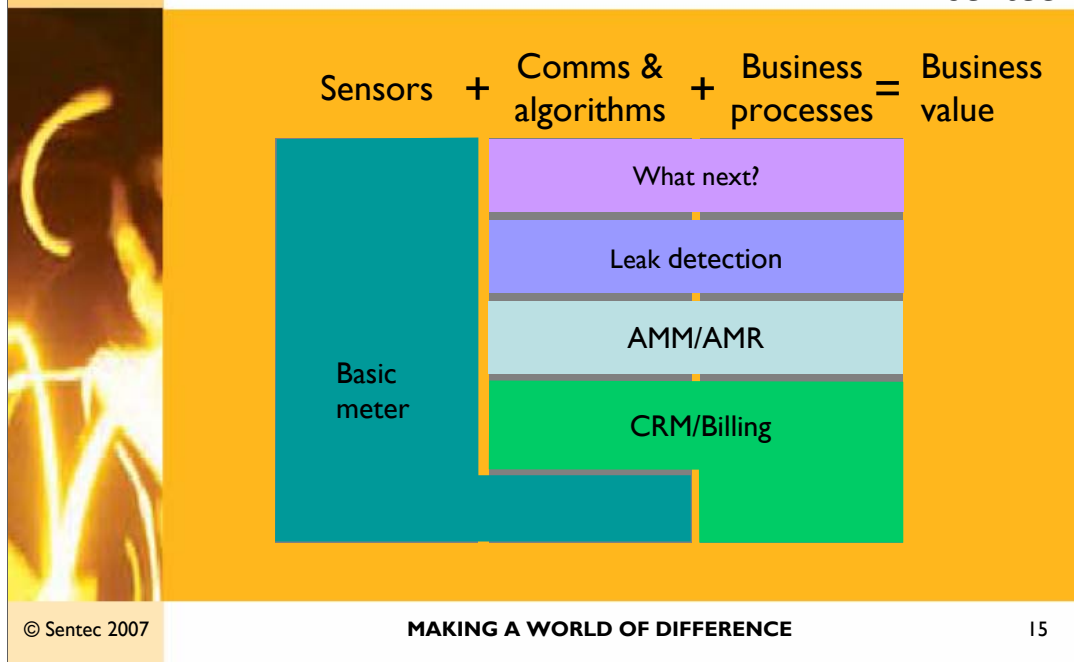
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An early cash register simply had two functions: it provided the shopper with a receipt, and it recorded the total cash so that the shop owner could spot theft by his staff. A 21st century Point of Sale system does much more than this. Through its bar code reader it tracks individual items off the shelves so allows owners to manage stock and to know which products are selling and which promotional techniques work best. With loyalty cards, the shop can now work out your personal habits and tastes and market new products and services to you on an individual basis. On top of that, note that this is a self service check-out. The shop owner has cleverly transferred a bunch of costs to his customer.

A point to note is that early investors in POS technology did not envisage all the future benefits. They saw that POS was an area in which to create advantage and took a leap of faith. Modern POS were not designed in one step – they evolved to support the evolving business processes. Smart metering will be the same. Do not consider this as a once-off investment.

How meters create business value



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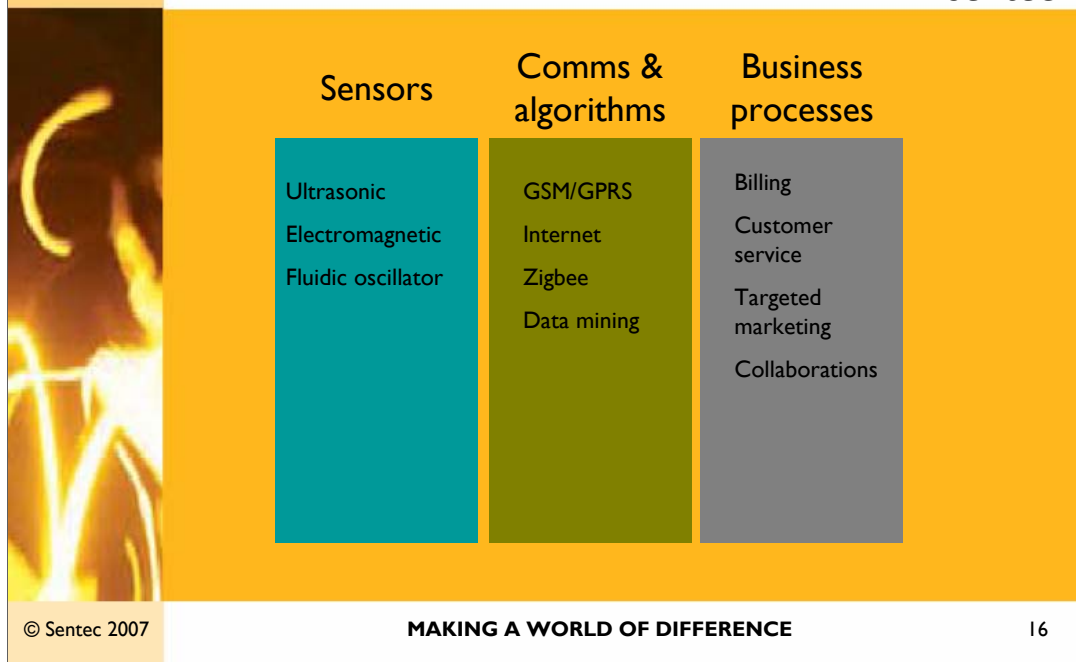
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How could smart meters add value to a water company? A meter is a sensor and provides data. If you add communications and algorithms you can turn that data into information on which the business processes can act. When the sensor, comms and algorithms and business processes are all sensibly hooked together, you get business value. Any one of these things on its own does not generate value.

Actually, even a simple meter is a sensor with a little bit of processing to totalise the consumption. When the totalised reading is fed into a billing system, a bill pops out and the customer pays it. That's value: cash in through the front door. The next area of value comes from basic AMR. Don't send a man to read the meter – do it remotely and save operational costs. Beyond this, we are into areas of heated debate. And we can be reasonably sure that many more areas have yet to be invented. As I have the joy of taking 'an innovators view', let's be inventive for a moment. Leak detection could be extended into DMAs by recording instantaneous flow rates at known times and using this data as part of the water balancing activity. Leaks downstream of the meters could be detected by looking for unusual flow patterns in the meter. Any single 'event' that draws more than, let's say, 2 bathfulls of water is probably a leak, or someone using a hose. Wouldn't that be nice to know when you've got a hosepipe ban? Better still, wouldn't it be nice if your consumers knew you could detect hosepipes and were deterred from cheating in the first place? Any continuous low flow could also indicate a leak. Perhaps it's a dripping fitting, soon to be a full-blown pipe burst. How about a meter with leak detection that earns you a discount on your home insurance premium? How about some form of non-life-threatening flow restriction if a customer doesn't pay? Perhaps, for social reasons, it has to be coupled with an easy-pay tariff, or prepayment mechanism? Would it help to 'peak shave' consumption by time shifting it into periods when pumping energy is cheaper? Would a pressure sensor in every home allow you to minimise your pumping energy and your leakage?

What I'm trying to say is that you can't always know how innovation will benefit you. You shouldn't rely too much on unforeseen benefits, but you can be certain that you won't get any if you don't invest!

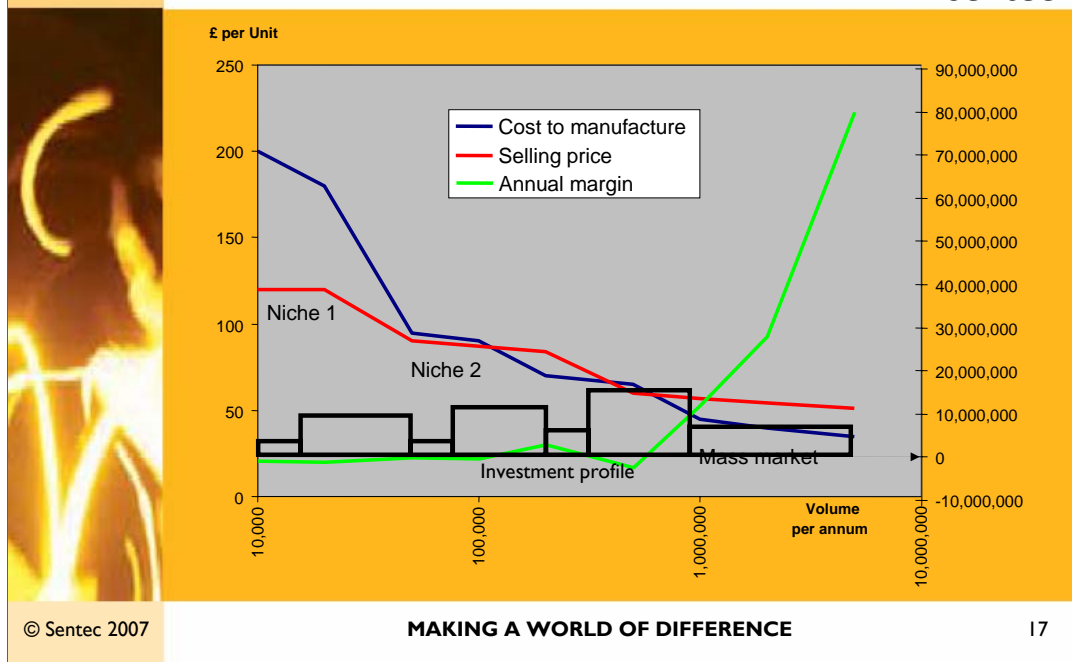
Technical advances in metering



So let's take a look at just some of the technical advances that might be candidates for investment. In metering sensors, we have competing static technologies that each have their advantages. I don't want to go into comparisons here, because Sentec has it's own technology called Sterling. It's magflow, and it's clearly the best!

In comms, we could borrow low power mesh radio from the Zigbee initiative, so reaping the benefits of substantial investment by other industry sectors, almost without cost to ourselves. We could avoid the cost of building our own comms backbone, by going for a public infrastructure solution such as SMS or GPRS. Once we've got the data into the back office, we could mine it for useful information using artificial intelligence software. We could then use it to construct useful messages on an individual basis and send them out over the internet, by email, web page or SMS text message. We could do joint marketing campaigns with partners. How about a joint campaign with Norwich Union on home insurance combined with smart leak detection? Or join with the BBC to offer a special gardener's tariff that rewards use of hosepipes at the time of day that has the lowest operational cost?

Typical product cost reduction



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What about the rate of innovation? I would like to make a point about the realities of developing and manufacturing electronic products. This shows a typical product (not specifically a meter). Note that the X axis is logarithmic. The first production model is typically very expensive to produce. The manufacturer can't get good prices from component suppliers because the volumes are too low. He hasn't yet invested in automated production facilities, and his yield is low because he's still ironing out problems. If he could just get a big order, he could justify the investment in engineering and production processes to cut the unit costs. But the buyers just drip-feed him small orders, and give him no real confidence about future market size. Despite this, after he has found enough customers to generate volumes of say, 50,000 a year, he invests in a new process and changes the design to take advantage of it. His unit costs fall to £95. Small improvements take out a little more cost, until he has the confidence to invest heavily again. This process continues, reducing the cost in a series of steps, with shallow slopes in between.

Now let's look at the investment profile necessary to achieve this. As you can see, each successive step needs a bigger cash injection. But, each step applies to a bigger volume, so, if it's timed correctly, the investment can be justified.

But what it costs the manufacturer is not interesting to you. You are more interested in what will he sell it for. At low volumes, he may accept a loss on every unit, just to grab market share or establish the product. He can only afford to do this at low volumes, so he's limited to addressing small niches in the market. If he gets his marketing right and is bold with his cost reduction strategy, he might be able to make a small margin on each unit by the time he's got the volumes up to a few hundreds of thousands per year. But he's still nowhere near making a true profit, because he hasn't yet recovered his investments in initial development or cost reduction. So, finally, after yet more investment in ramping up his production he can address the mass market and retain a margin on each unit sold. Note that the selling price continues to drop in the mass market phase. This is because competition will emerge and margins will get eroded. The winner will be the manufacturer who can best grab market share at margins that allow him to keep investing in product and process improvement.

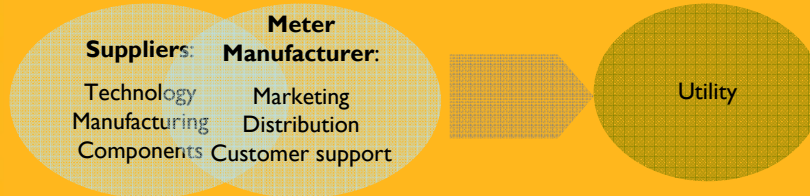
Let's look at what this all means in terms of annual margin for the manufacturer. At low volumes, the loss on each unit sold has little effect, but at high volumes, even a small unit margin has a massive effect. With a good product, the right introduction strategy and a sensible investment plan, the manufacturer can make very healthy returns.

So what is the lesson here for technology buyers? Slow roll-out is a very bad thing! If you can't demonstrate to manufacturers that there really will be a very large market to address, they will not invest, and you will have to buy under-developed products at high prices. Alternatively, you can wait until another buyer takes the gamble, and hope to take advantage of the price reductions caused by his bolder purchasing strategy. So, if you want to lead in technical innovation, be bold.

Opportunities to invest



Investing in new technology does not have to mean simply purchasing new meters...



Investment through:

- Joint developments with manufacturers
- Trialling and testing facilities
- Direct investment in technology/component design

What about “how to invest”? There are more options than simply buying new meters with comms and having a system integrator connect it all up to your back office systems. Look at the whole supply chain. Where can you get best value from your investment? In early stage and proof of concept, or in product development and manufacture (like Enel’s Telegestore project)? Perhaps you should team with a like-minded water company and do something together?

Of course, as a technology provider, I’m biased towards innovation in technology. It’s equally valid to consider investments in people and new business processes, even if they are not technology based.

The last point I want to make is about foreseeing the future.

Spotting the value



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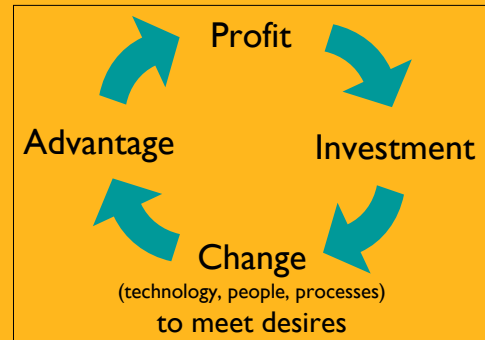
You walk into a bread shop. What did you want to buy? Did anyone answer “a loaf of bread”? I bet you didn’t just want a loaf of bread. No, what you actually wanted was something to make sandwiches from or, perhaps even, to not be hungry at lunchtime. The bread was just the means, not the desire. Good marketing is all about addressing the desires: spotting them and fulfilling them well.

Taking a fresh view

People don't just want water. They want to:

- drink
- wash themselves and their possessions
- dispose of waste
- swim
- irrigate their gardens
- feel healthy

(and what else?)



So, we need to do some similar thinking for water. What do water companies' stakeholders desire? For each group of stakeholders (that's shareholders, OFWAT and government, environmental organisations and commercial and domestic customers) we need to make a leap of imagination. However, because I have limited time, and because we are focusing today on smart metering of customers' consumption, let's just talk about domestic customers as a stakeholder group. Do they want water so that they can put it in a tank and admire it? No, they want to use the water for specific purposes. What are those purposes and what are the desires behind them? Do they want to eliminate bad odours? Do they want to grow their own vegetables? Do they want to have a shinier car than the neighbours? Whatever their desires, fulfilling them should be the objective of water companies' innovation. Because getting it right will bring advantage.

Summary

- Work out your customers' desires
- Evolve the business processes to address their desires
- Use technology to enable the business processes
- Create operational and environmental benefits along the way

*Smart water metering is part of a business strategy,
not just an opportunity for saving cost*

But, in reality, the water companies must do this thinking for themselves because they understand their customers. Don't they?

Well, they would soon understand their customers if they implemented smart metering!

Thank you for listening.

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