Public acceptance

Exactly what is behind public acceptance?

Michael O'Brien and Alexander Bentley believe that if we understand how word-use affects public acceptance of science and engineering, we could do a better job at communicating and creating a more informed public. This doesn't mean that concepts need to be dumb-downed for public consumption. According to the authors, engineers with a message to sell should craft messages that are succinct and carry specific information that can be repeated endlessly without loss of content.

The Norris hydroelectric dam was the first dam to be built by the Tennessee Valley Authority in 1936. TVA officials worked hard to pass on knowledge to local people and help shape positive attitudes about the company's electrification programme in the 1930 and 40s.

People are an intriguing lot, which, for those of us in the social sciences, makes them all the more interesting to study. For those in the public or private sector, though, humans can be perplexing, and often vexing creatures for all kinds of reasons. Sometimes there's no apparent link between what people think – or say they think – and how they act. Other times, people are difficult to persuade that change is good. And more times than not, people want their cake and eat it too.

Even when confronted with unassailable facts – for example, lower costs of electricity or lower carbon footprints – some people will cling tenaciously to old ways. Conversely, a few might abandon old ways and jump on radical bandwagons for no apparent reason. More likely, though, people will say they embrace something – the green movement, for example –- but what they really mean is, "I embrace your embracing it; I'm too set in my ways to do much changing."

Being an engineer

We can only imagine what it's like being an engineer, especially one in the power business who constantly has to sell a doubting public on the advantages of one kind of power over another. Neither of us is old enough to remember the heyday of the rural electrification of the United States in the 1930s and 1940s, accomplished in large part through the construction of impressive dams and powerhouses like those built by the Tennessee Valley Authority (TVA) on the Tennessee River and its major tributaries to bring electricity to the southeastern US states.

Despite not living through that period, we've read enough to know that at the political level, hydroelectricity was a fairly easy sell for TVA, especially with the country plunged into the Great Depression. For the millions of rural folks cooking, washing, and heating with wood-burning appliances, or for schoolchildren doing homework over coal oil lamps at night, electricity was a boon. Everyone was in favour of rural electrification – unless a proposed dam was going to flood your farmstead or town. Then you might have other ideas. And lots of soon-to-be-displaced rural Americans did have other ideas.

How do you get people to accept change, especially when they have a vested interest in what's being changed? In the case of rural electrification of the US, the will of the substantial majority was always going to win out in the end, as it usually does. TVA officials worked long hours

The authors of this article, Michael J. O'Brien and R. Alexander Bentley, offer some advice on how to sell the advantages of power projects to the public.

with individuals in the affected rural communities who had the trust of their friends, training them in the positives of the electrification programme so that they could be knowledgeable spokespersons for power projects and help shape attitudes. And, of course, the promise of jobs didn't hurt the cause, especially in regions of the country that were poor to begin with.

These are the kinds of phenomena we love to study, trying to figure out what works in some situations – and why – but not in others. We have consistently found, not surprisingly, that what works in one place and time may not work in others. Let's look at another example, this one from Samsø, a small island off the coast of Denmark.

Until the year 2000, nearly all the several thousand inhabitants of Samsø heated their houses with oil, used imported electricity, and thought little about it. Within several years, however, after organising energy cooperatives and seminars, residents had cut their fossil fuel use in half through wind power, and by 2005 the island was producing more energy from renewable sources than it was using. The turbines cost a million dollars each, so they were purchased collectively, with shareholders receiving dividend checks from the generated electricity. It was the perfect story: people made money in the long run, felt a sense of communal responsibility, and were excited just to be a part of things.

The funny thing was these were ordinary Danish citizens who were not previously passionate environmentalists but who became increasingly interested and proud of their ability to become self-sufficient. Although it started with Samsø winning a government-supported contest to become Denmark's "renewable-energy island," there was otherwise no prize money, no tax breaks, not even government assistance. There was just enough funding to hire a few people to work on the project, the first of whom was Søren Hermansen, a lifelong Samsø resident.

"There was this conservative hesitating, waiting for the neighbor to do the move," Hermansen told New Yorker writer Elizabeth Kolbert. Hermansen repeatedly stood up at local community meetings and made his pitch for the project. Lubricating his meetings with free beer, he got his neighbours to imagine working collectively on a project in which they might all take pride. "This is where the hard work starts, convincing the first movers to be active," Hermansen said.

Eventually the social dynamic began to work in favour of the project. As more people got involved, this prompted others to join in. After a while, enough islanders were participating that it became the norm. Or, as islander Ingvar Jørgensen put it, participation became a kind of sport.

Clearly, the behaviour spread for social reasons and became a social norm, but this doesn't tell us why it spread. Every lobbyist or advertiser wants to create a new social norm these days. What made wind power on Samsø different? There were at least five key elements. First, people's experience was changed by the contest, which introduced an incentive to everyone and changed their lives directly. Contrast that with a vested interest that promotes a particular brand of behaviour to the exclusion of all others, as companies do with their products. As the contest proceeded, people's direct experience was modified further.

Second, the Danish government wanted to light as many "sparks" as possible, so the contest was open to the entire country. Then, when Samsø won, the project was open to any employable volunteers. When Hermansen became the project leader, he promoted it at every opportunity, from local town meetings to everyday conversations.

Third, the community was small and socially cohesive. New social norms need a critical number of people, which allows a norm to overcome inertia. As New York Times essayist Malcolm Gladwell argues, norms need regular face-to-face interactions, not just online communication. In both aspects, a small community has an advantage over a larger one, at least in the beginning.

Fourth, the behaviour had a rationale. Although it spread through social learning, the shift to renewable energy was economically beneficial in the long run. Further, it was gratifying as a constructive project, and it gave people something exciting to do together.

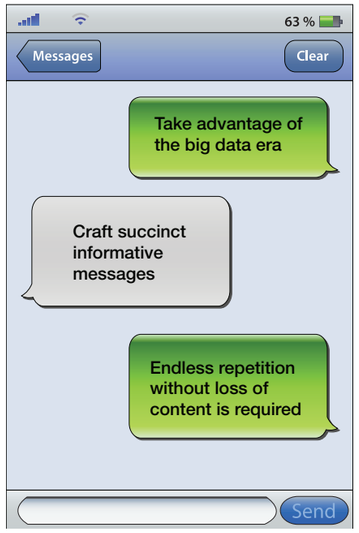
Fifth, the results were permanently visible and sustainable. By becoming part of the constructed environment, newly erected wind turbines became a highly visible source of learning for everyone.

Behavioural diffusion

The Samsø example shows us that the change was jumpstarted by a small amount of independent learning by a few people, followed by copying by everyone else. These two elements, independent learning and copying, or social learning, are the basic ingredients of behavioral diffusion, a fundamental phenomenon of human society that has even been demonstrated to some degree among chimpanzees.

Classic behavioural diffusion models are used in marketing and economics. The models work well for the rise of innovations whose benefits are obvious, such as the bow and arrow or the automobile, or even more modern behaviours such recycling, drinking bottled rather than tap water, or perhaps even taking yoga classes. The new behaviour may be an intrinsically attractive option, but the knowledge of, aspiration for, or acceptance of the behavior needs to spread socially.

Individual learning is really any way of adopting a new behavior except by copying someone else, although our use of "copying" does not include learning across the generations, such as children learning from their parents or apprentices learning from masters. This is most usefully categorised as individual learning, just over a long period of time - a vertical line of inherited knowledge through the generations. Guided in turn by each generation's elder mentors, knowledge can accumulate as each individual's experience is added to what gets passed down the ancestral line.



Engineers should remember certain points in today's highly socially interconnected society

Until recently, most marketing conversations were mainly about individual learning. Make information widely available and people will consider it on their own. This was certainly the tack that TVA took in identifying a few key individuals in each community who in turn made information widely available and asked their friends to consider it. More recently, however, marketers have become interested in social learning, specifically the probability that someone will adopt a new behaviour by imitation. A good example of the adoption process that we have all experienced is the comings and goings of buzzwords, which are being picked up and adopted, passed on, and dropped for something more novel all the time, every day.

This has important implications for those interested in understanding public perceptions and acceptance. What if the language we use to convey certain phenomena power production, for example is going in one ear and out the other because the words are nothing but passing fancy? Surely, we say, technical words that have specific meanings aren't the same as common words such as "yo" or "hippie," which float through time, suddenly becoming popular and just about as suddenly unpopular.

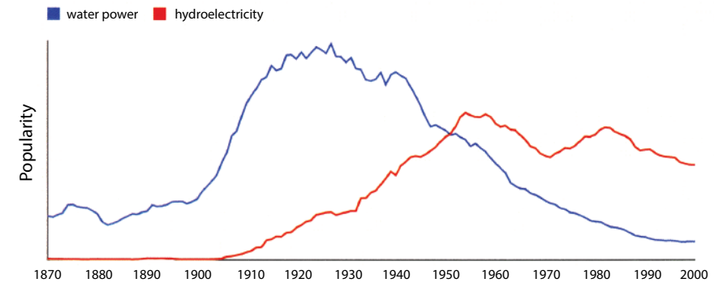
We have long believed that if we understood how word use affects public acceptance of science, we could do a better job at communicating science and thus creating a more informed public. To develop such an understanding, we used a remarkable new tool, Google Books Ngram Viewer (http://books.google.com/ngrams), which draws on a database of millions of books published up through 2008 to show the annual popularity of any published word or phrase over the last several hundred years.

We found that several important terms in the discussion of climate change had entered the popular literature from technical obscurity in the early 1900s. These terms included:

- Biodiversity, the degree of variation in life forms within a given area.
- Holocene, the current era of the Earth's history which started at the end of the last ice age.
- Paleoclimate, the prehistoric climate, often deduced from ice cores, tree rings, and pollen trapped in sediments.
- Phenology, the study of how climate and other environmental factors influence the timing of events in organisms' life cycles.

We also found that almost all the words were becoming passé in public usage. For any scientist or engineer interested in affecting policy or public opinion, the trendiness of words in a particular field might be of concern, given that the less the public understands and uses words from a field of research, the less likely people are to garner insights from that field. It becomes a matter of here today, gone tomorrow. How does one counter the vagaries of how words and concepts move through society?

Plot showing the life histories of two terms, water power and hydroelectricity, using Google Books Ngram Viewer as the source (http://books.google.com/ngrams).



Perhaps we take heed of what went on in Denmark with wind power. Get people involved in the early decision-making process and show them the benefits. These early adopters, especially if they have standing in communities, naturally attract others, and then others, many of whom are simply copying the patterns of those around them, eventually creating the well-known "S"-shaped adoption curve that typifies what at first is an individual learning situation but that over time becomes social learning.

Let's use the Ngram Viewer to construct a relevant example of how this works, using two terms – water power and hydroelectricity – that appear in books written in American English. The figure shows the terms plotted against each other for the period 1870–2000. Each has had a distinct life history. Water power was around much earlier than hydroelectricity, which is no surprise, given that dams have been used for hydropower all over the world for millennia. The term peaked in usage around 1925 and then started a gradual decline, to the point that by 2000 it had almost vanished.

Hydroelectricity, in contrast, did not enter common usage until 1905, reaching a peak in the 1950s, then dipping a bit before rising again to a peak in 1980. By 2000, it was exponentially more common than water power.

We don't want to make too much of these kinds of trends, but they do tell us something about how the public uses terms, especially how some terms stick around and others die off. It shouldn't be too surprising that the more precise term hydroelectricity, even though it never saw the popularity of the more generic and hence less precise word water power, would not experience the dramatic, steep decline that water power experienced. Of course, we would need to see the next fifty years of the hydroelectricity trend, but based on our research, the more precise a term is, the more likely it is to hang around.

All engineers and scientists can take heart in this because it means that we do not need to dumb down concepts for public consumption. We just need to be precise in what we say and define terms in words that we can all comprehend.

Social scientists and engineers

If there's a take-home message in all this, it might be that engineers and those of us in the social sciences who study human behaviour have a lot to offer each other. On our side of the fence, the behavioural sciences have long flourished by studying how traditional behaviour has been governed throughout most of human history by relatively well-informed individual and social learning. That stands in stark contrast to what is occurring today, where social phenomena can occur with unprecedented scale and unpredictability, and individuals have access to previously unimagined social connections.

Clever scientists and engineers with a message to sell can take advantage of this "big data" era by crafting messages that are succinct and carry specific information that can be repeated endlessly without loss of content. The great architect Mies Van Der Rohe famously stated, "Less is more," but we like the US Navy's rendition better: "Keep it simple, stupid." All of us engaged in selling a message would do well to keep that in mind. ■

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