Future factor

A new research project aims to take the guesswork out of predicting what technology people will take up in the future. **Con Nats** and **Debra Maynard** report.

Imagine if we could accurately predict what new technologies would meet the future needs of consumers and markets. It is a challenge that has dogged technology producers for decades because traditional market research techniques are limited in dealing with the unpredictability of the future. Yet as our societies become more technologically driven, billions of research and development dollars increasingly ride on getting the future right.

Consider the more than $250 billion spent by some of the world's biggest phone companies on third-generation (3G) wireless licences for mobile phones since 1999, with little return in sight. Even with cashed-up Hutchison Telecoms "pressing ahead when others have closed their eyes to opportunity" – according to Hutchison's stakeholder relations director, Steve Wright – many telcos are taking a wait-and-see approach with so much still invested in second-generation networks.

Some say the jury is still out on whether future demand for 3G mobile phone services will justify the billions of dollars more it will take to build and market 3G services for mobile users. However, Wright asks: "Why then have so many telcos paid the entrance fee for rights to operate?" Telstra, Optus and Vodaphone have all bought 3G operating rights in Australia and Hutchison has now rolled out 3G services in nine countries, including Australia.

"The industry fully expects that the natural next step is to move out of the sound-only dimension into sound and visuals and that in the future there will be demand … the question is when the demand is going to be there in a big enough way to justify the capital it takes to create a new network," says Wright.

This problem of predicting into the future for new technology uptake is not a new one. There have been many failures that may have been avoided if the developers had had access to more accurate methods for predicting future product pricing and demand.

There was the Sinclair C5 electric car launched in the 1980s that was promoted as a revolutionary advance in personal transport. Its developer spent more than 7 million pounds on the wrong car for the time. Around the same time, Sony's Betamax video recording tape format was said to be the best in the market, but the price was too high and it was usurped by VHS. The 1980s also saw IBM's floppy-disk based home computer, the PCjr, fail because of keyboard design flaws and competition from Apple's launch of the Macintosh.

It is well documented that producers going to market with new products fail more often than they succeed. Over the past 30 years in the US the rate of success for new product uptake has been only 7 per cent to 35 per cent, with the median success rate around 15 per cent.

A big part of the problem for technology producers and their forecasters, according to the AGSM's professor Timothy Devinney, is that traditional market research methods fail to deal with the many future possibilities that can determine how new technology will evolve and the choices consumers will make.

"For example, cast back 20 years and ask yourself how many computer users understood or could foresee that the main use for home computers would be Internet communication," says Devinney.

"No technology develops in isolation and consumers typically use a specific technology in combination with complementary products like third-party software – so you have to factor those things into your methodology to get a more accurate prediction," he says.

A NEW WAY FORWARD

A Sydney-based team of academics and computer programmers has recognised that product forecasting theory and methodology – including important techniques such as information acceleration developed in the early 1990s by a US team of marketing academics (from the Massachusetts Institute of Technology) – have progressed sufficiently to make it possible to significantly enhance existing methods and software for technology forecasting.

The team is led by Devinney, director of the AGSM's Centre for Corporate Change, and professor Jordan Louviere, professor of marketing and co-director of the Centre for the Study of Choice at the University of Technology, Sydney (UTS). The initial one-year program of work is funded by a $165,000 Cooperative Research Centre (CRC) for Smart Internet Technology grant and

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FORECASTERS
From left: Jordan Louviere, Tim Coltman, Timothy Devinney, Ben White, Steve Cook and Michael McGee.

supported by academic and computer programming services from the AGSM, UTS, University of New South Wales and University of Wollongong. The team includes AGSM PhD candidate Tim Coltman, who brings an understanding of information systems technology, and University of New South Wales statistician professor Robert Kohn.

The team's technical developers include Steve Cook, Michael McGee and Ben White, whom Devinney describes as "absolute masters" because they have been through the dot com boom and bust and understand choice modelling and experimental design.

According to Louviere, whose academic field is understanding and modelling human (consumer) judgment and decision-making, one of the biggest problems with traditional forecasting methods is that they tend to place just one or two bets, based on what the technology producers or industry experts believe will happen.

"But if you are predicting into the future, say 10 years from now, there are millions of things that could happen, and to place a bet on one or two of them is very limiting," Louviere says.

NARROWING THE ODDS

"We are taking technology forecasting to new levels by developing methods and software that integrate advanced theory and associated quantitative methods in marketing and economics that have been proven to increase the predictive ability of standard methods for marketing and technology prediction," says Devinney.

The team is drawing on the statistical modelling work of the 2000 Nobel Prize winners in economics, US professors Daniel McFadden and James Heckman. It is combining radical product design concepts with sophisticated statistical experiments, and using advanced information acceleration techniques to simulate future markets and technologies. This makes consumers sufficiently aware of future scenarios for their decisions about future product offerings to be meaningful.

The term information acceleration comes from the idea that you have a future and a product for that future, and what you want to do is accelerate the individual into that future.

How do you do this? The team creates the information, using extremely realistic multimedia techniques – ranging from advertisements and user testimonials to visual product demonstrations and media reviews – that consumers would receive in the

marketplace in the future. The aim is to make respondents feel as if they are in the future environment.

"We create a whole world of possibilities – ranging from negative to positive and everything in between – so we can see what the uptake [of a new product, technology or service] is going to be no matter what the future environment is," Louviere says.

The team's aim is to solve for producers the problem of working out which particular ways of configuring a new product or technology will be robust no matter what the future, and to figure out what people will pay for a new product.

Louviere recalls getting involved in predicting the consumer uptake of Fruche – a completely new fresh cheese product category introduced to Australian consumers in the late 1980s. The producer underestimated demand and ran out of some product flavours – which eventually allowed second movers into the market. "We actually predicted they would run out, but if we had had information acceleration at the time, we would have used it [to provide a more convincing forecast]."

Information acceleration is particularly useful for testing the uptake of technology that people are largely unfamiliar with. The team has been working with another group of CRC-sponsored researchers, under the direction of the University of New South Wales' professor Claude Sammit, which has developed a wireless Internet personal digital assistant (PDA) with speech recognition and advanced artificial intelligence capabilities.

Few people have seen this kind of voice-activated feature in a PDA, and the developers want to understand what is the likely demand for it and what consumers are likely to be willing to pay for it.

"What we've learned over the last decade-and-a-half is that when you're dealing with unfamiliar products you have to accelerate people through to the future – you have to make them aware and build a level of interest," says Louviere.

DETERMINING CHOICE

Once consumers are exposed to all the information about a new technology or product, as well as the future context in which they are likely to be using it, they are then given a range of offers from which to choose. This part of the forecasting methodology is all about trying to get people to make a comparative choice.

The methodology has to force consumers to make comparisons and decide what is the best combination for them – the objective is to force people to make a trade-off and, in so doing, reveal what they think is most important to them.

An example of trade-off in the methodology is a consumer being asked to choose between a basic PDA and one that is voice activated but which costs 30 per cent more. Another choice scenario might be the offer of voice activation on a new PDA without pen input – which forces the consumer to choose which feature is more important.

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This is the kind of choice situation the team's methodology puts respondents through to get meaningful data for predicting new product or technology uptake.

"We can analyse whether consumers purchase or don't purchase, delay or don't delay. We can also test for the likely rate of product or service usage – which is important for predicting the uptake of new infrastructure like tollways," says Devinney.

BREAKTHROUGH DESIGN

The research team employs sets of sophisticated forecasting experiments – designed to educate respondents about the future and accelerate them into what the future might look like in order to obtain meaningful data. The experiments are complex and usually would require thousands of respondents if standard techniques were used.

However, this research team has developed a methodology to streamline the mathematical complexity – which means that experiments can be designed and implemented with far fewer respondents and are, therefore, viable without sacrificing outcomes.

"What experimental design does is allow you to sample intelligently from a huge range of possible combinations – or futures in this case – so you can generalise reasonably well to those you don't sample," says Louviere.

And that's where the breakthrough in this team's forecasting lies – in its ability to develop experimental design solutions that are able to cope with, and integrate, a vast amount of multi-dimensional information.

"I developed the original science that underlies the design of these experiments – that allows one to study discrete outcomes like choosing one particular offer from a set of competing offers," says Louviere.

"The design theory allows people to study and understand how consumers are going to make choices and to derive models that will predict accurately what will be chosen," he says.

The behavioural theory – how people make these decisions – has been around since 1927. Developed by psychologist Louis L. Thurstone, it has had an unquestionable impact on the study and understanding of how people make choices. However, one of the more recent influences on the team's work is Daniel McFadden's Nobel Prize-winning theory that has made it possible for others to study and model how consumers choose among multiple product offerings.

"Prior to McFadden all we could do was study choices among pairs of options. Dan figured out how to extend this to multiple choices, which allowed us to derive models for how consumers choose among multiple offerings that are competing with each other at the same time," Louviere says.

"What I did was provide the experimental design theory that allows you to take what McFadden developed and use it to derive models from controlled experiments that systematically vary competing offers and observe how consumer choices change in response to changing features, prices, terms and so on."

The first applications of these choice experiments were carried out in Australia in the early 1980s. One of the first tasks was predicting demand for a new ferry operating between Melbourne and Launceston. "We had to predict what types of cabins, service features, amenities and prices would best compete with airlines, and we got it pretty right," says Louviere.

More recently, Louviere has been involved in work related to measuring and modelling the value of speed for new-generation aircraft for Boeing's commercial airline division in Seattle. The high-stakes nature of new-generation aircraft development is a good example of a technology sector that has a lot at risk and, therefore, a lot to gain from accurate forecasts of future demand.

OTHER UPTAKE FACTORS

According to Louviere, you can look at any product on the shelf today and reasonably ask:

'Why did they make that one – is it optimum; in fact, is it anywhere near optimum?'

"Most of the time producers are operating sub-optimally. The reason? There is really no substitute for science to solve these sorts of complex problems because human beings are pretty bad at doing it on their own," Louviere says.

However, uptake success is not just about accurately forecasting what products or features consumers will want or will be willing to pay for in the future. The success of a new product is also determined by understanding more about consumer behaviour such as delaying a purchase decision – which can be crucial in technology markets.

A classic example of the problems that consumers can create by delaying their choice is the first commercial PDA – the Apple Newton – that failed not because it wasn't good technology, but because it was offered too early. Computer experts spotted others developing the next generation (Palm Pilot) that would be faster and cheaper and so consumers waited.

"What Apple should have done was put in place multiple generations of the Newton with a plan to roll them out based on the fact that consumers expected developments in the technology," says Devinney. "By failing to do this they handed the market over to the second movers; the Newton was as good as the Palm Pilot but it didn't have sufficient complementary features to go with it."

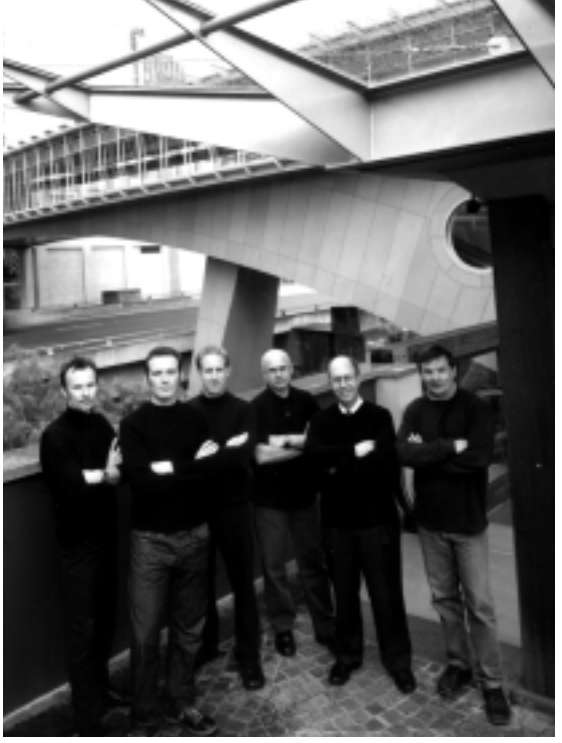
According to Devinney, the development of complementary software matters. "Take the ongoing development of 3G mobile phones. They will be heavily dependent on content, such as voice or video news, Internet search, games, inbuilt cameras and the like. But you have to know what content matters to consumers because if you don't know you can over-produce and overwhelm the consumer," says Devinney.

"If technology is evolving, improving and getting cheaper, people will delay. You can't assume that because they don't choose now that they won't choose tomorrow. Our research can deal with that because we can test consumers' choice in tomorrow's context," he says.

APPLICABILITY

"Even slightly more accurate decisions about what new technologies to invest in could result in enormous value to companies and societies," Devinney says.

"Our methods have wide applicability and capability for evaluating and testing technologies at any stage of development.



PHOTOGRAPH: FRANK LINDNER

> "We are taking technology forecasting to new levels."

"Suppose you are planning a high-speed train from Sydney to Melbourne. Some of the pricing and demand issues would include competition against the airlines and other transport options, as well as the influence on demand of things like oil and airline prices, airline structures and high-speed Web-based videoconferencing.

"If it is a costly project you are going to want to know if people will use it or the context in which they will use it," says Devinney.

Another example is home networking – the kind that Microsoft founder Bill Gates has – to allow people to monitor their houses 24 hours a day, or even have their houses monitor them. Developers want to know how much people might pay in the future and what features they are likely to want.

"But the real question is: 'What's the right configuration of these home networks for specific types of people, and what parts matter to different market segments?'," says Devinney. Individuals don't want it all – so you need the right product at the right price that can be put into ordinary people's homes.

NEXT STEPS

Both Devinney and Louviere are confident their forecasting platform is well in advance of any in the world. Earlier this year they presented their platform to academics and researchers at the Wharton School of the University of Pennsylvania in the US, who had developed their own forecasting tool called Future View.

The team also presented to and discussed current and future developments with Mercer Management Consulting in Boston, which operates a commercial information acceleration platform.

"At Wharton they were very impressed with what they saw because they were never able to go beyond the very simple automation of information acceleration," says Devinney.

The team is 12 months away from developing a 'plug and play' version of the forecasting platform, which will be adaptable across a variety of consumer uptake challenges. Devinney predicts that full commercialisation is about two years away.

"The idea is there will be a licensed product, which developers and producers could slot into very easily with standard sets of experiments.

"Ultimately, the plan is to have a software product that can be licensed to technology developers, consultants and researchers, where they can easily choose from a menu of standard experiments that allow them to understand customer response to new products and technologies.

"Right now we can build this system to meet almost any set of requirements but the future is in having a product others can use," Devinney says.

The team hopes to take the forecasting even further by using the experimental design that it has developed as a base for determining an individual's choices. The aim is to be able to predict an individual's actions or choices at any given time and for any situation based on given variables.

"What we'd like to have is the ability to literally trace out or map individuals' future preferences – so you could accurately predict whether a person would prefer this product or feature twice as much as that, pay this amount of money for that, or choose this product over that one," Devinney says.

"In the end, what we want to do is simulate the path of the product and technology adoption over time and to do so very accurately," adds Louviere. "If we can fund this next stage we will have the most advanced forecasting system in the world bar none."