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Mapping the future

by *Anna Teo*

Jack Dangermond, founder of Esri, the market leader in geographic info systems, says passion and good old-fashioned business values are behind the company's success.

JACK Dangermond is one of the world's most influential people who isn't a household name. For that matter, Esri, his company, is probably little-known outside the mapping software world that it rules. That despite Esri's technology – the brainchild of Mr Dangermond – being a driving force across a myriad functions and processes that touch everyday living.

Here in Singapore, the Land Transport Authority uses the technology to better understand commuter behaviour across different modes of transport. The Urban Redevelopment Authority (URA) employs it in a map-based application that helps users search for information to buy or lease a property. URA will also be using Esri's 3D smart city technology for urban planning and design simulation. And over at the Botanic Gardens, every tree planted is "organised" using the billion-dollar California company's flagship product.

"I'm very proud of our users in Singapore, particularly the Botanic Gardens here," Mr Dangermond tells BT. "It's one of my best GIS users here in Singapore. Every tree that they plant they put in a database, they visualise the Gardens, they do the facility management of the Gardens, so GIS is everywhere. It's interesting because there are probably a hundred major botanical gardens around the world – the big ones like Kew Gardens in England; the (Kirstenbosch) in Cape Town, South Africa; Arnold Arboretum at Harvard – they all use GIS to manage the location of their living collections."

GIS is Geographic Information Systems – the use of geography to map and analyse information, allowing one to view, understand and interpret data in many ways that reveal patterns, relationships and trends. Around the world, more than 1 million users across

350,000 organisations use Esri's ArcGIS software for thousands of purposes, with its biggest client, accounting for about half of its business, being the US federal government.

Software titan

Recognised as a pioneer in the field, Mr Dangermond is soft-spoken and unassuming, but forthcoming about the wonders of GIS, and about Esri's growth and market reach. "Most of the nations use it (ArcGIS) for just about every department – so healthcare, epidemiology mapping," he says. "NGOs use it a lot, like in conservation or humanitarian activities. Our policy is we donate our software to NGOs and educational institutions, so you get everybody from Bill Gates trying to eradicate polio to nature conservancy to small NGOs in the Philippines. At the other end of the scale, it's big transportation companies that are using GIS to do automated routing of vehicles, to retail organisations that are trying to pick the best locations for restaurants or retail stores, to utilities that are managing the wires and the pipes. So it's quite a mix of organisations."

Yet, "in many ways we're probably the largest software company that you've never heard of", he says with a soft laugh. "People just don't know us. We have, uh, approximately 9,000 employees scattered around the globe."

One gets the sense that he'd prefer to keep things low-profile, so long as Esri delivers for its customers. Perhaps untypically quiet and modest for a highly successful software titan, Mr Dangermond – who's been called, to his chagrin, "one of the world's secret plutocrats" by an Atlantic writer – has kept Esri private all these years, and not taken a cent of debt. He himself says he's just an "old-fashioned" businessman who wants only to get the work done.

A landscape architect by training, Mr Dangermond founded Esri – originally Environmental Systems Research Institute – with his wife, Laura, back in 1969 when GIS as a field had barely been established.

"I was working in a laboratory at Harvard, in the lab for computer graphics and spatial analysis, and this lab invented some of the first computer mapping and spatial analysis technologies, it was the predecessor to what we call GIS today. My colleagues and I were very excited about it but I had to go back to California for personal reasons. When I got back I wanted to (continue) this kind of work – spatial analysis and its application to various kinds of decision-making. When I was still in school (at Harvard), both my wife and I thought very strongly about what we wanted to do, and it was to use computers and quantitative methods to be able to respond to challenges in the environment, to land use planning. At that time in the 1960s, it was sort of the birthing of the environmental movement, so everybody was conscious about the challenges that the environment was facing but nobody had any methods or tools to use, and I saw this computational geography approach as an interesting platform that we could invent and apply to different problem-solving efforts that people talked about a lot."

Esri was started in Redlands, California, on a US\$1,100 budget "largely around little projects – people would give us a contract to study a watershed or pick the best site for a location like a new town or a power plant or do various environmental studies, land use plans", he says. "Gradually, over about a 10-year period we invented new tools, and people began to want them, and we grew the company up to about a hundred people doing consulting business, project by project."

At around the 10-year mark, Esri decided to package its ideas into a product. "At that time Microsoft or Oracle or Autodesk, all these big software companies, didn't exist so we were kind of pioneering the idea of software as a product. And in the beginning it was a very modest product called ArcInfo, run on mini-computers. Later it became called ArcGIS, which was a much larger platform, but this idea of expressing the trade craft of environmental or geographic planning in a product was the cornerstone of our vision, and we began selling it to planning agencies, environmental companies, forestry companies, first in the natural resources and environmental areas, and later in running whole local governments. Then later whole nations would buy these tools, and then later businesses – people like Starbucks or Target or McDonalds; they use GIS as a foundation for being able to make decisions about location or understand the impact of their work."

Most Esri users employ the software as specialised implementations for particular functions. "Say, for example, Singapore Power

uses it for managing their network assets here. But increasingly, people are using ArcGIS as a platform across the entire enterprise. In the past our tools were quite difficult to use but in the last couple of years we've created a new Web GIS platform which is very simple to use so that anybody can make maps in their organisation on their iPad and on their browser and they can share maps, almost like email. Most people now are familiar with Google Maps because it's a consumer kind of technology. We've taken concepts of that very easy to use, do-it-yourself mapping and implemented it in our enterprise systems so that while some people will be sophisticated and do database management and heavy-duty analytics, other people want to just use the platform to make simple maps on their mobile devices or on browsers."

With Web GIS, the number of GIS users in Shell, for instance, surged from 400 specialists to more than 10,000 employees, who "are using maps to spatialise spreadsheets and map out everything", he notes. And because the information is now easily accessible by "everyone in the organisation" via simple Web tools and mobile devices, "they can take GIS out on the field, do field data collection on these mobile devices, put it in their enterprise systems and they capitalise on this across the enterprise", he says.

"Now this is a trend, this idea of going from a few to many users inside of organisations – and that's what's growing our business dramatically. It's not just happening in government or in the private sector, it's happening in many organisations, and it's only beginning. What Google did with consumer mapping opened people's eyes... "Hmm, I'd like to map this, I'd like to map that'. But what we do is provide enterprise software that allows people to do that inside of their organisations.

"So that's been the evolution of our company: from mainframes to minis to workstations to PCs now, and to the Web and tablet apps, and with every one of those steps our user base has grown by orders of magnitude. This last one is really a big jump, these sorts of cloud-based mapping technologies that we now have are becoming very popular."

What GIS advances might one expect to see? Mr Dangermond points to a few areas.

"The first is realtime content – as we evolve, we are measuring everything with more geographic specificity. Sensor networks are wiring up the planet, like a nervous system of the planet, and that measurement system is going into the Web as Web services, and GIS is becoming realtime in its use. The second one

is that GIS is becoming 3D. So instead of a 2D map, I can look at the full virtual city, the smart city.

"There's also this third dimension – from satellite we're able to take more and more imagery, not just snapshot pictures but also full motion video from platforms like on the space station. So on the content side, we're moving to a world where virtually everything that changes will be measured and all of those measured will be fed into GIS databases through the Web. And then what can we expect out of that? Well, the software technologies are evolving to be able to handle realtime processing of those measurements, like geo-event processor technology which we've just released – geo-triggers. Like when I'm getting close to something, a message is sent, or if two trains are coming to each other and they might crash, the GPS measurements will alert something and things will shut down."

Privacy concerns

There's also geodesign, where "we can interact with smart virtual cities and do design work where we can test different buildings or configurations of buildings and understand the consequences of different designs almost immediately", he adds. "So those are three big ones for me - measurement, analytics and geodesign."

But sure, there are "a lot of policy issues" in GIS usage, Mr Dangermond acknowledges when asked about controversies around the misuse of GIS information and privacy concerns.

"It starts with simple policies about data-sharing. Some countries are very restrictive about letting mapped information be available to the public, and other countries like my own put all geographic as well as other data into the public domain purposely. I've seen a whole spectrum of policies about the sharing of data." There's no evidence in the United States of any link between an open data policy and risks of terrorism, he notes. "People who want to blow things up, if they are terrorists, can do so without maps or geographic data just as easily," he says. "So I'm quite a strong advocate of open data and open data sharing, and we see that as a movement all around the world."

As for information misuse, he says: "People have lied with statistics, and they have lied with maps since the 15th century, and there is no difference now with digital maps, but I have not seen a lot of it. In my experience people are very ethical with respect to their modelling and representation. In GIS, I've really not

ever in my entire career come across a situation of evil misleading misuse of GIS technology. I don't know why that is, it just has not really been something that's shown up. But the potential, of course, is there but I don't like to think too long about that."

He doesn't think privacy issues are a major concern either. "We are moving increasingly to a society globally where we have digital profiles about each of us – what we buy, what we look at, what we read, what we observe on the Web, and also where we hang out, and that's enabled not so much through GIS, it's GPS... information about personal characteristics of us as individuals. I don't really have much to say about it, only that that's the process that we're going through. Does GIS invade privacy further? Perhaps, by overlaying GPS data on top of other demographic data, on top of other property data, people might be able to find more about us as individuals. I haven't seen, again, the evidence of that, but I'm sure it's potentially there and probably in the deep, dark bowels of companies like Google or Microsoft, that kind of analytics is going on."

Long ranked on Forbes's list of billionaires, Mr Dangermond – whose Dutch immigrant parents, a gardener and a maid, ran a plant nursery in Redlands – brushes aside speculation about his net worth.

"We are not (wealthy people)," he insists. "If you monetise Esri, it's worth billions, but we have no intention of monetising the organisation; in other words, taking it public. I've had the luxury of being able to keep it private because I started in a very conservative way, never borrowing money, and that meant I've never had to leverage either venture capital or the banks to run the organisation. That has been wonderful for me because I could focus on what my customers need rather than what stockholders need or venture capitals need."

His philosophy has centred on the value of being "a private organisation if you have a public mission", he says, "and that is pretty much what we have – a focus on our customers and making them satisfied, as opposed to a focus on stockholders and trying to meet their financial requirements".

He adds: "So as we evolve the software, we keep listening to customers, they tell us what they want us to do, we work on the product and we get it back to them, that's the relationship, and they pay us to do that. I don't claim that everybody can or should do it; I'm happy that there are people that run with public companies or take venture capital, that's

one way to do it. But I would like to encourage young people to follow my model, or at least look at that model before they simply take venture capital and sell out so that they no longer can concentrate on the idealistic goals that they really started their business with. Venture capital compromises typically young entrepreneurs' ambitions quite severely."

Grounded in values

As far as Esri's concerned, "I basically would say, we're old-fashioned business people who keep this business going and growing; at the same time we're pushing the frontiers of the technology, so it's an unusual old-fashioned kind of business style", he says.

"Most people can't do it or they're too greedy to try this kind of method or they have other objectives. We do our work, we focus on our work, and we like our work. For us, by holding on to that values set, it's been very effective for us being able to be successful."

Indeed, he pauses a good while when asked what he does for leisure before saying with a little chuckle: "I don't have leisure time." He

then adds: "Well, I grow oranges and avocados, I live on a farm. I plant a lot of trees, several thousand trees every year; I restore landscapes, I design parks, things that I like to do on the side."

And he firmly dismisses any notion about being "the brains" behind Esri. "Oh no, I've never been the brainpower; there're literally hundreds of very, very smart people in this organisation," he says. "People always want to find a hero. I think in my case, this is a network of very smart people and we've been able to attract and keep this team for many, many years, and new ones keep coming. I like to think of it - my contributions are some raindrops in a watershed, with lots of other raindrops that make a river of change. I certainly don't have the feeling that I'm either a strong manager or have that kind of power. It's much more of a team culture, and that's very important, of course, because I will die, things will change but I think our organisation and its support with our users will remain intact."

Esri in the future, he maintains, "will continue pretty much the way it is right now".