

Megatrends of the future

The global forces affecting automation innovation

Glenn Johnson

There is no doubt that the changing face of the world manufacturing industry is presenting enormous challenges and opportunities to the automation and process control industry. Can we in Australia be innovative enough to continue to prosper while meeting our environmental and social responsibilities in the future?

As editor of *What's New in Process Technology* I recently attended the user conferences of two of the major automation industry vendors, Citect and Rockwell Automation. The 'Citect Connects' User Conference and Rockwell's 'RSTechEd' were both held in August.

In his address to the Citect User Conference, Lionel Finidori, Pacific zone managing director of Schneider Electric, said that his company sees a future where we all need to achieve more by using less of our common planet. While productivity and efficiency are always important issues, it is also now really a question of survival — survival not only for business in a competitive global environment, but also survival of our planet and our environment. He identified four key world 'megatrends' that impact the process automation industry:

- **Energy and sustainability** — Schneider expect energy needs to double in the next 30 years, so, to keep an even carbon footprint, efficiency must improve by 50%.
- **Growth driven by new countries** — China, India, Brazil and Eastern Europe are driving growth, and the impact of this in Australia has been seen in its effect on the resources sector.
- **Everyone connected, everywhere, at any time** — The global trend towards the internet being accessible everywhere will have an impact on how we perceive automation, and this is extending now also into other areas such as buildings, infrastructure and even housing.

"Today, China is the world's leading manufacturing country, and is changing the face of manufacturing. Chinese manufacturers are able to produce manufactured goods at costs much lower than in the western world."

- **Simplicity, quality and ease-of-use** — Customers are looking for ways to simplify the use of technology, as consumer products such as the Apple iPhone set new paradigms for ease-of-use in their respective technologies.

These trends are translating into an evolution from the traditional customer needs of safety, reliability and performance into new customer needs for solutions that drive the business outcomes required today and into the future.

Resources, labour and knowledge — where is the labour?

Jim Pinto, industrial automation commentator and futurist, had a great deal to say about what changes may be coming up in the

world manufacturing scene in his keynote address at the Citect conference. He pointed out that while Australia is ranked number 53 in size by population, it has the 14th highest GNP, which means that our per capita wealth is very high. We also have all three of the major ingredients for creating wealth: resources, labour and knowledge.

In contrast, the Middle East (where Dubai has the highest per capita income in the world) has valuable resources, but out-sources much of its labour and knowledge, leaving it in an unsteady position if the value of its resources were to decline.

Today, China is the world's leading manufacturing country, and is changing the face of manufacturing. Chinese manufacturers are able to produce manufactured goods at costs much lower than in the western world. Many people in the first world believe that this is because Chinese labour is cheap, but this is not so, argues Pinto. We must remember that many of the major industries — manufacturing, food and beverage, pharmaceuticals, mining and infrastructure — that drive a country's economy today use a great deal of automation, and even if labour costs are low, labour is often not the most significant cost in the process. China still faces the same raw materials, infrastructure and energy costs as any other country.

According to the Society of Manufacturing Engineers, the world as a whole lost 22 million manufacturing jobs between 1995 and 2002, mostly due to greater automation. Of these, 15 million were lost in China alone, while the US lost two million for the same period.

Van Rafael, head of Rockwell Software



Asia-Pacific, also pointed out at RSTechEd that in real terms there is a strong trend towards a reducing labour market in many significant parts of the world. In first world countries this is mainly due to declining and ageing populations, while in China it has been due to population control laws. The number of people in the 15-19 year age group in China has peaked and is beginning to decline, resulting in China facing a 50% reduction in its entry level workforce within 15 years. Combine this with a rising standard of living, and China's labour cost advantage is being rapidly reduced.

As a result of all this, the automation industry has seen significant business growth in China, but the cost of manufacturing in China is not significantly lower than elsewhere.

So why are Chinese goods still cheaper?

The Achilles heel of capitalism

According to Pinto, the Achilles heel of capitalism is its need to constantly grow and increase profit. Success in capitalist economies is judged by how a company grows, quarter-by-quarter and year-by-year. Companies that don't continue to grow don't attract investment. In the first world, and particularly in the USA and Europe, this focus on profit growth means that product gross margins can be as high as 60%. In Australia the average is more like 40%.

In contrast, the average gross profit margin in China is 10% or less, and profit is often zero. China is not a democracy, and they can run at a loss if they want, or the government can inject funds. They also do not take on business that does not have high sales volumes, and so they can sell

their goods at a price that first world corporations cannot compete with. China understands the Achilles heel of capitalism.

What is different between first world businesses and those of countries such as China and India is a different mindset when it comes to profit and wealth. Pinto points out that most western corporations are still persisting in the paying of exorbitant salaries and 'golden handshakes' to senior management, as if they will do more if they are paid more. As China and India become more successful, this model will eventually prove unsustainable, he argues.

With some of the emerging 'megatrends' we are faced with today — environmental issues, new economies — it is difficult to know where we need to be focusing technological development. Where will the next 'big idea' in industrial automation come from?

Predicting the future

Predicting the future is hard. Pinto said it is necessary to remove the "rear-view mirror":

"The world is driving faster and faster while looking into the rear-view mirror. On a long straight road this is OK, but when the road curves, there's no use looking in the rear-view mirror because you can't see anything — it has changed", he said.

Van Rafael called this "linear thinking", which is where we create ideas sequentially, imagining a future only in the context of the information we have today. He used some famous quotes as examples of how linear thinking prevents us from seeing opportunities (see sidebar).

Rafael used the example of Arthur C Clarke, the famous sci-fi author and futurist. In 1945 he proposed the use of communication satellites in a geostationary orbit, which is now known as the Clarke orbit in his honour. Clarke once said that in predicting the future, "the only way of discovering the limits of the possible is to venture a little way past them into the impossible". In other words, he is encouraging us to look past our linear thinking and imagine how, through innovation, we can change our world.

Alvin Toffler was another famous futurist who in his 1970 work *Future Shock* predicted that "we are moving swiftly into the era of the temporary product, made by temporary methods, to serve temporary needs". If we look at today, do we repair clothes or shoes much any more? Do we repair our mobile phones? They are cheaper to replace than repair. Will the Tata Nano, the Indian-made \$2000 car, be thrown away or repaired? According to Rafael, the world is consuming more than ever before, faster than ever before, and if the manufacturing industry wants to keep up, we are going to have to know how to innovate.

Innovation inflection points

Pinto referred to inflection points as points in history where a major innovation came about. Examples are the invention of the steam engine that helped kick off the industrial revolution, the invention of the car, and the development of the internet. Following the impetus provided by the inflection point there normally is a long period of gradual improvement to the technology that was created at the inflection.

If previous cycles are anything to go by, then we are approaching another technological inflection point. The question we need to ask ourselves is: 'Where will the next great idea come from?'

Famous examples of linear thinking

"I think there is a world market for maybe five computers."

Thomas Watson, chairman of IBM, 1943

"We don't like their sound, and guitar music is on the way out."

Decca Recording Co explaining why they were choosing to reject the Beatles in 1962

"There is no reason why anyone would want a computer in their home"

Ken Olson, CEO of DEC, 1977

Certainly not from minds that are “looking in the rear-view mirror”, as Pinto says.

Knowledge is power

Some kinds of knowledge are very powerful, and that knowledge is stimulated by information. In recent times, a great deal of technological knowledge has been embodied in software — we could call software ‘embedded knowledge’. And thanks to the internet, information can be shared with anyone anywhere, and knowledge work can be done anywhere. The old paradigm that the ideas come from the powerful first world countries is dead.

India is a classic example, with the software development that has been outsourced to workers in India over the last decade. The fastest growing software company in the world is Infosys in Bangalore. Pinto asks the question: “What if only 2% of Indians are very smart, creative people? That would be a greater number than the population of Australia.”

So what knowledge do we need to create the next revolution in automation technology? And how will today’s emerging technologies influence the future of plant automation?

Connected everywhere, all the time

As Lionel Finidori pointed out, we need to monitor our energy consumption all the time, we need to be more competitive in a changing global environment, and we need to be connected and

informed all the time, with information from anywhere as needed, with simplicity and ease-of-use. So how big can an automation system be?

Citect has a site with half a million points of input, but now more sensors are becoming wireless connected. While current estimates of the world market for computers are about 12 billion, how many sensors will there be? Possibly trillions?

With new intelligent wireless sensors, it is becoming cheaper and easier to monitor more points and collect more information all the time.

With today’s technology, it is probably not possible to scale to a network of, say five million points. Pinto points out that the current technology that still uses PLCs and deterministic architecture, a 30-year-old technology, will need to be replaced with something that can deal with millions of independent intelligent sensors non-deterministically. Modern sensors are becoming smarter. Why would we need to monitor them all continuously, when devices with predictive diagnostics can tell us when they are in need of repair or maintenance? He goes even further to suggest:

“Why do we even need the software to talk to a human operator? Why not let the machine talk to another machine? The internet is becoming pervasive, and with connectivity comes productivity. And do the Chinese know this? Yes they do!”

There is one thing that all this new technology can provide,

and that is the ability to capture, integrate and present many types of information in new ways. As Van Rafael points out, “This creates new insight, which in turn allows us to react quickly, with higher confidence, to the rapid-fire changes occurring all around us. The result is less time focused on how to get the right information, and more time acting on it. This frees us to imagine more of what’s possible, and maybe even circumvent linear thinking to find solutions that can help us do more, faster.”

What if a manufacturing executive could prioritise the information they need each day, as easily and quickly as adjusting the equaliser on an entertainment system? Or what if — instead of measuring and analysing OEE — a ‘downtime advisor’ could proactively detect, escalate and identify the most likely cause of pending equipment failure? Or how about a tool that takes feeds from various production and business sources to create a handheld, real-time risk management device? Van Rafael of Rockwell Automation believes that these things are possible today if we apply the new technology we have in the right way.

Conclusion

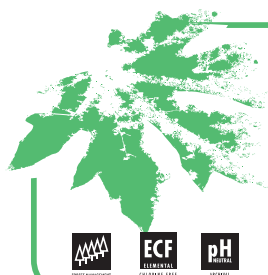
There is no doubt that the changing face of the world manufacturing industry, and the ‘megatrends’ that are driving innovation present enormous challenges and opportunities for the automation and process control industry. Australians have a history of being able to respond and innovate when the ‘chips are down’. Can we do it again? Can we make effective and creative use of the technology we have today, and the technology that will come in the near future? Can we be innovative enough to hold on to our present level of wealth while meeting our environmental and social responsibilities in the future? Only time will tell.

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