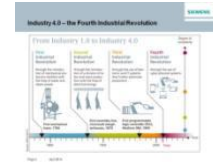




Good morning all and thank you for giving me this opportunity to speak on such a critical topic. We truly believe that Australia should and can have a successful future in manufacturing. And right now we are at a critical crossroads and we need to take urgent action.

Today I will share with you Siemens' thoughts on the topic of Industry 4.0 and how this is a ***journey*** rather than a discreet point in time.

But first, what is Industry 4.0?



Put simply, Industry 4.0 is a term used to describe the 4th industrial revolution. The first was mechanics and steam; the second mass production and the third electronics and automation. The fourth is a move to what we call cyber-physical where we will see:

- the merging of the virtual and physical worlds
- where products will communicate with production lines
- where production processes will be distributed, independent and self optimising, and
- where we will see personalised mass production.

What does that that really mean for the way we do business and to what it will look like for consumers?

I want paint a picture of just one scenario of what Industry 4.0 may look like for consumers in the not too distant future:

BMW – story



Cast your mind back to 1985 - and also the year that I'm pleased to say Essendon trounced Hawthorn in the grand final!

If you were looking to buy a BMW, there were about 3 model series with around 20 models – plus a choice of a few options.

Fast forward to today...



If you go onto BMW's website, you'll find more than 12 model series with over 100 individual models with an almost endless array of options. Is this ***personalised mass production*** that I mentioned earlier? No.



With Industry 4.0, you'll go to the BMW website, enter the 3D modelling software program, and within set engineering parameters for safety and aerodynamics, you can select and tweak a design which will be unique in the world. With a click of a mouse, for instance, you could flare the guards and put a slight bonnet bulge for a more aggressive look.

The integration of the virtual and real world will allow these processes and real-time adjustments in the production line. I'm not saying that this is the path for BMW, but what I am saying is that this is a very real and achievable future if you consider the pace of technology development we're currently experiencing. This is personalized mass production.



Industry 4.0 is about addressing common challenges of increasing **competitiveness**. It's about helping businesses become more nimble, adaptable and intelligent; from design to prototype to production and throughout the entire lifecycle – with rapid innovation cycles. So industries can perform faster, better and produce more with fewer resources.

However, Industry 4.0 is not a point in time or a piece of software. It's a concept to describe the future and it's probably going to be a 20 year transition. Therein lies the urgency for Australia.



Many advanced technologies are available today and companies such as Ducati and Cannon investing in the latest technologies (early adopters) are already seeing outstanding productivity and efficiency gains – including halving times from design to production.



The development of the F35 Joint Strike Fighter JSF is a good example of the challenges of manufacturing of the future.

It's a true global supply chain and the collaboration challenge is of unprecedented magnitude:

The aircraft is being built by a Lockheed Martin-led coalition of leading military aircraft manufacturers and suppliers around the world who must work as if they are one contiguous enterprise.

- There are three primary partners
- They are supported by up to 600 suppliers.
- Production is spread across more than 30 countries, spanning 17 time zones.

Coordinating their efforts and fostering collaboration across the companies with dissimilar development environments is a critical challenge. The common platform is Siemens PLM.

This example is reflective of what large global manufacturing is starting to look like and as I've said previously, Australia needs to find its place in the global supply chain.

With Industry 4.0 we will also see the 'Internet of things and services'

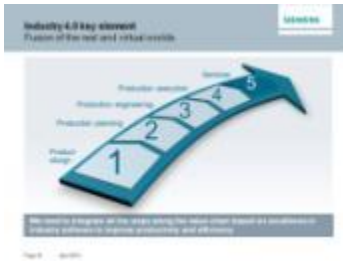


We're all familiar with the internet of people but now with intelligence being built into all sorts of products, devices and services, the world of Industry 4.0 will be incredibly "smart and networked".

This transformation is leading to the emergence of smart grids in the field of energy supply, smart logistics and smart health.

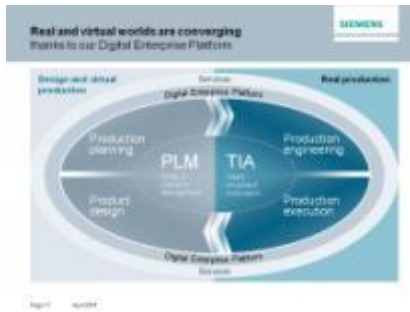
This completely changes the manufacturing environment.

In Industry 4.0 we will also see convergence of all stages of the production process.



It's moving from linear discrete steps to one merged and integrated unit in the virtual world.

Siemens is transforming their own business to reflect this integration of production steps.



You can see here how Siemens views the integration of real production and virtual production. But this is not just rhetoric or a model on paper...



Since 2007 Siemens has undertaken an aggressive acquisition program investing over 4 billion dollars into software companies, with the aim of enabling a real-life digital depiction of the value chain.



Through complete integration of the individual steps it will be possible to achieve advances in productivity. Without this, any possible productivity gains in manufacturing will taper off.



Industry 4.0 is also being realised in our own factories. Siemens is in a unique situation in that we are one Germany's largest manufacturers and we are also manufacturing things designed to improve the efficiencies of others.

Take for example our Amberg electronics plant in Germany. This is one of the most advanced production facilities in the world. Products already communicate with production machines and IT systems control and optimise all processes to ensure the lowest possible defect rate. This is where we produce programmable Logic Controllers (PLCs) - devices used by our customers to automate their machines and equipment. The factory produces one control unit every second with a production quality of 99.9988%.

But in the future world, new skills are needed

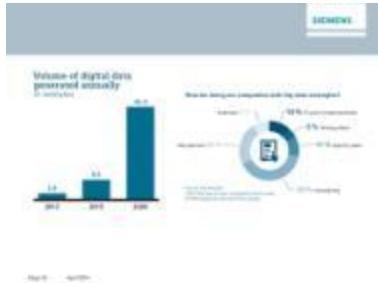


This new future of advanced manufacturing and Industry 4.0 needs new skills. The common tool of trade for a manufacturing worker is more likely to be a computer tablet than an impact driver. The proportion of the value of the software component will continue to grow. According to the Australian government's 'manufacturing workforce study' released in April this year, ... ***'success in this new environment will require new and higher level skills, particularly science, technology, engineering and mathematics.'*** What they're calling 'STEM' skills.

Our experience in Australia is that we see a general knowledge gap in engineering already. Siemens invests over \$6 billion in R&D each year globally, continually developing new technologies - so it's difficult for universities to be up to date by the time they produce their engineers. That's why we offer regular training programs for young engineers from our EPC partners to ensure they're familiar with latest technologies that they can't get from a text book.

If we dig a bit deeper in Australia and compare ourselves to Germany, we have only a relatively few types of electrical engineers. By necessity we are generalists, whereas in Germany they have 7 main electrical engineering degrees in different categories. There are around 200 Universities running different flavours and specialties of those degrees. Students can choose out of 220 very specialized engineering titles just in electrical engineering.

And another skill needed by our future manufacturing workers is how to work with Big Data and use it to enhance productivity



In 2003, it would have taken 1000 years to produce 5 billion gigabytes of data. In 2013, the same volume is generated in 10 minutes. Modern production facilities are generating more and more data. Gathering and storing data is the least of the problems. The real challenge is turning the bits and bytes into meaningful information to enhance productivity.

Six trillion gigabytes of information will be produced this year (that's a six followed by 21 zeros!). For the uninitiated amongst us, the term for this is zettabytes. This volume is expected to double every two years.

Any business that wants to use big data to achieve a competitive advantage needs special IT tools – and highly qualified experts. In Germany Siemens is a founding partner of the Smart Data innovation Lab which started this year. Here the manufacturing industry and academia are doing research into turning big data into smart data.

What does this mean in a practical sense? Well it's a key part of the journey to Industry 4.0 and becoming more efficient and competitive. With big data turned into smart data we can offer customers predictive maintenance as a service, and predict potential component failures and replace parts just in time to minimise productivity loss and downtime. We've seen cases for example in the mining industry in Australia where unplanned downtime due to product failure has negatively impacted the share price.

From Siemens' point of view, we are seeing tremendous potential in some initial projects; for instance, 8,000 gas turbines all over the world deliver data about their status online to a Siemens computer centre, where suspicious patterns are detected and impending failures are reported. Another example is in the field of medicine where big-data algorithms can reveal connections between the data in diagnostic imaging devices like MR scanners and doctors' findings, and then derive treatment recommendations.

But again one of the biggest challenges will be a lack of skilled experts in these areas. This is something that Australia should be looking at right now.

What's the government's role in all of this?

It's probably a good idea to look at what other governments are doing around the world. Here are just a few examples:



Europe: There is a strong focus on SMEs because they're recognised as growth engines. They also often lack the resources to make use of the latest technologies. The European Union's Factories of the Future program is intended to change that – backed with funding of €1.2 billion. Some 80 projects are already under way, many of which involve digitalization of production. This is only part of the massive 'Horizon 2020' program which is the most expensive research and innovation promotion project ever funded by the EU. It will run from 2014 to 2020 with a budget of €70 billion.

€17 billion has been set aside for innovation in manufacturing including developing information and communication technologies, new materials, nanotechnologies, advanced production systems (Factories of the Future), and other technologies.

In India: they have a **National Manufacturing Policy:**

- with National Investment and **Manufacturing Zones** all over India with modern infrastructure and less red tape
- Target Manufacturing GDP increase from 16% to 25% by 2025.

In the US, they're building a National Network for Manufacturing Innovation - 15 research institutions across the nation. And **in the UK** they've set up 'Catapult centres' – a network of leading technology and innovation centres.

So what can our government do?

There is a lot that can be done and the research report today points to some great initiatives and recommendations. Here's my view.



Clear & Positive Vision

First, articulate that they want to have a strong industrial & manufacturing sector in Australia – after all it employs almost a million people and contributes around 10% to our economy.

Second, **Incentivise technology investment.**

I believe many Australia companies are holding back because they're not confident to invest in something that may be beyond a 2 year ROI.

Policies and Incentives should encourage certain behaviours and actions. I'm not a big believer in handouts but I do believe there is a role in policy including tax policy to encourage technology investment which is critical to the future success of any industrial or manufacturing business. Global companies get to choose the most fertile ground for their investment and we need them to look at Australia. Special conditions could be put in place for:

- Investment into advanced manufacturing and related industries
- Productivity upgrades through technology investment

- Energy efficiency upgrades.

In terms of energy efficiency, we know that electricity prices have risen by as much as 70% over the last four years. Now we face the next challenge of gas prices rising from around \$3 to \$11 in a similarly short time. The cost of gas and electricity in almost any industrial operation is somewhere between 20% and 60% of their operating costs. We can dramatically reduce these through technology upgrades but in many cases the ROI will be beyond 2-3 years and companies need a way to bridge the gap. Smart government policy and programs can assist.

For SMEs you also need to make it really easy to access programs. The complexity of navigating state, local and federal and departmental programs can be just too difficult for SMEs who don't

have the resources and expertise. A unified approach across all governments and State borders is critical. Even the EU is doing it with the €70 Billion Horizon 2020 program I mentioned. Australia should be able to do the same!

Other things are obvious including removing red tape and of course we need policy certainty. Companies don't make decisions when there is a cloud over their head. With short government cycles and policy reviews it can be a trap that policies may only last less than half a term of government – but company investment cycles need to be longer.

In his address to the Sydney Institute this week, Prime Minister Abbott said 'Governments should do what the people can't do for themselves.'

But in terms of being an infrastructure government, they do need to take every opportunity during the development of projects to ensure that they leave us not only with the ***physical*** infrastructure but also with the ***knowledge and skills*** that makes us more competitive as a nation in other transferable areas. If we take for example the area of defence and the future submarine project, one option may be to buy off the shelf from another nation. Another would be to look for local manufacturing content and hence build capability in areas that reflect the future of manufacturing.

Living within our means is important. However, **saving** money does not equate to generating **income**. Investment is the basis of all business growth and we're at a 25 year low in manufacturing capex investment right now! It's important to remember that things such as Social welfare can only increase sustainably if it comes from income that's been generated in the first place.



In closing, I'd like to refer to the example of F1 which I think has a lot in common with the ***Journey to Industry 4.0.***

1. The competition in F1 is global
2. We are definitely in a race to Industry 4.0
3. It relies on continual investment in technology just to stay in the race – waiting for Industry 4.0 before making investments would be a disastrous error.

Thank you.

[ends]