**Flinders University**

Fearless Conversations

Episode 7 – Advanced Manufacturing  
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**SPEAKERS**

George Freney, Sharon Wilson, Cameron England, Professor John Spoehr, Audra McCarthy, Anthony Kittel

**Cameron England** 00:09

Good morning all, my name is Cameron England business editor at the advertiser, and I'd like to welcome our virtual audience to the seventh fearless conversations event. This series is a collaboration between the advertiser and Flinders University. And it's about being brave enough thinking about how we drive South Australia forward and challenge ourselves to position this great state for success. Topics being discussed over the 13 weeks of the programme include high tech innovation, tourism, infrastructure, education, health, and more. For each discussion, we have assembled a group of thought leaders to pose a series of questions to in order to explore their views on the opportunities and challenges we have in relation to each topic. Today we're exploring manufacturing. Naturally, manufacturing has played a huge role in our state. However, in recent years, it's been a seismic shift, with the winding down of car manufacturing in concert with the surge in investment in advanced manufacturing, defence and space, centred around hubs such as the tonsley innovation innovation district and Lot 14 in CBD, and Edinburgh and down Osborn at the shipyards. You can feel free to join the conversation through Twitter using the hashtag fearless conversations, or in the comment section at advertiser.com.au. Before I introduce today's panellists, I would like to acknowledge that we are meeting on the traditional country of the Kaurna people of the Adelaide plains and pay respect to elders past and present. We recognise and respect their cultural heritage beliefs and relationship with the land. We acknowledge that they are of continuing importance to the Kaurna people living today and we also extend that respect to other Aboriginal language groups and other First Nations. Now on to today's discussion. Today, we are joined by BAE systems maritime Australia continuous naval shipbuilding strategy director Sharon Wilson, Flinders University, Flinders University's pro Vice Chancellor research impact John Spoehr tech entrepreneur George Freeney, Audra McCarthy, Chief Executive of the Defence taming centre, and REDARC Managing Director Anthony Kittel.

**Anthony Kittel** 02:14

Morning Cameron.

**Cameron England** 02:17

I've spoken to john over many, many years about manufacturing in South Australia. JOHN, you've done a huge amount of work in this area. So maybe you can help us set the scene. So advanced manufacturing was seen as a key growth area in the state's economy, following the whole enclosure in 2017. And Mitsubishi earlier than that, how successful has transitioned been from traditional to advanced manufacturing, and high tech industries over the past, say, four or five years or so?

**Professor John Spoehr** 02:45

Yeah, morning, Cameron. Great to be here. But manufacturing has always been central important to South Australia. But of course, we've experienced some really challenging times over the last decade or so with the closure of the automotive industry. at a time, we had over 100,000 people working in the manufacturing industry here in South Australia. So it was a core industry here in South Australia generating lots of high value, high skilled jobs, and was a significant contributor to GSP. We took a hit, everybody knows that when the auto industry closed, and we will be forced to then look at where to from here. And I think the position we're in at the mind is that there's no consensus, I think, in South Australia, and nationally, that advanced manufacturing is fundamentally important to the core of an economy. This idea is or the idea is that what you make is what you know. So it's fundamentally important to engage in manufacturing because in the 21st century economy, it is a driver of and it continues to be a driver of, of knowledge intensive economic growth, and employment. And many of the people we've got around the table here today are involved in businesses that will be at the forefront of the resurgence of manufacturing, following the closure of the automotive industry and particularly in areas of space, where we can expect significant growth, shipbuilding, obviously, is going to be a major driver of growth in advanced manufacturing, consumer electronic goods, recreational vehicles, the grey nomads, I'm sure, Anthony will talk a little bit about that in a while, but we've got a range of of businesses that are positioning themselves for growth and advanced manufacturing in the 21st century. And that's very, very, very, very important if we maintain the sorts of living standards that we've come to enjoy. And what we know more than most other states, I think, is that manufacturing is the foundation to higher living standards, because it's only through manufacturing that you maintain high levels of investment in research and development. Manufacturing is the most research and development intensive sectors of the economy. So we must recognise that So it's terrific that we've got consensus in Australia and South Australia about the importance of advanced manufacturing. And we've got a lot of support going towards trying to accelerate the growth of advanced manufacturing over the next decade. And what I'm hoping we're on the cusp of is, is a nice Ops, if you like, of manufacturing in Australia,

**Cameron England** 05:20

and I might get a bit of a an explanation about industry 4.0 and related technologies, I guess AI robotics and additive manufacturing, perhaps Anthony and Sharon, what opportunities does the change in technology and these new technologies offer for your business? And, and what sort of roles and maybe products does that bring in for you?

**Anthony Kittel** 05:43

I think john hit the nail on the head that, you know, manufacturing is thriving through investment in r&d. And I guess through that investment, there's a whole range of jobs being created and manufacturing that probably didn't exist five or 10 years ago around data science, augmented virtual reality, robotics, all these sorts of things that are, I guess, enabling us as a low to medium volume, high value added industry with the aim of exporting. I think that's really the key is that we're not focused inwardly we're focused outwardly diversifying our business in lots of different market areas, which is exciting for young people coming into this industry, apprenticeships, traineeships degrees, Masters, all the different qualifications that we need in our, in our businesses. So really exciting time to be joining manufacturing,

**Cameron England** 06:36

and Sharon what does manufacturing look like for BAE? They might be a traditional view of shipbuilding as cutting steel, but obviously there's a lot more to it digital twinning things like this, what does it look like for your company?

**Sharon Wilson** 06:48

Something I agree with, with Anthony, you know, what, what we're seeing is a change in the kinds of people that actually part of manufacturing and, you know, people who might have gone to university, or going to trade would say that, that their skills and the knowledge that they're actually developing is can be used in a manufacturing environment where there might not have seen that before. You know, when we talk about creating a digital twin, for example, you know, we might start with the engineering with the design. But that flows all the way through into manufacturing, you know, one of the things that I like to refer to is, you don't want to capture knowledge. So if we've got, let's say, a fitter working on a ship, in the old days that might have put together something, had a bit of difficulty, might have told his mate that was really hard to put that together. But that was it. And then 910 years later, when the maintenance person who was pulling that apart, had exactly the same problem. Well, today, that worker can talk to that future maintainer, by capturing that data as part of the digital twin and a part of the information. So that information lives on beyond the task that that person is doing on the day. So I think we've got a very different connection for like, from the people in the manufacturing the products, right through life, in terms of how those products are operated and maintained, going forward, that's very different. I'm going to answer this point, that's got to be exciting for people who are working in our industry, to say, I'm not just doing this task, I'm actually part of the whole infrastructure that provides the support and the products to our warfighters.

**Cameron England** 08:32

And as part of the job of people like us, I guess, communicating the jobs in manufacturing, and what we might have thought of, it's not production line. And, you know, he was industries as it might have been 30 years ago, but it's actually, you know, a lot of design, some very high tech jobs, additive manufacturing, 3d printing, is that part of the role that you have to try and get people into your,

**Anthony Kittel** 08:54

you know, all of those areas, you know, following on from what Sharon said, that three years ago, there was the creation of a digital apprenticeship that didn't exist before. You know, it's about, I guess, connected products, connected machines, that the data that we're gathering is so important for our customers, it's so important for our businesses so that we can make everyone's life easier and and we need people that are interested to further their career. It's no longer do a trade and stop. There's lots of steps now that you can do a higher apprenticeship, you can go on and do a an associate degree or degree and really build a long term career in this industry. And I think they're the opportunities that we want to paint to young people that you have, if you're prepared to, you know, undergo continuous learning and develop your career then the sky's the limit.

**Sharon Wilson** 09:44

I just like to add to that I think Anthony's got a good point talking about young people in terms of the career path. But, you know, we developed with Flinders University Diploma in digital technologies last year, that our 51 of our workforce, so existing workers participated in that was highly successful. You know, when those people went back into the shipyard, and they spent a year doing that course went back into the shipyard into very different jobs. So people who would come from trades backgrounds are in detailed design, and they're bringing their trade experience to bear into the digital design planning activities. And basically, you know, they'll say it changes their lives. And some of those guys were, let's say, more mature students. And so the change in existing workforces capabilities, and bringing them along that journey as well is just as important. You know, and giving them I guess, rewarding outcomes as a result,

**Professor John Spoehr** 10:52

coming, I think we've seen that sort of transformation of occupations as the demand from employers, whether it be in defence, or space or other areas, grows for people who work across different disciplines, if you like. So the division between, say mechanical engineering, and and electronic engineering is, is that gap between those two disciplines is narrowing. And those two disciplines are sort of merging into new disciplines that are growing into new occupations, if you like we're seeing that occur all the time at the moment.

**Cameron England** 11:26

And two, I guess, sort of not really kind of phrase, but they're very cool jobs, aren't they? They're the sort of exciting jobs, you get to make things you have to design things. Yeah, they're very

**Professor John Spoehr** 11:35

creative jobs. There are lots of challenges, lots of problems to solve in industry. And so they're very exciting careers.

**Cameron England** 11:42

And George, you are based down at Lot 14, we're reflecting just before this chat on the remarkable progress are some of the companies down there, perhaps from five years ago, from almost a standing start, we have companies with satellites in space, we have companies like airspeeder, you know, flying cars, it is quite amazing. Where does manufacturing fit in, you know, tech hub, like, Lot 14 or a Tonsley,

**George Freney** 12:06

I think I was really fortunate to be on the government's entrepreneurship advisory board, from May 2018. And at that point, Lot 14 was just an idea, there was no one there, the space agency was something we were trying to collect, you know, create here in South Australia. And to see the evolution of that, and the number of jobs that it's created, sort of in the design phase, as well as the manufacturing phase, if you think of innovador, that's now 40, plus person company building satellites at Lot 14, you think of Mariota, there are 50 person plus company who are building satellites, and you know, technologies. And I think they're using South Australian companies in the supply chain to build the printed circuit boards. You've got fleet space technologies, not based at Lot 14 but really part of the environment that they're employing, and I think upwards of 100 people soon. And that's, in my view, creating pull through for the supply chain in South Australia and giving more diversity than just defence for those companies that provide parts into that. And interestingly, it was this environment that gave us the confidence. So we founded a company called space machines company to build orbital transfer vehicles about a year and a half ago. And this environment is what enables people to be fearless in sort of pursuing those sorts of objectives. And our objective, there are five or six years from now we'd be building one of these vehicles every month, at least, and employing 100 people in South Australia and you know, probably across the country in a supply chain that provides paths into that. And I think this advanced manufacturing focus in the environment that's been created is giving these companies that sort of the licence and opportunity to be fearless in this way.

**Cameron England** 13:38

And Audra I might bring you in here. What about jobs? What what are the roles that need to be filled in their manufacturing in the defence sector in the future? I visited an occasional shipyard, and you're quite likely to see somebody in a virtual reality helmet or augmented reality helmet, for example, what what is the diversity of the future defence employee, you're still

**Audra McCarthy** 13:59

going to see your basic trades, as well as your higher end engineering, project management skill sets needed in the sector. But it's what those trades people are actually doing and how they're doing is contrast like different to how those trades are traditionally known, as Sharon alluded to before that with the digital desktop technologies, we're taking and seeing trades people embracing more digital tools to be able to undertake and still do their trades. And what's important is that that commitment to lifelong learning as Anthony said that in the way we actually do manufacturing now, we are now focusing on value add, and to be able to continue to grow a manufacturing sector. That ongoing commitment to value add means that we are continuing to learn and develop our workforce and evolve those skills. So that means we need to have a better pipeline of commitment to taking people from wherever they choose to enter the workforce with a basic skill set and giving them a pathway to be able to grow that skill set, and not just focusing on the high end engineering skills, the degrees in the service sector, but also looking at where the practical application is for those skill sets, whether it is starting off in assembly, I mean, even if, if you look at what traditionally, we regard as a low skilled role of assembly, it's actually does require a lot of skill, as Anthony will probably tell you that when you're dealing with electronics assembly, it's meticulous attention to detail, the ability to be able to adhere to stringent quality controls. So what we would traditionally say as low skilled or unskilled is actually still got very high skills and a development pathway forward for someone to have a really rewarding success. Successful career.

**Cameron England** 15:57

And Anthony, you've been growing pretty quickly over the past few years, everyone seems to be out camping, you know, during the pandemic, so that's gonna be helping out, you've always put a lot of money into research, I know, do we have enough people to do these jobs? And, you know, what do we need to do? If we don't? Do we bring them in? Do we need to start training earlier? How does that sit for you

**Anthony Kittel** 16:18

is certainly that investment to train in training is critical on each of our businesses, like the investment in r&d, it really needs to be matched. So, you know, we're working closely with with Flinders University, taking students at at, you know, for vacation experience and giving them opportunities so that rather than wait to the end of their degree, they're actually able to get out in their first, second third year of their of their studies and get a hands on experience and see what it's like to work in a business. You know, you mentioned additive manufacturing. I mean, you know, now you can play around and prototype a product, set it in motion overnight, come back in the morning, see the see the outcome of your work, test and validate it and say, okay, that's not quite right, and then go again. So this speed to market capability that provides us is, you know, is amazing. And so, to have young people straight out of NGO, out of engineering school, and being able to utilise these tools, I find it really exciting, and I see their faces and see how much they love it. And they can, you know, they fail fast, there's, there's no problem. You know, we keep iterating, we come up with great design, that's world class.

**Cameron England** 17:27

And when the pandemic hit, we saw ourselves having to scramble to, I guess, start manufacturing surgical masks. There's a recent Flinders uni report, which found that Australia's dependence on imported goods is the highest in the developed world. And we're very vulnerable to global supply chain disruption. So john, is it important that we turn this around, we do have a bit of a reputation as a country that tends to dig things up and send it overseas and South Australia has been a bit different. But is there a long way to go? I guess in terms of bolstering those supply chains locally. Well, there

**Professor John Spoehr** 18:01

is Cameron and you know, the if there's any upside, and it's difficult to find one with COVID, it's that it's refocused our attention on this on the importance of manufacturing, not just here in Australia, but internationally. And for me, that's very, very welcome. And it's a great opportunity for like to, to build an accelerate the growth of advanced manufacturing in this environment where there's clearly multi multi partisan support for the centrality and importance of manufacturing in the economy. So it's off the back of that understanding of the importance of making things domestically, not that we'll, we're going to put some barriers up in the way of imports, when that's not the way we need to go. We need to encourage exports and, and also be a trading nation, a fair trading nation, but we have led the pendulum swing too far in terms of our ability, as a nation to be able to make many of the things that we once made. So I think that's why they recognised now, national policies, recalibrating the Biden administration, the United States undertook 100 day review of this very, very question and looked at every sub sector of manufacturing in forensic detail, to make some decisions, good decisions about what should be the focus of manufacturing going forward, we've began to do a bit of that in Australia. But we need to do more of it over over coming months and years. And emulate I think some of the good practice that I observe in the United States and also Europe, which we can touch on a little later if you like.

**Cameron England** 19:36

Quickly, Anthony, do you find that the made in Australia tag is a big selling point, obviously locally, but even overseas in terms of quality?

**Anthony Kittel** 19:44

Absolutely. I mean, our customers particularly in North America, their view is if it can survive in the Australian outback, it will survive in the US. So you know, we're really proud to have made in Australia, all over our products all over our packaging. It's it's For us, it's a badge of honour. And our customers think the same way.

**Audra McCarthy** 20:03

But you have to question after the pandemic, there's been increased attention on the need to support Australian made. And it's a little ironic that Australian companies have to spend the extra effort to differentiate themselves in the market to their own local consumers that their Australian made, yet our imports don't have to make it very clear that they're an important product. And so going back to John's point that the policy landscape is, is beginning to change. But there's so much more that we can do, I mean, it's great to be able to have the Australian made logo, but to be part of that construct actually costs. So if you're an SME, to be able to differentiate, you got to invest in that you got to subscribe to that logo, you got to pay an ongoing licence fee just so that you can support a local industry in Australia, it shouldn't be the other way around that if you're importing a product, it should be very clearly labelled a product. This isn't

**Cameron England** 21:00

your competitors, not made in Australia.

**Audra McCarthy** 21:02

So not made in Australia. So people go Okay, not mine, Australia, I'll go to this product, it makes it a lot easier for the consumer to then make a decision. And on the flip side, as the younger generation become more environmentally aware, they're starting to look for sustainable products that are being made. So products that last and are not just throwaway society, I'm against my generation are the throwaway society where we buy it, we buy cheap, we throw it away, we get another one, the younger generation will reduce, reuse and recycle. And so that's where the you know, the the strange Australian products where they're made to last is actually starting to get traction. And that I think these are things that need to support better policy, to build an advanced manufacturing that's going to continue to grow and support our local economy. You also need a significant investment in the infrastructure. Over the years, we have not I guess our policy has not supported the significant infrastructure into advanced manufacturing that's needed. Because we've gone back to our roots, it's mining, let's just rip it up and export it, let's not try and value add. And now we're seeing announcements from the government about the need to actually look after our rare earth minerals and start actually processing the minerals to be able to manufacture the high end chips and inputs that are needed to be able to support the sector.

**Cameron England** 22:34

Do we need some policies that focus on I guess value, adding those minerals, one of the things that really strikes me is it, there's a big lithium push on at the moment in mining in Australia, which will be sent overseas, turned into lithium ion batteries, which will then buy back, which will then send again overseas to recycle potentially. So from a policy setting point of view, perhaps john is something that should be looked at in terms of, you know, I guess incentivizing industry to get into value add in these areas,

**Professor John Spoehr** 23:03

was enormous benefit from getting into value added in the first place, really. And that's the sort of whole point of advanced manufacturing, it enables companies that may have thought that they couldn't be competitive, internationally to be competitive through the adoption of advanced technologies, digital technologies, robotics and automation. And in combination with upscaling of the workforce, you can be competitive globally. If you've got an export focus, and you've got to focus on quality, and you're rescaling upskilling constantly that we can be competitive in Australia. So we really haven't caught up with, you know, what I describe as a sophisticated understanding of the role of advanced manufacturing in the economy. That's what we have that's a challenge for Australia in the 21st century is to understand how centrally important manufacturing needs to be is to the economy to celebrate mass manufacturing, which was the foundation of South Australia, Australia in many ways, but then to move well beyond that. It's a high value added manufacturing, which many of the many of our panellists are involved in right at the moment. So it's off the back of that commitment that we can do well, but it won't happen without really significant investment by the industrial partners. And by the industrial partners, I mean, government industry and universities together, working over the medium term on sustained uptake and diffusion of advanced technologies in industry,

**Sharon Wilson** 24:28

maybe touch on the catapult sites of the UK Government going back to policy invested in what they call the catapults in the UK and I think there's quite a few catapult sites. A couple that that we as a business to be a systems are closely involved with, one at Sheffield at the advanced manufacturing Research Centre and one at Strathclyde University, the advanced forming centre those Government policy, which was to invest in advanced manufacturing, in very similar to what we're talking about in cities where industries have sort of gone away. So in Sheffield, certainly, the steel industry, as I've been in demise, as well as the sort of culture of mines mining in, in that area, invested in a catapult facility there that actually employs more people now than what was in there at that facility previously, so, you know, those catapult sites, and that deliberate policy by the UK Government to invest has attracted both investment from industry, so Sheffield, in particular, there's Rolls Royce McLaren are their BAE systems are there as well as Boeing. And so you see, that attract, and it does sort of start to build almost like a bit of a momentum of its own. And so you've got not just the people that work there in terms of numbers of people, but the kinds of jobs that they do,

**Professor John Spoehr** 26:10

I hope helps lower barriers to entry, if you like for small and medium sized companies that who are a little bit nervous about investing in new technologies, because of fear around the cost and whether or not they'll get a good rate of return on investment in those new technologies or upskilling of their staff. So these sorts of facilities have proved to be transformational regional economies in the face of difficult circumstances in the UK was, you know, the demise of the coal industry that drove drove that enormous investment in advanced manufacturing in Australia, I suppose it's the demise of the auto industry that could do the same. So we're on the cusp of that state governments invested in what we're doing at tonsley, which is fantastic. And we're hoping to build significantly on that over the next few years.

**Cameron England** 26:53

a catalyst is obviously very useful, George, what's the Lot 14 has been running for a while now what's, what's the vibe down there, like for want of a better word than

**George Freney** 27:02

the vibe of the place is amazing. I mean, you go back three years, and it was 10 people working in 100. I think there's 1100 people on site now. And the heritage buildings have been sort of all retrofitted and upgraded. And now they've almost finished the demolition and building the new, the new innovation and entrepreneurship hub, it's a really amazing environment, like the the unlikely, you know, serendipitous connections make life really easy to so you've got the space defence, Australia Institute, machine learning, but all these diverse groups, all bumping into each other. So the speed with which you can sort of have ideas, talk about ideas, make connections and make things happen, I think is really, really important. And I think now you're starting to sort of get a bit more maturity and how Lot 14 fits into the overall state ecosystem. And the role Tonsley plays, which is very different is growing around advanced manufacturing, it's only getting more mature and all of these innovation precincts work with each other.

**Audra McCarthy** 27:55

And they're all interrelated to the technologies that are out before and they're interrelated. So you can't have AI machine learning, if you don't have consideration for your cyber fabri, you know, most companies who get into the space sector typically already in defence sector, so and that's, I think, is that the real success of because we want diversified businesses, in our sector. And I think that environment enables and supports the diversification of our industries across the various sectors and that collaboration to continue to grow and support one another.

**George Freney** 28:31

I agree. And you know, in the course of a day, you can bump into the head of the Australian Space Agency, the person who runs the a three CD, Australian cyber collaboration centre. You know, it's it's amazing, like all of the parties are there. And it just makes it really quick and easy to actually work through ideas and have conversations.

**Anthony Kittel** 28:49

I think Audra hit the nail on the head. In other words, collaboration. And what we see at Lot 14 is people as George has said, with ideas and they're able to share those and you know, collaborate together and really take it forward at a speed I haven't seen before. And the same goes back when we're talking about manufacturing and suppliers. To me, it's no longer a manufacturer and supplier, its manufacturing and partners because we have to collaborate. At Southern we're working together and then we're growing together. And as the manufacturers get larger, the supply chain gets better and stronger. And that's what we're doing here in South Australia. So I think it's exciting from that point of view. And then you look at you know, people are George and Andrew Nunn, the chief entrepreneur and Jim Wally. We need people prepared to put themselves out there as entrepreneurs and show the example to young people. Because again, you know, when REDARC when we invested in manufacturing in 2007, it was it was you know, not the thing to do offshoring was the was the way to go. So I'm really happy to stand up and say, Look, we are manufacturing, we're proud of it, because we need to set those examples and show them what's possible. And once you see what's possible, and people follow and you know, it builds bigger and bigger.

**George Freney** 29:59

Yeah, I think you know, you're seeing some of the startups a lot 14, I think it's Ping off the top of my head, I try to keep on top of all that thing. Ping is that you're that you're working with big with support that your your power supply chain to Ping now, you know, they build intelligent listening for wind farms. And so you start to see this diversification and enabling activity going on. Like if you weren't in existence, it would be harder for ping to exit these connections.

**Professor John Spoehr** 30:22

Absolutely. And they went through the innovative manufacturing accelerator programme at Tonsley. At Flinders University. So there's a lot of connections that we take for granted that are maturing, as you say,

**George Freney** 30:32

and I think one of the things, Cameron I think about quite a lot, because I've been fortunate to be from Lot 14 at the beginning and spend most on how to get the message out. And how do we explain the depth of opportunity in the school careers that are that if you all look at, there's just so many jobs across the defence space, cyber, high tech businesses that are sort of part of Lot 14 and the other nice things like Tonsley, there are 1000s of open jobs, you know, high tech, good quality jobs, and then they're enabling other recruitment more sort of everyday jobs that exist inside companies like marketing, bookkeeping, and so forth. So there's this real growth coming, you talk to a lot of people outside this world were in and they don't see it. So I think there's this huge opportunity for so many careers, and I sort of every few weeks, have some people from Adelaide uni come across a bit of a tour, and it just opens their eyes to the art of the possible that's coming.

**Professor John Spoehr** 31:23

What George's alluded to is something very important in advanced manufacturing. And that is this blurring between making things and the provision of services. So manufacturers are traditionally are no more than they ever have been becoming service providers, for providers at the same time, as they making goods and services. So they're, you know, they're adding value to products by making them smart products. Now things Anthony is a good example of that.

**Cameron England** 31:47

And the hope is that a lot of these employees will go on to create their own companies as well as a skills development.

**Anthony Kittel** 31:52

Exactly.

**Cameron England** 31:53

Yeah, you get further spinouts. Do we have enough people going into the pipeline? At the moment? I imagine there's a pretty serious war for talent. Maybe Audra and Sharon, defence is a very long timeline. How are you working with, I guess, schools and government to ensure that you've got the skills you need, and is it also going to bring a lot more people into South Australia as we need to fill these roles?

**Sharon Wilson** 32:16

Well, we've already seen the reversal of the way our brain drain back into SA, which is great to see. I mean, big projects are gonna attract a lot of people. And when you look at the hunter class project, you know, it's going to go for a very long time, and people are going to work on the last ship, probably not even born yet. Which is one of the things that we like to say. And so that engagement, you know, starts pretty early, if we can no part of the, our establishment of our innovation hub at Tonsley is actually designed to demystify some of the work that we're doing, you know, if you if you're ever down at line zero down at what was the Mitsubishi manufacturing facility there, you can see in that's not defence secret, you know, it's designed so that if you're at a if if you're at uni, if you're on school break, and you're just riding your bike around, Tonsley, which quite often people do, then you can see in to the facility, you know, we want people to get curious, you can see robots, you can see a robotic dog, you can you can see some of our mechatronics engineers, ladies working working in there, you know, so we want people to get curious, we host quite a lot of tools a lot easier for us to hold tours down there than it is at the shipyard, of course. And so that that's actually, you know, one of our main ways to engage with people, because you can see hands on that this is not around, you know, a dirty environment with a weld that this is using a robot to do welding. And this is a very different environment for people.

**Audra McCarthy** 34:02

But I think building the pipeline of people into that fabric starts with the schools and I think we still get a lot of work to do in the school sector. And what we don't have is a breadth of understanding and awareness in our education system and in the parents of today as to what those careers actually look like. And I've got two daughters who have just finished school won't tell you how old they are, give away my age. Were navigating through school there's still a perception out there that when you graduate, you should be a doctor or a lawyer. And they'll never be an account because mom's an accountant and that's no good apparently, but and that was the success of life being a doctor or lawyer or something. But that you know, and that was because the education system is constructed so that they're encouraged to go and continue to educate, go to university and that's almost Pressure is almost put onto students that that is a indication of their success, we haven't broken down the perceptions of barriers that hey, it is actually okay to go and do a trade. In fact, there's a lot of very well off electricians and plumbers out there who run their own businesses. And we don't get that message out there. And it's largely because the education system, and the teachers, the people who are the mentors are the students aren't aware themselves, and they can't impart with that knowledge effectively enough to be able to provide the pipeline that we need. So we need to be doing more in schools, and then the parents, not all parents. I mean, I'm quite lucky, I know the sector, I can speak to it. But there are parents out there who've never had an exposure to any of these trades. There's some parents out there who have never worked in their life, but they would like their child to work, and they can't teach and help them understand what careers are available. So that's, I think, an area we need to be spending more time

**Cameron England** 36:02

in your journey. You're we're on the entrepreneurship advisory board from when it was set up. How important is that message that you can create your own job not, you know, go and work for somebody, and

**George Freney** 36:13

it's really easy to miss one, create your own job. And the other is it's not a linear path, thats right? Like you might start as a plumber, but end up creating your own business and something completely different, or electrician or, and I think this I see it a lot that is this sort of view that it's got to be linear school uni job career pathway, like, that's just not how it's working. It's fragmenting more and more, it's just very diverse. And it's this sort of view that you should be fearless in respect of like, I'm going to do something and learn from that, and then move over to this and then try that and move over here. And, you know, if I started as a chemical engineer, never work today as a chemical engineer. And I think it's, you know, educating parents and schools. And that's sort of the way the world is working. Now you sort of make a bet and go on direction and have the confidence to change direction as you learn more about what you're passionate about, and how the world is changing.

**Cameron England** 36:59

But he says, I thought that the best way to get people into the into STEM is drive a flying car, or a Lamborghini into a school year, right. And that sort of sets the scene rather than, you know, go and do maths and science, because they are difficult subjects. But I think people forget that they're creative subjects as well. And

**George Freney** 37:17

I think that, you know, engineers and people who build things, they actually make things, building the future that we're going to be enjoying and living in and solving the world really complex problems, we need them, right. So I think the decisions are made early, like year eight, and nine is the right time for people to be inspired. And, you know, we need things that genuinely inspire people to go it is worth doing. maths, physics, chemistry, all these sorts of subjects that are sort of provide the foundation stones for these sort of more complex careers.

**Cameron England** 37:44

And I imagine your staff would, a lot of them would move through from entry level church and more creative and design and sort of coming up with ideas for new products. I can't remember the figure but we've spoken before about you, you put something like 30% a year back into

**Anthony Kittel** 37:59

research, so 50 cents on every dollar Yeah, in r&d, a good pathway

**Cameron England** 38:02

there for people who, you know, might have a bent towards engineering, but uni might not fit or something like that.

**Anthony Kittel** 38:09

Yeah, and I look, we got numerous case studies in our business of people who have gone down the, I guess, engineering track, then, you know, they found it difficult, they dropped out, then they've come to REDARC, they've started in a trade, then of going on and going back to engineering, and they are progressing their career from there. So, you know, I think, as George says that, you know, it does, it's not all about you take that career, and that's where you stay, I think we go on this path, until we find what we're really, really passionate about. And I think that's the key is that, you know, a career is something that you can tried lots of different things. But it's the passion that counts, because that's what takes you to your end goal. And, you know, our goal is if we're going to be a world class business, we need world class people. And so, you know, let people be creative, let them try different things good and opportunities to move in different areas of the business. In fact, we encourage people to move around and try different areas, because different set of eyes, different ideas, you know, that's when the magic happens.

**Professor John Spoehr** 39:09

Cameron, I think part of the problem is is is the view that we've had of manufacturing for the last decade or so, you know, the the common perception is that manufacturing is, you know, on continuous slide down in Australia and in South Australia. And what we know from the employment numbers right at the mind is that actually manufacturing employment has stabilised, which is fantastic. And in some critical sectors, like the ones we've talked about today, it's growing. And it's set to grow over the next decade, particularly off the back of investments in shipbuilding. So we've got to turn that popular view around that mythology around if you like that. There aren't jobs in manufacturing, because there are and there's some of the most interesting, rewarding and exciting jobs but it's difficult. I think, for young people these days to get windows into what that looks like and down at times. We've created this extraordinary little environment ba actually has laid This at a tonsley called the factory of the future facility. And we have over a 12 month period we have 1000 people actually visit that facility. So it's proven to to be fascinating partly because of the robotic dog that Sharon referred to before called spot the dog. But oh, fearless, the dog absolutely so fearless. The dog, the fearless is, is perhaps one of the most spectacular examples of what you can see down at tonsley. But, but it's it's just getting a sense of what modern manufacturing looks like in the 21st century, it's and anyone who gets in touch with that, who sees it and gets up close and personal with it is inspired by

**George Freney** 40:41

I think the opportunity to paint that picture, though now is much better than it was even three or four years ago, because you have got these companies doing these things, and you can go down to line zero, or you can go a lot 14 and red arc and see real advanced manufacturing. And absolutely five years ago, that was really hard to sort of create that content and show what that future could look like that people were making decisions about their careers.

**Sharon Wilson** 41:01

I think the key the key thing for me was, you know, on the industry 4, you know, when we really started to hear about it probably about five, six years ago, you know, it was lots of presentations, or lots of people talking about it looked, it was very German looking, you know, very looking at companies that were highly vertically integrated. And from an SME perspective, you know, people looking at that going well, that's all great, you know, it looks like robots and stuff. What does that mean to me? How would I implement that in in my business? You know, I can't afford that. But that's mad. And so, you know, I think there was a lot of listening, but not a lot of doing your part of certainly what Anthony has been doing some of the things that we've been doing in terms of working with the innovative manufacturing Research Centre, in terms of how we translate industry for into real outcomes for industry. Yes, we're doing it for ourselves in terms of what does it mean for BAE systems, but actually, we're sharing that with industry, you know, part of that CRC output is training packages for SMEs. So a lot of the things that people can see is actually how they might apply that to their business, or they don't have to invest. So there was human issues around working with technology. How do I deal with unions? How do I deal with training people in different technologies? Can I wear a virtual reality headset for two minutes? More, you know, does it make my head hurt? How long does the battery last, you know, all those things that that an SME, you know, really would not be able to have the wherewithal, were using these activities to basically say, Hey, here's the outcome of that, have a look at it, come and play with it, does it actually suit what you want to do? And if so, then you know, where you're going to put your investment. Okay, to me that that's actually part of what we're trying to create in that sovereign when we talk sovereign capability, which is what were tasked to build not just nine ships, but a sovereign capability in shipbuilding, but it's actually wider than shipbuilding is actually, you know, you build it in defence, but people are doing defence actually do commercial work as well. So you know, it's building that that whole ecosystem and using that investment that the government's making in shipbuilding, that's a wider economic benefit to the nation, in effect. So that is part of building that ecosystem, you can't just say, just given an SME and order and order retailers just given them an order doesn't actually build capability. Building capability is much wider than that is the research and development is people development skills development, and is a longer lasting outcome than I've got an order for a year to build a load apart when I've done. That's it. Okay, that's really not what this is about. It's really about building that, that whole ecosystem of capability. And that's how, you know, we will want to spend our money.

**Cameron England** 44:09

This isn't the last question, but I will flag that. For the last question. I might ask any big policy changes you'd like to see. So maybe think on that for a little bit more? Recently, obviously, we've had naval groups, submarines programme came through and we have a new submarine programme about that. order it How is the industry responded to that and when we'd like to see I guess more local content from a new contract or I know it's it's a moving faced at the moment, but yeah, obviously there's been some disappointment, but also a sense of opportunity. So what's the what's the feeling around that?

**Audra McCarthy** 44:46

Yeah, it's it is both good and bad news. And the good news of the AUKUS announcement, if we, if we look at this more strategically is it actually presents more opportunities for Australian industry sooner because we know that the vessels will need to be sustained. So irrespective of what the government decides to do with the manufacturer of the next boats, there's talk about UK or and us utilising Australia as a forward operating base and having vessels located here. So that is likely to result in opportunities in the sustainment side of the supply chain for Australian industry. Now, that's opportunities which will likely materialise much sooner than what we had anticipated under the existing programme. So you've got to see that as a bonus, not to mention the fact that we're now talking about nuclear powered submarines, which, again, is a new technology and it presents new learning opportunities for for industry. So you know, that's, that's certainly great. When it comes to capability versus content. That that's always something that's to be debated. Now, Sharon said, giving a company a purchase order doesn't actually build the capability, we want actually sustainable businesses who can continue to innovate and evolve. And that's not something that happens when you just make a short term. Once off investment in industry, we're talking about a commitment to Australian industry made over time that actually supports that businesses, which means the return on that investment may not materialise immediately. So the disadvantage is that, you know, industry now have to stop and pivot to understand what is the new direction of the programme that delays a lot of the business development activities. You know, there's a lot of great businesses out there who have been investing significant time and effort to pursue opportunities and understand the naval great way of doing business. And now they're going to have to understand a new way of doing business with whoever the new trading partner is going to be for the for the build. So there's pros and cons. But I actually do like the fact that we are now looking at sustainment opportunities sooner than what we would have been under the previous approach.

**Cameron England** 46:54

And john, the example of Germany is usually one that in advanced manufacturing crops up quite a lot, especially in industry 4.0. Are there any lessons that we can take from I guess, other countries about you know, what good policy settings are, or you know, how to get people into the pipeline, anything that you've come across in your work over the years, it's a

**Professor John Spoehr** 47:15

short short, we've been inspired by the British experience, to a large extent, and Sharon referred to earlier on, but there's a network of catapult centres in the United Kingdom, that work with manufacturers and universities, on accelerating the growth of advanced manufacturing in that nation. And they learned from the from the Germans. So Sharon talked about industry 4.0. Well, actually, the Germans coined that that term. But it's a strategy. It's not a set of technologies. It's actually a strategy for accelerating the growth of advanced manufacturing in Germany. And we're all trying to emulate that internationally, including the Americans, the Americans set up a network of manufacturing Institute's national manufacturing Institute's, again, following the German model. In Germany, there's a network of around about 63 Fraunhofer institutes and these are all dedicated to accelerating the growth of of manufacturing. What we can learn from that is if you bring the partners together, and you've got a 10 year plan, a 15 year plan, a 20 year plan for growing advanced manufacturing, you can do it and they are doing it very, very well off the back of similar experiences. To to that, that we've been through here in Australia, a period of deindustrialization decline in employment in manufacturing. In particular, off the back of that they begin to rebuild their manufacturing sectors. But that won't happen automatically. It's a it's a, it requires a national policy direction that's dedicated to patient medium to longer term investment in facilities that work closely with companies to help build capacity and capability, partly on the uptake and diffusion of technologies. But also, crucially, in relation to building the skills base that you need to be able to sustain that over the long term because, you know, you can have large projects, but not have the capability to be able to implement them successfully. So you end up importing all those skills, or getting the getting the work done offshore. And you're always at risk of that if you don't build domestic capability. So that's an important part of the of the so called sovereign capability, building objective of governments. The other thing that I think is crucial, and we don't do that do it very well in Australia is, is reward collaboration between universities and industry. Other nations are very, very good at doing that, you know, they have collaboration dividends associated with their r&d incentive schemes, for example. So we graded inventing things in Australia, but we're not so good at translating those inventions into commercial outcomes. And that's partly because we don't have the institutions in place that exists between universities and industry. And that's what we're trying to solve it at Tonsley at the moment at the Tonsley innovation district with companies like BAE and REDARC and others creating that sort of first World Class industrial transformation accelerator

**Cameron England** 50:07

is a bit of a policy gap potentially federally, South Australia has certainly over the past decade decided that advanced manufacturing is where it wants to be. Is it a need for more of a conversation at a federal level around this?

**Professor John Spoehr** 50:20

Although I think so I think the modern manufacturing initiative when it was announced a couple of years ago now was a landmark announcement, I think it was a game changer in terms of the being, I think, for the first time, bipartisan, or multi partisan commitment for manufacturing in Australia. So that was very, very welcome. It's just that we have to build substantially on that we need to see in the next budget or a substantial commitment to that being realised over a 5-10 year period is not good enough to fund things for 12 months or two years, you've got to build engineering capability.

**Audra McCarthy** 50:55

Industrialization strategy, though it could be better executed, if we have a government that's committed to a department of industry, where in five years, we don't have a revolving door of ministers going through our department portfolio, I think that's the elephant in the room, you can't get traction in your policy, if you don't have stability in the leadership of the portfolio. Each time a new minister comes through, it's it's huge disruption and industries. struggling with that. So since we can get some stability in the leadership of our industry portfolio, we should be able to get some kind of real rungs on the ladder without industry policy.

**Cameron England** 51:36

But we've got about four minutes left, so I might throw open the idea of what policy would you like to see changed? Or do you have already thrown out a great one is the the overseas made sticker? I think that's a wonderful idea. Anthony, any ideas that you have that you'd like to see implemented or sort of a push from either government or industry?

**Anthony Kittel** 51:56

Yeah, I think probably over the last few years, you know, we're seeing a little bit of erosion of the amount of funding available under the r&d tax scheme. So I think for businesses to continue to grow in Australia and diversity, I'd like to see that, you know, that more encouragement for doing research locally, partnering with universities, collaborating with other SMEs, so that we can really build that horsepower that we need here in in South Australia and Australia. So anything we can do around r&d tax, to encourage businesses to to create more high more resort searches, you know, do interesting things take risks. That's what we need.

**Cameron England** 52:35

In order, I think I'd sold you short, you had two great ideas of ministerial stability as well. Anything else you'd like to add to that?

**Audra McCarthy** 52:42

I do, like the idea of making it harder for overseas products, to to buy their way into our shores? And I'm not talking about companies, I'm actually talking about the products and services. So

**Cameron England** 52:58

and yeah, some companies are not to sort of shy about doing that to Australian products or other overseas products.

**Anthony Kittel** 53:04

Well, I think, you know, we're, it's about paying tax in this country. Yeah. So we need to make sure that the entities that are here are paying their fair share of tax.

**Cameron England** 53:13

George, anything policy wise, or big picture you'd like to add? Yeah, I think

**George Freney** 53:17

from a like a startup perspective, like from an early stage company, government procurement, federal and state, like let's buy from these companies and take some risk on to help enable these companies to sort of lift up like, we're really bad as a country in the state in my view, and buying from the early stage companies, other other jurisdictions around the world doing really well. So I think that would really help get the flywheel of growth going for early stage companies.

**Cameron England** 53:42

John, anything that you'd particularly like to see for your king for a day?

**Professor John Spoehr** 53:47

Yeah, not give me an hour is so much to say, but look, I think one of my closing points has to be that shipbuilding is the driver of industrial transformation. Here in South Australia for the 21st century. It's the scale and the duration of the project that makes it a game changer for South Australia. It doesn't replace the automotive industry, but it is of sufficient scale, to be able to be a magnet for confidence. And we're already seeing that. It's you're seeing SMEs attracted to want to work in the shipbuilding sector because of the scale and the size of the project. But also, the complexity of shipbuilding also lends itself to, to accelerating the growth of advanced manufacturing challenge is for us to maximise the opportunity to see that as a national challenge and a state challenge for us to really make the most of shipbuilding for the acceleration of advanced manufacturing in other sectors and I think we've got a once in a generation opportunity to do that.

**Cameron England** 54:59

And Sharon, any closing thoughts

**Sharon Wilson** 55:01

can have two. So that's the first one is actually just sort of follow on from from John's comment around that I think, you know, we we have to take an enterprise approach. And when I say we have to, we actually contracted to take an enterprise approach to build in that sovereign capability. And that, so what I really like to see, and we are seeing glimpses of it, is that the other side of that enterprise so that, from an industry perspective, certainly we've got industry and academia really leaning in to that enterprise approach, really like to see, you know, other parts of government, not just defence, but part of industry, in fact, education. As to two key examples, really leaning into that enterprise approach to build sovereign capability. I think, you know, like I said, we see glimpses of it, but I think, you know, really, really pulling that together. The second part was really around things like the modern manufacturing initiative, which is absolutely fantastic initiative. And certainly, we know lots of the state governments have partnered with industries, to put in those applications to the federal government, but really like to see that as part of that entire process, whether it's this round or future rounds, to say that what we develop in Australia is complimentary state by state, not competing state by state. I think you know, that investment in those capabilities to leverage it Australia is not big enough to have competing efforts in states you know, really like to see that, you know, the catapult light sites, if you like, that said, you know, if you've got doing one thing in another area, don't repeat it somewhere else. Let's actually have that maximise the dollars that we're spending across Australia.

**Cameron England** 56:47

And let's not fight amongst ourselves about where it might

**Sharon Wilson** 56:49

particularly well is, you know, instead of arguing about you know, what size of piece of the pie let's argue about making the pie bigger.

**Cameron England** 56:57

Thanks a lot for your insights everyone. It's been great. So we have time for today. To keep the conversation going. You can use the fearless conversations hashtag on Twitter. And to review today's and past conversations, you can visit the advertiser.com.au slash fearless conversations. Next week, fearless conversations will feature a panel from the education industry. So be sure to tune in for that one. Thanks a lot.