ECONOMICS AND INDUSTRY STANDING COMMITTEE

INQUIRY INTO TECHNOLOGICAL AND SERVICE INNOVATION IN WESTERN AUSTRALIA

TRANSCRIPT OF EVIDENCE
TAKEN AT PERTH
WEDNESDAY, 18 MAY 2016

Members

Mr I.C. Blayney (Chair)
Mr F.M. Logan (Deputy Chair)
Mr P.C. Tinley
Mr J. Norberger
Mr T.K. Waldron

Hearing commenced at 10.13 am

Professor ANDRIS TALIS STELBOVICS
Pro Vice-Chancellor, Faculty of Science and Engineering, Curtin University, examined:

Professor BRIAN EVANS
Professor, Petroleum Engineering and Resources, Curtin University, examined:

The DEPUTY CHAIR: Welcome, Brian and Andris, to the Economics and Industry Standing Committee. Chairman Ian Blayney gives his apologies because he is unable to be with us, but as deputy chair I have stepped into the role and there are three of us here to hear your contribution.

Before we start, I have to read a statement to you because it is a formal hearing. On behalf of the Economics and Industry Standing Committee, I would like to thank you for your appearance before us here today. The purpose of the hearing is to assist the committee in gathering evidence for its inquiry into technological and service innovation in Western Australia. You have been provided with a copy of the committee's terms of reference. At this stage, I would like to introduce myself and the other members of the committee here today. I am Fran Logan, the deputy chair of the committee. We have with us Hon Terry Waldron and Jan Norberger. Peter Tinley may be with us; he may arrive late, I am not too sure. The Economics and Industry Standing Committee is a committee of the Legislative Assembly of the Parliament of Western Australia. This hearing is a formal procedure of Parliament and therefore commands the same respect that is given to proceedings in the house itself. Even though the committee is not asking witnesses to provide evidence on oath or affirmation, it is important that you understand that any deliberate misleading of the committee may be regarded as a contempt of Parliament. This is a public hearing and Hansard is making a transcript of the proceedings for the public record. If you refer to any documents during your evidence, it would assist Hansard if you provide the full title for the record.

Before we proceed to the inquiry-specific questions that we have for you today, I need to ask you the following. Have you completed the "Details of Witness" form?

The Witnesses: Yes.

The DEPUTY CHAIR: Do you understand the notes at the bottom of the form about giving evidence to a parliamentary committee?

The Witnesses: Yes.

The DEPUTY CHAIR: Did you receive and read the information for witnesses briefing sheet provided with the "Details of Witness" form?

The Witnesses: Yes.

The DEPUTY CHAIR: Do you have any questions in relation to being a witness at today's hearing?

The Witnesses: No.

The DEPUTY CHAIR: Would you please state the capacity in which you appear before the committee today?

Prof. Stelbovics: I am the pro vice-chancellor for the Faculty of Science and Engineering at Curtin University.

Prof. Evans: I am a professor in the department of petroleum engineering at Curtin University. I am also faculty director of oil and gas initiatives at Curtin University.

The DEPUTY CHAIR: Before we ask you any questions, do you have an opening statement for the committee?

Prof. Stelbovics: No, apart from just saying that it is a pleasure to be invited to the committee to actually make you aware of what Curtin's planning is in terms of initiatives for not only our university but also in the oil and gas space that will benefit other universities and the whole state in terms of training and research.

The DEPUTY CHAIR: I will kick off the questions by asking you to give an overview of the proposals on subsea courses and training.

Prof. Stelbovics: Okay. Maybe I will start off, because the detailed operational aspects of some of this work has been allocated to Brian. I will give you a high-level overview of where we are in that particular space.

Our university, as all universities in the country do, regularly looks at where there is demand for new training opportunities. What we realised a few years ago was that the next big leap forward in the oil and gas space would be in the area of subsea engineering where oil and gas companies are seeking to reduce their costs, reduce the amount they have to spend on staffing and have more automation. The ultimate of subsea engineering in 10 to 20 years is to have fully operational plants on the bottom of the ocean. However, to actually achieve those aims and with so much automation, there are questions of reliability, and it would bring in all aspects of engineering in not only oil and gas, but also chemical, electronic engineering and mechanical engineering. It is a very new area in the globe. To Brian's credit, he recognised this opportunity, alerted the faculty to it and our response was, well, I think one way that we can meet this challenge is to consider setting up a two-year postgraduate masters of subsea engineering at our university. We began that planning, I would say, over three years ago and we took our first enrolment—this is our third year of the course.

Prof. Evans: In 2014.

Prof. Stelbovics: Yes. In that first year, we took only domestic students. How many did we have? I think it was of the order of about 70 students.

Prof. Evans: There were 71.

Prof. Stelbovics: That was before the downturn in the oil and gas industry. You can see that a lot of the people in the industry who already had jobs in the oil and gas industry saw that this was a way to really upskill and prepare for the future, so that was a great result. As with all of our masters' courses, we do then set them up so that we can take international students as well. In the second year, we took not only domestic students but also international students, and we had strong uptake from overseas as well. It was in the order of —

Prof. Evans: That was 45 international and five domestic in year 2.

[10.20 am]

Prof. Stelbovics: So what you can see is that the pent-up demand from domestic was satisfied in the first year and replaced by international students in the second year. What about this year's enrolments?

Prof. Evans: This year is 35 international and I think we have five part-time domestic.

Prof. Stelbovics: The fall in domestic is not surprising, given the very significant downturn in oil and gas and also when we speak to the major players in the oil and gas industry, they say, "Andris, this downturn is not going to reverse itself that quickly." I was optimistic with the oil prices increasing in the last few months, but they said, "No, no, no; it will bump along like this not only this year, but we expect next year, and we really will not see significant change until possibly 2018." However, the good news is that, as I said, our university is attracting a very strong uptake still from international students. One of the reasons for that is that only about half a dozen

universities in the world actually have an offering, either undergraduate or postgraduate, in subsea engineering. It is a great initiative for the state. In terms of our faculty and university priorities, oil and gas is one of the very top priorities, so we are continuing to build our strength in this particular space.

That leads me into our next development, which is a partnership with the University of Aberdeen. That was initiated by the university well over 12 months ago. Our vice-chancellor, Professor Deborah Terry, met with her counterpart at Aberdeen, Sir Ian Diamond, and they discussed the strengths of both institutions. Aberdeen university is located in Scotland. It services the oil and gas industry in the North Sea and also has an outstanding reputation. They are also one of the other universities across the globe that has offerings in subsea engineering. When the two vice-chancellors met and discussed opportunities, one of the things that is happening in tertiary education is this globalisation and to become a player in the future of tertiary education across the globe, some of the universities, including ours, are taking the view that we should form very strong partnerships with like-minded universities. Because of our strengths in oil and gas engineering, this was an obvious partnership to pursue.

For the past year, there have been meetings at a very high level to determine how we should build upon this partnership. One of the recommendations that has come out is that because we have almost a globally unique offering in subsea engineering, why do we not combine the best of our lectures and materials for subsea engineering and produce the Rolls Royce degree in subsea engineering globally, so then we would be playing to a much bigger market with the appropriate branding. Brian Evans has been charged with developing that offering and going through the issues—the timetabling one, for example, their students start in August–September and we start in February. We have been able to nut out those sorts of issues. We have asked the question: what would make this type of degree unique? One part of it is because we have offerings and content provided by the two universities that we should also provide our students with networking opportunities within the global industry. As part of this global masters, we will be bringing students over from Aberdeen and the whole group will be meeting to network with industry and to be able to carry out project work, so it would be a unique offering. The details are being worked out and we are very close to finalising the proposal.

Prof. Evans: Yes. I might comment that one of the benefits of it is that for one semester—let us say for four to five months—a student from Perth can actually go to Aberdeen, work for a company in Aberdeen, and vice versa, because we have a very similar industry, if not identical manufacturers of equipment. Perth is not so much a manufacturing base as a using base. It is very important that our students can actually go and see the equipment from the likes of FMC, General Electric—these big companies—and can swap within those companies, and continue the tuition when in Aberdeen to complete the joint degree.

Prof. Stelbovics: We are proposing to actually start that joint degree for the first time in the second semester this year.

Mr J. NORBERGER: How has it been branded?

Prof. Stelbovics: It has not been branded yet, because we can only carry out the branding once all the approvals are obtained through both university approvals processes. So there is actually added complexity, because it has to go through our course approval process, and they separately have to put it through their course approval process. The date for finalising it I expect is within the next four weeks, is it not?

Prof. Evans: Yes. It is supposed to operate from September.

Mr J. NORBERGER: How does that work? Do some of the students complete some of the units through Aberdeen but do it online?

Prof. Evans: There are online units, but there are also real-time meetings in what we call collaborative spaces. There is a room with four large TV screens, 5.00 pm in Perth is 9.00 am in Aberdeen, so both students on their side in Aberdeen are there in the classroom, if needed, at 9.00 pm and 5.00 pm. We run our lectures like night school, from 5.00 until 7.00 or 7.00 until 9.00 in the evening. We actually run them in QV1 right now. We might modify that, but that is the idea. It is Chevron's head office, of course. Why do we run that there? Because the benefit is we get principals from industry from Woodside, Chevron and the like, coming in to provide lectures.

Mr J. NORBERGER: Which probably leads me, Brian, to my next question: what involvement has the industry had throughout this journey? You mentioned demand. How did you measure the demand in the first place? Was it industry-driven demand? Did they come to you?

Prof. Stelbovics: Absolutely. To determine that there was demand, we spent quite a few months a few years ago meeting with principals of most of the players in the oil and gas industry here. We took them out to lunch and had a discussion. Brian might like to comment on the details, but I was involved in some of it.

Prof. Evans: Specifically, GE were a major promoter who actually came to our VC and asked her if we could develop such a subsea engineering program, because they perceived a need for qualified subsea engineers in the future and there simply were not any in the southern hemisphere. That is where we started from. That was about February–March 2013; that is what started us. Subsequent to that, we had industry advisory committee meetings. We held them every second Friday morning at GE's Jandakot teaching centre. We had four or five people. We had the Society for Underwater Technology—SUT—which is the major society that people join. They were involved in developing the plan. This took us six months to actually develop, with industry telling us what was needed. The final result was, essentially, 80 per cent of the first year is academic, plus 20 per cent is industry driven—industry lectured. Then the second year is entirely industry driven—entirely industry lectured. That is why presently we run it in QV1.

Mr J. NORBERGER: What are the prerequisites for the course?

Prof. Evans: A bachelor of engineering, or any area of engineering, except I think it is computer engineering, since I do not think they do adequate maths.

The DEPUTY CHAIR: What are the academic units that you teach in subsea engineering?

Prof. Evans: Introduction to subsea engineering, umbilicals and risers, hydrocarbon phase behaviour, corrosion engineering—my brain says PLTs and acronyms for what we have! Basically, we have eight different subjects per year for a person over two years, with the fourth semester being the project semester.

Mr T.K. WALDRON: You talking about the global side of it and doing this with Aberdeen. Once that is bedded down and you feel it is working well, do you plan to then go further with that course, so a university—you mentioned there are about five or six that do it. Would you be partners with someone, say, in the USA as well? Is that a long-term plan, or do you think you will cross that bridge when you get to it?

[10.30 am]

Prof. Stelbovics: Certainly, if I can give you the senior executive's position, we as a university feel that we would like to build a strong relationship with either a US or a Canadian university, so I think that would be the next step. It is very early days with the Aberdeen relationship and we do not want to bite off more than we can chew, because it is incredibly easy for an Australian university to sign an MOU with another university but to actually make the rubber hit the road, that really requires genuine commitment and allocation of resources and a clear understanding of what the benefits are and who is going to do what. We are in that phase now with Aberdeen, but I would say that within the next year or so, I would not be surprised if we have identified a similar partner in the US. It would be a university that has also got our strengths—so there is a significant strength in

engineering, with a focus on oil and gas and resources. I do not know. Brian has been over in Texas for a while—in Houston.

Mr T.K. WALDRON: Are there any other universities in Australia doing something similar?

Prof. Evans: From a global perspective or from a petroleum engineering–subsea engineering perspective?

Mr T.K. WALDRON: Subsea engineering.

Prof. Evans: No. We are the only one in the southern hemisphere.

Mr T.K. WALDRON: Right. I was not sure so I thought I would ask the question.

Prof. Stelbovics: I will tell you how strong we are in Western Australia, and I include the University of Western Australia in this. We have got the biggest department in petroleum engineering in the southern hemisphere at Curtin University. That is our strength. We are, in terms of international demand, a really significant global player. The faculty's strategy is to actually build on that, because with the resources Western Australia has got, with the quality of life—the lifestyle—the safety of the place and whatever, it is something that is very easy to sell. If we are successful, I would love to double the number of international students coming to the state. Our experience over the past decade is that the international students are highly competent in terms of pass rates and progression rates. There is no difference from our domestic students. So, provided we set the bar for entry at the right level, the system works well.

Mr J. NORBERGER: Are they residential international students? Do they come over for that purpose?

Prof. Stelbovics: Yes, they do.

Mr J. NORBERGER: Are they funding it themselves or do you find they are being sponsored?

Prof. Stelbovics: The majority would be funding themselves. There are some that are sponsored, principally from countries in the Middle East.

Mr T.K. WALDRON: What is the main area they come from? Is there a particular area?

Prof. Stelbovics: Our biggest in the faculty over the past few years has been China, Singapore, Malaysia, and the Middle East. Over the shorter period—over the last three years—our market in India has been growing significantly. We had a bit of trouble a few years ago with Indian students on the east coast and some incidences which were highly publicised, but since the past three years we have been able to recover that position and the numbers are increasing again. The Indian market is interesting because it does depend on the exchange rate. I think when we had parity two or three years ago, that was a big negative, but the future for the next few years is that we will not be going much higher than we are now, and I think that is about the right level for international students to find Australia as an attractive place.

Prof. Evans: I might just comment that in petroleum engineering and subsea engineering, it is mainly Indian and Chinese right now, not to forget the fact that we do presently teach subsea engineering directly into Korea. The vessels are being built in a Korean shipyard, and we teach at Pusan National University, and that is because they are on the same time zone so it is very easy for us to teach them. All of our subsea engineering is online anyway if needed.

Mr J. NORBERGER: Is that at an undergraduate level, did you say?

Prof. Evans: No, at the masters level.

The DEPUTY CHAIR: What is the difference between the work that is done by Curtin University and UWA?

Prof. Evans: UWA focus a lot on seabed geotechnics. We do not; there is the difference. We focus on what we call—what the industry calls—the subsea factory. If you appreciate the fact that putting

LNG plants onshore in Australia now is not well regarded, and that it is much easier to use floating facilities and have the actual compressors and so forth on the seabed, and allow the floating facility to be very much the storage point, that is the technology of the future and that is the way we do it. We refer to it in industry as developing the stranded fields. We have over 50 stranded small, marginal fields out there that certainly could not be developed if the pipeline was run offshore.

The DEPUTY CHAIR: I hope you have read our FLNG report, because we have a slightly different view from that!

Prof. Evans: I am saying that I believe the direction for the future is floaters, simply because if you have the technology—I mean, it is all doable. That is similar to the argument that we should have all offshore structures totally automated, not just for HSE health and safety reasons, but to make it an optimum decision-making process through what we are trying to develop at the moment, which is predictive analytics.

Mr J. NORBERGER: And you are causing him a lot of pain with everything you are saying!

Mr T.K. WALDRON: What was the last thing you said?

Prof. Evans: Predictive analytics. Another word for it is automation. You have to predict what is going to happen, so you have to take the automatic necessary steps to obviate it.

Mr J. NORBERGER: It is fantastic to hear what you guys are doing—congratulations. Are there any barriers to this coming to fruition? Are you pretty happy with how it is going? Are you going to get there? Is there something the government could have or should do, or may still be required to do, or are you quite happy that the environment as it is enables you guys to innovate and create this outcome on your own?

Prof. Stelbovics: I will answer that in two parts. The first part is no, we are not asking for a handout. We have made a business case and a business model that is working, so we are just very happy to tell you how well it is working. The second part is that in terms of having Western Australia and the facilities that we have here sort of globally at the top of the class, it would be ideal for universities—here I include principally our university and UWA—to have an oil and gas pilot plant for the training of engineers. What we find is that when we get the graduate engineers, the first chance they get to see a real-life working plant and analyse its complexity and learn all the procedures is when they get their first job. Companies pretty much say it takes 12 months to actually train them. So there is a lot of downtime. You can get a graduate engineer, and then you have to spend another 12 months when they get their first job, training them, and say okay, "You did the theory and whatever at the university, but this is the real-life thing and so we have to retrain you." So the way that we would prefer to go, and that we do go, is that during the courses—our undergraduate degree in engineering—we require that our engineers have what we call work-integrated learning, and the Institute of Engineers of Australia says ideally you should have three months of that type of experience before you can actually be qualified for membership.

With the downturn in resources in the past three years, a lot of players have been downsizing and exiting, and so the opportunities for this work-integrated learning across the state and across the country have dramatically reduced. So what we have been considering is how we can respond to this strategy. One thought that we have had for the last couple of years is why can we not have a partnership with industry where we develop an oil and gas pilot plant, and that plant would be able to provide the work-integrated learning. Because, as Brian was saying, predictive analytics is where the industry is going, the pilot plant would not only be for petroleum engineers and oil and gas engineers, but also for remote sensing, which is all about electronic engineering and software engineering. We can see a demand of about 300 students a year for this type of training. This training would be open to all the universities in the state, and it would be an attracter to get students from other parts of Australia who want to specialise in oil and gas.

[10.40 am]

Mr J. NORBERGER: Is there an opportunity to partner with the Australian Centre for Energy Process Training on that? I mean, ACEPT already has a plant down there, as you know.

The DEPUTY CHAIR: That is what I was going to ask.

Prof. Stelbovics: Absolutely. We have met with ACEPT, principally Keith Spence. We have both visited to look at their training facilities and plants. They principally are focusing on operator training, and the scope for sending our students from universities in WA down there and train them I think is very limited. I think they are just not set up to do that. So what we need is a pilot plant that is somehow funded by industry and which universities support. One of the options that we have looked at is whether such a plant could be located down there. There are arguments against that. One, principally, is location. The other one is that we believe there is a far better site in Technology Park Bentley. The reason for this is that these pilot plants will be largely automated in the future, so a lot of the training has to be around automation and data analytics. Anything to do with data analytics requires processing and access to high-performance computing. At Technology Park Bentley we have got the Pawsey Supercomputing Centre. One of the things that we have been considering is that in an ideal world, we would have a fibre-optic connection into the Pawsey centre so that the students could immediately have access to that high-level training where we could simulate accidents or emergencies and sit in front of a computer screen and solve it. In an ideal world, you do not want to respond to an emergency; you want to be able to predict it. This is where this new area of predictive analytics comes in. Can you tell from the information that is being fed from all the sensors in a plant when there is going to be a failure next month? If Chevron could have anticipated that a couple of months ago, well, we might not have had them sort of being offline and spending—what?—$100 million to fix the problem. This is where the future of the industry is—reduced costs, automated, make the predictions about where failures are going to occur. It is a huge growth industry. If you want to build in where the industry is going in the future and train our engineers appropriately, that is where we think the ideal site is. We have had discussions with some of the public servants such as, John O'Hare, for example. We have had a couple of meetings with him and said, "Look, this is the proposal." The response has been, "Okay; go and have a look at what is down at Henderson and start talking to them." So, we are holding conversations.

The DEPUTY CHAIR: They have fibre optic to there as well.

Prof. Stelbovics: Yes. So we have ruled nothing out, and we believe for the benefit of the state and the universities that within the next couple of years, something like that has to be built.

Mr J. NORBERGER: I think that irrespective of where you do it—I anticipated your answer in the sense that I think it is logical that ACEPT, as it stands, has been built for their needs, but rather than building two separate plants, I just think from a synergy point of view, even if something new needs to be built or whatnot, I think there is a synergy—your engineers work on it and their process plant operators work on it.

Prof. Evans: We are talking about 300 students for three months a year. This is a seriously large throughput.

The DEPUTY CHAIR: There is a lot of land down there.

Prof. Evans: We have been there, but there is large turnover of students. I honestly do not know how a student will cycle down there from Perth. We are talking about local and international students going and using this facility, and most of our students have bicycles.

The DEPUTY CHAIR: Brian, you are talking about my electorate. I would calm down if I were you!

Mr J. NORBERGER: You have already hurt him once!

The DEPUTY CHAIR: If you keep going, we will get the Sergeant-at-Arms to arrest you! You are talking about 16 minutes away by car. We are not talking about near the border.

Prof. Evans: How long?

The DEPUTY CHAIR: Sixteen minutes.

Prof. Evans: Sixteen?

The DEPUTY CHAIR: Yes.

Prof. Evans: From where?

The DEPUTY CHAIR: From here down the freeway.

Prof. Evans: I am talking about Curtin students or UWA students on their bicycles.

The DEPUTY CHAIR: If they are on their bike, you are on your bike.

Prof. Stelbovics: So from my point of view, taking the higher ground, nothing is ruled out. I would say we need this type of facility for the state. We have also been in recent discussions with UWA because we are aware that they also have a proposal for a processing plant. Now, unlike ours, which would only use air, water and mineral oil, theirs is a full micro-plant and that entails high pressures and higher requirements for safety. Their proposal, as we understand it, centres mainly around research, so instead of talking in hundreds of engineering students for training, we are talking in terms of tens if you are running it as a research plant. What we have actually emphasised is that a joint approach would be the way to go. I really think there is a great opportunity for the state. We are willing to cooperate. We are just pointing out the next step if we want to be the global centre for oil and gas training. I think we are one of the biggest in petroleum engineering globally already and we should have that ambition.

The DEPUTY CHAIR: Given that we are a very large LNG producer and oil and gas producer and user of stuff made overseas, so that would question the whole reason for training engineers if you are a user, apart from installation, and then maintenance and operation, of those numbers that you have given us in the students, particularly the domestic students, obviously they have come down dramatically since year one because of the nature of what is happening here in Western Australia. How many were self-nominating, self-enrolling students and how many were put in by the industry?

Prof. Evans: Broadly speaking, I can say that the Indian students are self-funded.

The DEPUTY CHAIR: I am talking about domestic.

Prof. Evans: They are mainly part-timers already working in the industry and want to get through the glass ceiling as a professional engineer.

The DEPUTY CHAIR: So there is no interest from companies located here in Western Australia to sponsor their employees?

Prof. Evans: There was 12 months ago. They are laying off. GE laid off and Woodside laid off. It is very difficult to get sponsorship when companies are laying off professional staff.

The DEPUTY CHAIR: I can understand that, Brian. I know what is going on in the industry. You can go down St Georges Terrace and see the engineers begging on the road. The issue is the argument from the industry is this: we are going into the maintenance and operations phase so there is a lot of engineering in subsea in maintenance and operation. I would have thought at that stage that this is the time that they would want higher levels of skill, particularly from predictive analytics. Why are the companies not nominating their people who are left?

Prof. Evans: First of all, we have to have graduates of data analytics. The course is not actually running yet—not until next year. Secondly, the story, I believe, is that Woodside interviewed in the order of 110 potential data analytics people and they employed three, because the rest were unqualified, and that is where we saw a gap that had to be filled with qualified people, but it takes time to get these things developed. Woodside is the only leader that I see, apart from GE, which

also promotes it, but this is a difficult time of year to start taking on new staff in really what is going to be a new industry. The whole automation industry is going to be a new one. We only have one offshore facility right now called Angel.

Mr J. NORBERGER: Brian, you mentioned data analytics. Is that a separate course?

[10.50 am]

Prof. Stelbovics: That is another trend that is gaining a lot of prominence globally in not only the engineering business and oil and gas, but also in areas in health, for example. If you get the data from all the hospitals about heart pulses and whatever, can you actually draw conclusions and make predictions from just looking at somebody's heart rate what category they fall into and predict that they will have a heart attack in two months' time? We are at the stage that we can, and it has been demonstrated with a few research papers that we can actually make those sorts of predictions now. This area of data analytics is something that will take the globe by storm. There is, to our knowledge, hardly any data analytics offering at Australian universities, so one of the other things that we have been planning for the past 12 months is to put on a master's degree in data analytics. We have gone through the course approval stage and will be offering our first master's degree in that from semester 1 next year.

The DEPUTY CHAIR: My question was about the course of subsea engineering masters, of which data analytics is a part, and why those companies—for example, Shell—are not taking students. I mean, it is still in the process of possibly getting its FLNG in position. At some stage it might leave the harbour. But there is an awful lot of subsea that is still required. They are currently training their operators down there in Henderson; why are they not then sponsoring people to do this course?

Prof. Stelbovics: The conversations that I have had off the cuff with some of the senior managers is that, "At the moment, Andris, we're in survival mode. All we can think about is have we got jobs next week." When people are just looking over their shoulder in the industry, it is very hard for them to think strategically, you know, and we found exactly the same reaction in the mining industry. We are saying that now is the best time for companies to invest in mining engineering people, because in four years' time there will be a massive shortage. No. They are in survival mode. One of the other great things we have got at our university is a national mining engineering consortium, which we are part of with the University of Queensland, the University of New South Wales and the University of Adelaide, to provide a national degree funded by the Minerals Council. The Minerals Council said it was going to cut the budget by—I forget exactly—in the order of 40 per cent for the next few years. That is just a kneejerk reaction, because the whole initiative was set up so that in the bad times we would ensure that there is a steady stream of engineers going into that area.

Prof. Evans: When the industry has a downturn, the first thing that goes is research funding—number one; and second is scholarship funding—number two; and then third is the staff. That is the problem we have right now.

The DEPUTY CHAIR: Unfortunately for WA, when the pick-up comes, the only people who will be trained to the level that they want will be the people that you have trained, the international students, and they will be asking for 457 visas!

Prof. Evans: Exactly.

Prof. Stelbovics: That is exactly right.

Mr J. NORBERGER: I wish Tuck had not have spoken so much—I think he has dominated!

Prof. Evans: Can I just say, I was also asked about the automated drilling rig that we are developing. It fits in the same context as predictive analytics. Curtin has been a member of the DET CRC for seven years—that is the deep exploration technology CRC—and it has one more year to

go, so it was an eight-year CRC. It is substantially funded in the order of—I cannot remember, but overall $60 million to $70 million over eight years. Curtin is leading one of the major areas. Because of our expertise in drilling engineering, we would have probably the best drilling engineering research labs in the southern hemisphere. We have been developing all the technologies for the actual applied drilling side of it. We have got to the point where now, Adelaide is the centre of that CRC, and two drilling rigs are being built, known as coiled tube drilling rigs. In other words, there are no pipe changes—a coil actually goes straight down the hole and is reeled back in. That is with a turbine and a high-speed motor. If you like, conventional drilling might be 50 RPM of a drill bit; we are working on 3 500 to 5 000. I call it the dentist drill. It is the only drill that is 1¾ inches, and right now it is for mining, but where I see it, we will get delivery of our drilling rig here at Curtin in the tech park, and where I am going with that rig is within two years' time—understand, right now it only requires two operators for health and safety; actually, one operator for steering and all the rest of the things you do with a drilling rig, and the other operator is more is an offsider, and that is it. We would hope, in years to come, that this will go down to two kilometres or three kilometres, and adapt it for the oil and gas sector. Right now, it is just for hard-rock drilling. Where we are going with this, and it comes into this data analytics future, is that I want to make that single man automated. In terms of drones, the technology is there today. It can have its own drones fly around there. This will be an exploration drilling rig. The target is $50 a metre. That is unbelievable in today's drilling cost structure—$50 a metre. You can go on the DET CRC website and see all these statements I am making, open for public analysis. It even has movies of our drilling, and cartoons. But, in the final analysis, later this year, in November–December, basically I take delivery of this new drilling rig, and I am going to fully automate it within two years' time. I might say that it couples up to a CSIRO-patented machine called Lab-at-Rig. It is fully automated and it couples up and has been commercialised by Imdex in North Perth. Imdex's own mud separator is coupled up to that. I would like to say that in three to four years' time from now, this unit will be going out there, fully automated, controlled from Perth, drilling. That is where I believe we can expand our mining industry. After that, I will take it into the oil and gas sector, because all it needs is a blowout preventer and we have suddenly got the oil and gas sector. Right now, a big problem is how do you handle a fracture when you lose circulation. In mining, automated drilling rigs are nothing special. BHP and Rio Tinto have their remote control centres. It is not as if it is a pie in the sky; it is going to happen within the next two or three years. That is where we will start making the new undercover—you know the expression CSIRO's undercover projects? That is where we actually start being able, at $50 a metre, to do something really productive and make WA the leader of the world in this form of technology.

I might also say, we have had the Norwegians come to us at the last AOG conference in February. I had a meeting with them where they said, "We want to take your new drilling rig subsea." I said why, and they said because in the North Sea, you can only work for two or three months. The semisubmersibles are half a million dollars a day. They envisaged this machine sitting on the seabed with an umbilical to a supply boat, whether it is locked in the Arctic ice or not—that is their problem. It will basically be sitting there, not with drones, but with gliders going down; they have the idea of three gliders, all patched into each other, controlling and monitoring this, just like the drones I envisaged on land. This is where technology is going in the future. I am really excited about this, as you might tell! That is the way we need to go. That is why we want to get into predictive analytics. The only predictive analytics there is going in the world is all in business. No-one is doing engineering; no-one is doing finances. We proposed three streams. The first is in engineering. It is called resources production engineering. That is one stream of our data analytics. The second is called finance and investment analytics. The third one is—Fran will appreciate this—asset management and productivity. They are the three streams. That is run by our graduate school of business. That is the future. It excites me because I enjoy this area of my life.

Mr T.K. WALDRON: I think that is pretty obvious.

Mr J. NORBERGER: Will they be online?

Prof. Stelbovics: We are looking at our product offering and mode of delivery, and increasingly there will be a trend to more and more online.

Mr J. NORBERGER: I did my MBA through you guys, predominantly online, with Robert Gordon University. If it had not been available online, I would not have been able to do it.

Prof. Stelbovics: If we want to be a global university, with different time zones, then we have to be able to increasingly design courses to be online. But we think it is also incredibly important that there are opportunities for your global class to actually see the others at least in live time through computer screens and technology, hence the design of this joint subsea masters. We want to have some of the lectures, and certainly the tutorials, in live time for the whole class, no matter where they are.

Prof. Evans: Specifically tutorials. I might also add that most of the domestic students that I referred to have been part-timers, sitting offshore.

The DEPUTY CHAIR: Thank you for your evidence before the committee today. A transcript of this hearing will be forwarded to you for the correction of minor errors. Any such corrections must be made and the transcript returned within 10 days from the date of the letter attached to the transcript. If the transcript is not returned within this period, it will be deemed to be correct. New material cannot be added via those corrections and the sense of your evidence cannot be altered. Should you wish to provide additional information or elaborate on particular points, please include a supplementary submission for the committee's consideration when you return your corrected transcript of evidence. Thanks very much indeed.

Prof. Stelbovics: Thank you very much.

Hearing concluded at 11.01 am