OceanWorks is a joint initiative between The University of Western Australia and Woodside aimed at enriching research capabilities and responsiveness to industry’s current and future needs.

This is done by engaging with the issues in offshore engineering and working with industry to develop solutions that will have a significant impact on industry practices and can be implemented quickly and efficiently.

OceanWorks has three main components:
(i) the OceanWorks space, located in the Indian Ocean Marine Research Centre (IOMRC) at The University of Western Australia, which is used to share industry challenges and foster collaborative problem solving;
(ii) a collection of mechanisms, in partnership with the Office of Research, Development and Innovation and the Innovation Quarter at UWA, which enable innovative applied research, and
(iii) a program of outreach activities to support teaching and encourage communication across industry and academia.

OUTCOMES + IMPACT

UWA
Woodside
Consultants/ Contractors
Collaborators

OceanWorks Space
• Pitching Sessions
• Away Days
• Hackathons
• Research/project meetings

IDEAS
RiverLab
Work with Masters of Professional Engineering students to use the Swan River as a Giant Wave Basin eg Mooring line integrity, demonstration of offshore concepts.

Prototyping Fund
Small scale research funds for fast, targeted research. Up to ~ $5K to progress an idea ~ 8 initiated in 2018.

Large Scale research projects
ARC + CRC scale eg Offshore Floating Facilities Hub, ARC Linkage projects.

Commercialisation
Supported by the UWA office of Research Development and Innovation Quarter. Three projects currently on pathway to commercialisation.

OUTREACH & TEACHING
• Workshops (Start something, unconscious bias, research communication)
• Future engineers program with women in subsea engineering
• Making waves concert
• Women in IOMRC network
• Perth Science festival
• Academic entering scheme for women
• Community media/engagement...
OceanWorks includes a physical space for facilitating interactions between industry and academics.

OceanWorks hosts events that encourage an open exchange of knowledge including industry workshops, hackathons, symposiums and social functions. The OceanWorks network is constantly growing and we are committed to developing an inclusive and innovative community that supports the research being undertaken at UWA and engages with industry.

**Prof Lyn Beazley visits Women of IOMRC**
Prof Lyn Beazley met with the Women of IOMRC network to share her journey of a career in science. The stories reminded the attendees to stay flexible and always be open to opportunity. One of the attendees, Dr Shiaohuey Chow, said “I found Lyn’s talk very inspiring with many take home messages. Her comments on the importance of leadership, fellowship and followship certainly struck a chord with me”.

**Woodside Challenge Sessions**
In a series of Challenge Sessions, Woodside visited OceanWorks and shared an engineering challenge they were facing and UWA academics then pitched solutions to these challenges. One proposed solution “Use of fibre optic sensors for integrity monitoring of piping, pressure vessels, crane and structure” was funded by the OceanWorks Prototyping Fund. A second proposed solution, “The calcification of marine growth on subsea structures” resulted in a pathway paper that was presented to Woodside.

**Australian Academy of Technology and Engineering (ATSE) Visit**
The Western Australian division of ATSE held their Annual General Meeting in OceanWorks in 2018. This was an opportunity for 30 of Western Australia’s leaders in technology and engineering to visit the OceanWorks space. Following the meeting, attendees visited some of the research facilities located in IOMRC, including the National Geotechnical Centrifuge Facility and the Australian National Facility for Ocean Gliders.

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**Events and Engagement**

150 Academic Events

35 Industry Events

3000 Visitors

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“I found Lyn’s talk very inspiring with many take home messages. Her comments on the importance of leadership, fellowship and followship certainly struck a chord with me”

Dr Shiaohuey Chow
RiverLab was developed by UWA and Woodside to bring together a community of researchers from diverse disciplines, with state-of-the-art equipment, to enable unique field measurements and experiments in the Swan River that support innovative offshore engineering.

So far, the Swan River has been used to explore the performance and response of model scale offshore structures and to enable the trialling of prototype devices and sensors, such as those used for measuring offshore waves and currents and geotechnical conditions at the river bed, and to monitor aquatic life.

‘I really enjoyed undertaking a RiverLab project, it gave me an opportunity to work on something industry orientated during my final year thesis, which had potential for long term impact.

Based on my thesis, I won a national prize awarded by Engineers Australia to attend the Australasian Coast and Ports Conference, and I have since received a McNamara PhD Fellowship to undertake further research in coastal engineering.’

Justin Geldard

Modelling the development of a subsea shuttle

The RiverLab was used to trial a new innovative subsea shuttle which could revolutionise the installation of subsea structures. The project investigated the hydrodynamic performance of the shuttle, which is designed to transport structures or chemicals to field locations offshore. One advantage of the shuttle is that it can replace the need for large construction vessels, which are very expensive to hire.

The shuttle is being developed by a US-based company Smart Marine Transfer (SMT). The work in RiverLab involved conducting numerical modelling and field experiments of the shuttle being deployed (lowered) through the water column (see the images on the right.)

The modelling and experiments were conducted by two Master of Professional Engineering students at UWA, Jeremy Lee and Calvin Lee, and demonstrated the reliability of the shuttle in a range of wave conditions. To showcase the shuttle and the RiverLab research a demonstration was organised by Woodside in the Swan River in July 2018. A range of professionals attended who have direct experience in deployment of subsea structures and the operation of construction vessels. The hope is that these professionals will take inspiration from the demonstration and collaborate with SMT and Woodside to deliver innovative installation solutions.

The work in RiverLab involved conducting numerical modelling and field experiments of the shuttle being deployed.

Incubating Research Ideas

RiverLab

RiverLab

RIVERLAB IN NUMBERS

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The OceanWorks Prototyping Fund was established to encourage innovation and enable rapid research into potential offshore engineering solutions. Applications for funding are required to identify the manner and scope of the potential impact that their projects will have in industry. Successful applicants are encouraged to work with industry during the project and communicate their findings.

8 projects funded in 2018

• Detecting Corrosion Under Insulation
• Shallow Penetrometer – Measuring In-situ Soil to Soil Friction
• Shear Stress Amplification and Scour Around Subsea Structures
• Elongation of Pipeline Spans Over Buckle Initiators
• A Feasibility Study of the Detection of Pipeline Dynamics Response Using Distributed Optic Fibre Strain and Discretely Located Accelerometers
• Robust, Automated Cameras for Biodiversity Assessments from Industrial ROVs
• SLAM – Local Adjustment Via Monitoring

Commercialisation
In conjunction with UWA’s Innovation Quarter and the office of Research Development and Innovation, OceanWorks supports researchers and their projects on the pathway to commercialisation. Commercialisation creates research impact, translating it from being interesting to useful.

• 3 projects in the process of being commercialised

Internships
OceanWorks sponsored interns over the 2018/2019 academic year break and plans are underway to extend this program. The interns learn valuable skills to assist in their career development and have the opportunity to work with and present their work to industry.

4 internship projects in 2018

• Water entrainment and trenching around offshore infrastructure (Ben Turner)
• Soil characterisation in shallow sands (Farid Bhatti)
• Development of an innovative miniature wave height measurement device (wave buoy) (Carlin Drew Lapuz)
• Development of miniature subsea smart sensor for measuring mooring line load and inclination (Louis Bok)

Large Scale Projects
OceanWorks works closely with the Australian Research Council’s Industrial Transformation Research Hub in Offshore Floating Facilities to upscale research projects. Plans are also in place to convert prototyping projects into larger scale research programs where key opportunities for industrial research are identified.

Performance Evaluation of Anti-Scour Frond Mats
This project focused on the significant and rapid sediment scour that impacts pipeline and subsea structures when they are deployed on mobile seabeds. It found that one of the most important factors in designing frond mats appeared to be the optimum frond shoot density.

The Swan River has been used to explore the performance and response of model scale offshore structures and to enable the trialling of prototype devices and sensors.
Examples of Outreach and Teaching

Women in IOMRC

The Women of IOMRC Network supports women in their careers and encourages collaboration with the different groups within IOMRC, namely AIMS, CSIRO, and UWA. Hosting networking events for the women in the building leads to opportunities to collaborate and share knowledge between institutions, and opportunities for female academics to advance their careers.

Subsequent talks and workshops hosted in the space will target the needs of these women, and will aim to grow their skills and give them access to leaders in industry and academia. This focus on equity and diversity is in line with OceanWork's goal of enriching our research capabilities and growing our relationship with our communities.

In 2018 the Network hosted a Launch Morning Tea (May), A Conversation with Lyn Beazley (August), A Panel Discussion on Work/Life Balance (October) and established a Fortnightly Newsletter (September) sharing outreach opportunities and equity events with the Network. In addition to this we supported our members in attending the Women in Kind Book Launch (September) and hosted the EMS Inclusion and Diversity Committee’s Workshop to create a submission for the Federal Government’s Women in STEM Decal Plan.

Future Engineers

OceanWorks participated in the inaugural Future Engineers Program (FEP) in 2018 in collaboration with Women in Subsea Engineering. FEP is a free STEM program for female students in years 8 to 12. In 2018 30 students participated in the program. Professional staff and academics linked with OceanWorks supported the program and talked to the students about their careers, plus hosted them on a tour of the Indian Ocean Marine Research Centre.

Final years Masters Research Projects

RiverLab provides research based projects for students in the final year of their Masters of Professional Engineering (MPE). Each student works within a team of UWA academics and industry partners to conduct research involving the Swan River. Partners have included Woodside, Arup, Main Roads WA and the Western Australian Institute of Sport. At the end of their project, students present the results of their project in a public forum that includes members of industry. In 2018 24 MPE students were involved with RiverLab projects, and an additional 20 students worked with RiverLab as part of the UWA Environmental Engineering Design Class. RiverLab students have gone on to win institutional and national awards.
From Academia to Industry

Three UWA researchers have been supported by OceanWorks to take their academic research projects into industry.

VOPS
Development of the VOPS software by Woodside Senior Metocean Engineer, Matthew Zed and Dr Ian Milne came from the challenge: how do different types of vessels operate and react in different metocean environments, wave response and weather systems. The algorithm for Response Amplitude Optimisation twinned with existing metocean and vessel data has been combined into a user interface and database currently in use by the Woodside Naval Architecture Team and gaining traction amongst internal clients.

The VOPS software solution has increased the accuracy of decision making and planning to reduce huge costs of demurrage associated with sending vessels to inoperable area.

Water Detection Device
Development of the water detection device began when Woodside brought us a challenge: here is a black box, how can we tell if there is water in it without opening it? Prof. Jie Pan and his team developed a combination of intrinsically safe tools (which he designed specifically for the project) to determine the vibration characteristics of the boxes and thus easily identify the presence/absence of water. The project is now awaiting final field trials prior to delivery of the Minimum Viable Product for application concurrently with the Woodside team navigating the management of change looking ahead to planned full-scale deployment in 2019 and commercialisation. Jie is also working with UWA’s Research Commercialisation Team to commercialise his invention in collaboration with the Woodside Technology Function having filed a patent application.

Woodside has thousands of units in each of their plants, and there are stringent safety requirements for inspecting these regularly. Previously, each time a box had to be inspected a lengthy shutdown process had to occur – now, this shutdown process can be avoided in most cases, which makes for significantly more efficient inspection times, and greater productivity within Woodside.

Pipe Stabilisation Device
OceanWorks are thrilled to be contributing to the commercialisation of an innovative subsea device which increases the lateral stability of “pipes” laid on hard surfaces (e.g. “pipes” = umbilicals, flexible flowlines and ridged pipe, power cables, telecom cables), mitigates abrasion due to pipe movement over rough surfaces and is intended to be applied to new “pipes” installations or potentially also retro fitted to existing “pipes”. OceanWorks together with the Woodside Subsea team are looking to help transition the patent pending device across the commercialisation “valley of death” with prototyping and field trials in parallel with UWA Office of Research Development and Innovation negotiating with a potential manufacturer.

The potential for the device to increase stabilisation of pipes from design through the whole life cycle of operation to removal is predicted to save considerable direct costs associated with maintenance and asset (“pipe”) integrity.