we champion IMCIC manufacturing innovation

Innovative Manufacturing CRC (IMCRC) HIGHLIGHTS REPORT 2022-2023



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The Innovative Manufacturing CRC (IMCRC) has been an independent and for-impact cooperative research centre that helped catalyse the transformation of Australian manufacturing.

By investing in research-led innovation in manufacturing products, processes and services, IMCRC brought together forward-thinking businesses and some of Australia's best universities and the CSIRO to collaborate, address pressing industry challenges and develop solutions that have led to substantial and wide commercial outcomes. We helped those involved to scale up, transform their business operation and become more competitive and resilient, and be exemplars for others in the industry to follow.

Thank you for your commitment and support.

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Disclaimer

IIMCRC has endeavoured to ensure that the information in this publication is correct. This report has been prepared to align with IMCRC's Commonwealth Agreement, referencing the outcomes, activities, participants and other matters as at 31 December 2022, unless it is otherwise specified in the document.

The Report has been produced sustainably in Australia, using recycled material. Only a limited number of reports have been printed, adhering to IMCRC's paperless office policy.

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HIGHLIGHTS



Achievements



71 R&D projects

SUCCESSFULLY COMPLETED. **43 WITHIN THE REPORTING PERIOD**



\$250+ million

CUMULATIVELY INVESTED INTO COLLABORATIVE RESEARCH. MANUFACTURING INNOVATION AND EDUCATION





RESEARCH PUBLICATIONS, 11 PUBLISHED IN FY2O22-23

800+ MANUFACTURING SMEs COMPLETED FUTUREMAP®. **60 IN THE REPORTING PERIOD**



MANUFACTURING INNOVATION SHOWCASE HOSTED



33 PhD and **Masters students**

SUPPORTED, 18 DUE TO COMPLETE THEIR RESEARCH **BETWEEN 2022-26**



25 manufacturing internships

> SUPPORTED THROUGH **APR.INTERN PARNTERSHIP**, **3 WITHIN THE REPORTING PERIOD**

6

Impact and Outcomes

Since its launch in 2016, IMCRC has purposefully invested **\$34 million of Commonwealth and other funding** to help transform Australian manufacturing catalysing over **\$250 million investment** in collaborative research, manufacturing innovation and education across Australia.



Industry-led Manufacturing Research across Australia and New Zealand



projects shown per industry partner location

The Industry Impact of IMCRC

IMCRC has successfully invested \$34 million of Commonwealth and other funding in 71 industry-led research collaborations to help catalyse the transformation of Australian manufacturing. The significant economic, social and environmental benefits of these collaborations have been highlighted in an independent impact report produced by leading economic, policy and strategy advisory firm ACIL Allen. The report found:



\$4.2 BILLION IN FINANCIAL BENEFITS TO

INDUSTRY BY 2030

OTHER SOCIAL AND ENVIRONMENTAL BENEFITS BY 2030 INCLUDE:

6,000+ **ON-GOING FULL-TIME** EQUIVALENT JOBS



COLLABORATIONS AND NEW PARTNERSHIPS BETWEEN **RESEARCHERS AND BUSINESSES**



\$2 billion **OF FUTURE R&D INVESTMENT**

PLANNED BY INDUSTRY PARTNERS

45

224

POSTGRADUATE COMPLETIONS (INCL. 33 PHD AND MASTER STUDENTS **DIRECTLY FUNDED BY IMCRC)**





CASES OF INDUSTRY PARTNERS **TRIALING NEW TECHNOLOGIES -**AI, AUTOMATION AND ROBOTICS, ADVANCED MATERIALS. VIRTUAL AND AUGMENTED REALITY, ETC.



IMPROVED ENVIRONMENTAL **OUTCOMES / MORE** SUSTAINABLE BUSINESSES



Message from the Chair

Over its lifespan, IMCRC has driven significant change for Australia's manufacturing ecosystem, helping catalyse the transformation of the sector through collaborative investment, research impact and innovation.



In 2016, IMCRC set out to grow Australia's manufacturing capability and capacity and drive realworld commercial outcomes, purposely investing in a diverse array of projects spanning from mining to defence. And to encourage growth across the whole sector, we supported start-ups, small and medium enterprises (SMEs) and global multinationals alike to exploit innovative technologies and deliver transformative business models, products, processes, services, and platforms.

Together with our partners, we have delivered a robust portfolio of 71 industry-led research and development (R&D) projects. Collectively, these collaborations have generated over \$250 million of investment into Australian manufacturing innovation.

IMCRC's efforts to help Australian manufacturers achieve outcomes that strengthen their competitiveness and resilience, and lead to longterm, sustainable economic growth were examined in "The Impact of the IMCRC", a report produced by leading advisory firm ACIL Allen. Evaluating the economic, social and environmental benefits of our industry and research collaborations, the report found IMCRC's projects are set to deliver at least \$4.2 billion of financial benefits to industry by 2030 including the creation of over 6,000 full-time jobs and a further \$2 billion in new R&D and technology investment. These results are a testament to the effectiveness of IMCRC's business model in establishing focused research partnerships that deliver mutually beneficial commercial outcomes.

In early November 2022, I had the pleasure of witnessing the innovative outcomes of these partnerships in person at IMCRC's Manufacturing Innovation Showcase. Over 40 of IMCRC's projects were on display, with industry and research participants sharing their findings and the next steps of their R&D and commercialisation journeys. All partners I spoke to at the event valued IMCRC's financial and other support, and attributed the team's manufacturing expertise and flexible approach to collaborative R&D as a key success factor to their investment.

One example is Queensland-based technology company Verton. In 2019, Verton partnered with IMCRC and the Queensland University of Technology (QUT) to advance its hands-free loadlifting solution for use with cranes. Three years on, Verton and QUT have successfully harnessed artificial intelligence, data science and robotics to deliver a revolutionary remote-controlled system that safely and accurately orients the loads. Another company that benefited from (in their words) the incredible support from IMCRC throughout their research collaboration with Swinburne University of Technology is Sleep Corp. Inspired by the outcome of their futuremap® assessment as part of their project, they designed and later integrated Industry 4.0 technologies into their new factory in Dandenong. There are many more examples I can attest to.

The scale and breadth of the IMCRC research collaborations across Australia's core industries have meant that IMCRC was directly and uniquely connected to many of the trends shaping Australia's manufacturing sector.

Utilising that knowledge as part of its Industrial Transformation Program, IMCRC encouraged over 800 Australian manufacturing SMEs, as well as many larger manufacturers, to accelerate their digital transformation journeys. At the Program's core sits futuremap®, a unique business diagnostic and education platform that has enabled manufacturers to assess their capabilities across industrial and manufacturing competitiveness and identify opportunities for growth and investment. An independent report conducted by Swinburne University's Centre for Transformative Innovation highlighted that many of the manufacturing SMEs that participated in futuremap® were growing faster than their peers and making innovation a priority within their businesses. We intend that futuremap and its benefit to industry will continue well beyond the end of IMCRC's term.

Although IMCRC's projects and activities formally concluded at the end of 2022, it leaves behind a proven and exemplary business model for research collaboration and manufacturing innovation. As one of the key success stories of Australia's CRC Program, it is my hope IMCRC's business model can continue to shape Australia's manufacturing and innovation ecosystem into the future.

It has been an immense privilege to support the transformation of Australia's manufacturing industry as IMCRC's Chair. On behalf of the Board, I would like to congratulate CEO and Managing Director David Chuter and his team, as well as our industry and research partners, for their remarkable passion and commitment over the past seven years.

I. Nufl

The Hon Ian Macfarlane Chair

Message from the CEO and Managing Director

Australian manufacturing innovation matters. With the successful completion of 71 transformative manufacturing R&D projects, IMCRC and its partners have proven how collaborative investment, research impact and innovation have strengthened the competitiveness, productivity and resilience of Australia's manufacturing industry.



When IMCRC opened its doors in 2016, it did so with a passion for Australian manufacturing and a deep commitment to helping the sector become thriving, relevant and globally integrated. Backed by a transparent governance structure and clear framework for commercialisation, we strategically chose to support innovative, industry-led collaborations that leveraged Australia's research strength, right from the start.

Six years on, IMCRC has delivered on its commitment to Australia's manufacturing sector, investing in and facilitating a diverse portfolio of innovative R&D projects between 13 different research organisations and 78 different industry partners, 80% of whom are small to medium enterprises (SMEs).

From an initial pool of \$40 million of Commonwealth funding, IMCRC's business model catalysed a \$250 million project portfolio, which will continue to drive transformative commercial outcomes for industry and shape the future of Australian manufacturing.

This financial year, the remaining 43 of IMCRC's 71 projects drew to a close. Their results demonstrate Australia's significant research capability and prove how collaborative research can be used to address some of the world's most pressing challenges.

Every one of these projects has resulted in successful outcomes. Many are already delivering substantial commercial results, growth, new and high value jobs and exports, and catalysing further investment to benefit Australian manufacturing. While much of the research and development focus has embraced technology, materials and digital, in each case success has come through the power of bringing together likeminded, curious, ambitious and willing people through these collaborative projects. It is people who work out how to best utilise technology to bring new ideas, business models, products, processes, services and platforms to a global market. That is what collaborative R&D can do, and why Australia more broadly must intensify investment in capability and capacity building, just as IMCRC has done for manufacturing.

In addition to project outcomes, we have continued to see wider impact through futuremap®, IMCRC's business diagnostic and education platform that so far has helped over 1,000 manufacturers, particularly SMEs, embrace Industry 4.0 and start their industrial transformation journey. In collaboration with our deployment partners, we facilitated multiple workshops that deepened manufacturers' understanding of their business capabilities by sharing insights into how Industry 4.0 can improve productivity and create new manufacturing opportunities. Together with Swinburne's Factory of the Future, we developed and piloted an additional 'Towards Net Zero' futuremap[®] module, which is designed to help manufacturers understand their role in supporting Australia's goal of Net Zero by 2050.

Early in the financial year, we asked the Centre for Transformative Innovation at Swinburne University of Technology to independently review futuremap[®] and verify the effectiveness and impact of the platform. The report found that businesses that had participated in futuremap[®] were growing faster and being more innovative than their closest peers. They invested more in marketing, organisational and human capital, suggesting that futuremap[®] encouraged them to address areas with deficits to complement their existing business strength.

At the close of 2022, leading advisory firm ACIL Allen published an independent impact evaluation report that examined the significant economic, social and environmental benefits of IMCRC's research collaborations. The report, "The Impact of the IMCRC", found that by strategically investing Commonwealth and other funding, IMCRC has helped generate estimated financial benefits of almost \$4.2 billion for industry by 2030 including \$3.7 billion in additional revenue.

Looking to the future, further benefits by 2030 include the creation of over 6,000 ongoing full-time equivalent jobs, 224 collaborations and new partnerships between researchers and businesses, planned industry investment of \$2 billion in future R&D and a reduction in greenhouse gas emissions of more than 3,300,000 tonnes CO2.

While these figures highlight the critical importance of strong commercial and governance frameworks, I cannot ignore that, especially through the challenges of COVID-19, strong relationships emerged as key drivers of effective collaboration. Thus, it is exciting to see that IMCRC's collaborative ecosystem facilitates enduring partnerships – both with research organisations working together on new projects, and industry partners collaborating through complementary technologies and business models.

In my final message as CEO, I would like to thank our team and project partners for their trust and confidence in IMCRC. I especially want to acknowledge their unwavering commitment over the past six years. I am extremely proud to have worked alongside a group of people so dedicated and invested in the success of every project and the industry as a whole. Thank you also to our Chair, the Hon Ian Macfarlane, and our Board of Directors, for their invaluable support and counsel.

Having concluded its CRC activities at the end of December 2022, IMCRC leaves behind a strong legacy and a clear framework for commercialising research innovation. It has been a great responsibility and privilege to co-invest Commonwealth funding with industry for the benefit of Australian manufacturing. After witnessing the strength, resilience, passion and ambition of our partners, I have full confidence in their ability to build the industry we need for the future.

Thank you.

David Chuter CEO and Managing Director

CASE STUDIES



* photo credit: IMCRC

AML₃D

New Al-Sc welding wire for the emerging Australian Wire Arc Additive Manufacturing Sector





By supporting the project and facilitating the introduction to IFM, IMCRC has helped change the trajectory of our business, expanding our potential customer base and creating further opportunities to innovate through R&D.

ANDREW SALES EXECUTIVE DIRECTOR I CHIEF TECHNICAL OFFICER, AML3D



photo credit: AML3D

3D printing technology is revolutionising the manufacturing industry, enabling the rapid and lowcost production of complex objects. However, the welding wire currently used in large-scale 3D printing requires time-intensive heat treatment to reach optimum strength, which can be costly and creates some logistical complexities.

To overcome this challenge, ASX-listed metal additive manufacturing company AML3D sought funding from IMCRC to develop novel high-strength aluminium welding wire that required minimal or no heat treatment post-manufacture.

Leveraging its established relationship with Deakin University's Institute for Frontier Materials (IFM), IMCRC was able to facilitate an introduction and subsequent collaboration between the research team and AML3D.

Through this partnership, AML3D and IFM have successfully developed a new high-strength aluminiumscandium welding wire for use with AML3D's Wire Additive Manufacturing (WAM®) 3D printing technique.

"Our cost-effective, high-strength aluminium alloy requires just 30 minutes of heat treatment once printed. When used with our WAM® technology, this wire has the potential to replace traditional manufacturing processes across industries that use aluminium, such as shipbuilding and aviation," said Andy Sales, ALM3D's Executive Director and Chief Technical Officer. Thomas Dorin, Senior Research Fellow at IFM, added, "We were pleased to work with AML3D and IMCRC on this ambitious project, which encompassed over 20 different compositions and iterations. Our chosen alloy, a mixture of aluminium, magnesium and scandium, has recently been patented, and we've also commenced commercial production."

"The next phase of the project involves manufacturing five tonnes of welding wire and printing products to demonstrate its potential applications. We'll then work with AML3D to show boatbuilders how they can print directly at the shipyard, which is an effective way to reduce material waste and streamline logistics."

It's hoped that with a solid business case, this innovation can help bring wire production back onshore in Australia. Most of the welding wire used in Australia comes from Bahrain, with very few manufacturers left producing locally. But in time, Thomas believes the demand from the shipbuilding and aviation industries will reinvigorate the local market.

For Deakin University and AML3D, the work through IMCRC has been incredibly rewarding, with both parties describing the process as mutually supportive. "We loved working with Thomas and the team," said Andy. "It was seamless, smooth, fun and overall, we're genuinely excited about what the future holds for this research."



* photo credit: AML3D

Ausdrill

High Access Localised Operations (HALO)





The hard rock mining environment poses many challenges in regards to safe systems of work. The introduction of an automated rockwall scaling robot is a game changer for the protection of our people and is in line with our company principals of "Smarter Together" and "Enabling Tomorrow".

RAEGAN RUMBOLD GEOTECHNICAL AREA MANAGER, AUSDRILL



* photo credit: UT

Ausdrill is a leading Australian provider of drilling project management services. Its offering encompasses everything from exploration to geotechnical operations. This includes scaling the walls of open pit and underground mines to remove loose or unstable rock, a dangerous and demanding task currently performed by specialist abseilers.

In 2020, Ausdrill partnered with experts at the University of Technology Sydney (UTS) to explore the concept of a robotic system that could take the place of abseilers and improve the efficiency and safety of its rock scaling service.

A year later, with the support of IMCRC, the project team took the next step and harnessed robotic and virtual reality (VR) technologies to develop a proof-ofconcept prototype capable of scaling rock in a range of mining environments.

"We started the project with an early-stage, rudimentary prototype and ended it with an intuitive robot boasting a custom-built arm and VR assisted controls," said Dr Gavin Paul, Senior Lecturer and Researcher at UTS' School of Mechanical and Mechatronic Engineering.

"We've successfully demonstrated the technology across three different test sites and are now seeking additional funding to support a larger scale developed prototype."

"Working with IMCRC gave UTS the opportunity to build a bigger, better project team including students with different skillsets who helped us explore new avenues of research. And IMCRC's support, coupled with the program's industry focus, strengthened the ties between UTS and Ausdrill and facilitated an open and trusting relationship."

For Gavin, another key benefit of the project was the experience his students gained working directly with industry to solve a real-world challenge.

"My students now have an engineering project they can reference as a useful outlet for their research, something that's incredibly important as they start to look for employment," he said.

Raegan Rumbold, Geotechnical Area Manager at Ausdrill, who has led the project, is excited to start working with the prototype in the field.

"We are eager to mobilise the prototype into a live mining environment to conduct the trial and highlight and improvements going forward. The removal of personnel from harm's way is the ultimate goal and I think we are on the right track with this project", he said.



* photo credit: UTS

Accelerated commercialisation of world's first and ground-breaking technology to rotate and manage suspended loads



The success of Verton's second-generation load management system, which has been released across Australia, Europe and USA, is a direct result of the partnership with IMCRC and QUT.

STANLEY THOMSON CHIEF EXECUTIVE OFFICER, VERTON





Currently, when a crane is moving a suspended load, it must be manually positioned or oriented by a person on the ground. Given the operator's proximity to the load, this is a risky process that has the potential to result in injuries or fatalities.

To de-risk load management, Queensland-based technology company Verton designed, engineered, prototyped, and manufactured a hands-free lifting solution, and in 2019, partnered with IMCRC and the Queensland University of Technology (QUT) to further refine and commercialise the product.

Three years on, Verton and QUT have successfully harnessed artificial intelligence, data science and robotics to deliver a revolutionary remote-controlled system that safely and accurately orients the loads.

"Using gyroscopic technology, our system enables an operator to remotely manipulate and hold loads in place from up to 200 meters away," said Marcio Casagranda, Verton's Head of Business Development.

"The main motivation behind developing this product was improving safety, but as we have deployed the equipment and started monitoring its performance, we have noticed a significant improvement in efficiency as well.

"We have now got the results, proof points and case studies we need to go out to industry to demonstrate how our technology can save time and money. And with key components of our load-management system manufactured in Australia, and with it assembled in-house in Brisbane, we can offer our customers an Australian-made product."

Stanley Thomson, Verton's Chief Executive Officer, added that working with IMCRC and QUT was a great experience.

"By providing funding and connecting us to QUT's expertise and resources, IMCRC helped us to accelerate the commercialisation of our technology, reduce costs and create a more robust and reliable product for our customers.

"IMCRC was able to ensure QUT's research aligned with Verton's commercial objectives. And QUT's team was incredibly supportive of IMCRC's industry-led approach, as it enabled researchers to integrate with our team and solve a real-world challenge."





* photo credit: Verton, IMCRO

Geoinventions Consulting Services

Development of a smart sensor system for soft soil engineering and construction safety



IMCRC has enabled us to push boundaries - not just by financially supporting this unique project - but by stretching our thinking around applying the technology and connecting us to key people within the industry.

BARRY KOK OPERATIONS DIRECTOR, GEOINVENTIONS CONSULTING SERVICES







Australia's coastal roadways are under stress from overuse and extreme weather events, with many requiring maintenance and upgrades. This type of soft soil construction comes with risks, the management of which geotechnical engineering consultancy Geoinventions Consulting Services is set to transform with the advent of its world-first smart sensor.

Developed in collaboration with Griffith University and supported by co-funding from IMCRC, the sensor harnesses micro-electro-mechanical systems (MEMS) technology and the Internet of Things to measure stress-strain behaviour and soil-infrastructure interaction.

The robust, waterproof and energy-efficient sensor is designed to withstand Australia's harsh environment, and with its many functions, can do the job of two devices traditionally used in geotechnical engineering.

Barry Kok, Geoinventions' Operations Director, said, "Thanks to the support from IMCRC and the research expertise from Griffith, we've developed and successfully patented a sensor capable of revolutionising traditional geotechnical monitoring, managing risks and improving safety in construction."

"We're proud our sensor will be Australian made, with production set to begin this year on the Gold Coast in Queensland. By manufacturing locally, we can offer an alternative to imported sensors, overcoming supply chain delays while providing a cost-effective, highquality, customisable and more advanced product.

"By facilitating industry-led research and development (R&D), IMCRC has enabled us to create a truly innovative product and contribute to the growth of Australia's sovereign manufacturing capability while doing so."

Professor Dzung Dao, Head of Mechanical Engineering at Griffith University, added, "IMCRC's approach to R&D helped shape a close and collaborative relationship between Griffith and Geoinventions. which will endure into the future as we continue to advance the sensor technology.

"Through this project, Griffith's research has helped solve a real-world challenge for industry, while also advancing Australia's MEMS manufacturing capabilities and helping to position the nation as a leader in geotechnical sensor technology design and production."



Australian Red Cross Lifeblood

Design and development of a work cell for robotic folding of whole blood donation packs





IMCRC has been instrumental in bringing this project to life. The team has been with us every step of the way, from helping us refine the initial project proposal to challenging and questioning our approach to ensure it was robust.

DR SHANTI KRISHNAN DEPUTY DIRECTOR, SWINBURNE FACTORY OF THE FUTUR



Currently, processing blood donations is a complex, manual task. At processing centres, staff fold the blood packs by hand so the blood can be centrifuged and thus separated into its cellular components.

Despite rigorous training, there is the potential for human error throughout this process, and staff face risks including repetitive strain injury and exposure to potentially hazardous biological materials.

That's why in 2021, Swinburne University of Technology partnered with IMCRC on an 18-month research collaboration to develop a world-first system capable of handling and folding blood packs.

In addition to addressing risks to staff, the project sought to minimise disruptions to production, reduce deviations in quality and enable the capture of operational data - which is needed to meet regulatory process monitoring requirements.

By utilising collaborative robots, vision systems, jigs and actuators, the project – which concluded in July 2022 – has successfully delivered a proof-of-concept prototype capable of folding the soft, deformable blood packs.

Project Champion and Scientific Director, Manufacturing and Quality at Australian Red Cross Lifeblood Sue Ismay credits the success of the project to the fact a domain expert from Lifeblood was embedded into the project team at the Factory of the Future at Swinburne's Hawthorn Campus. "The Lifeblood expert was able to advise the researchers about every aspect of the blood pack handling process, and their presence created an inclusive environment where issues could be addressed on the spot," she said.

"The research collaboration benefited from this in multiple ways, as there was a shared understanding of core processes and associated risks and obligations. Feedback could also be provided, applied and tested in real-time."

Deputy Director of Swinburne's Factory of the Future Dr Shanti Krishnan said IMCRC's clear processes kept the project on track, especially through delays caused by the pandemic.

"IMCRC's stage-gated approach measured our progress against clear milestones, which helped mitigate the risk of the project and ensured all partners were aligned," said Dr Krishnan.

"As it moves towards commercialisation, our prototype has the potential to transform a critical manufacturing process for the global medical industry. And the effective integration between all partners was key to achieving this outcome.

"IMCRC has been instrumental in bringing this project to life. The team has been with us every step of the way, from helping us refine the initial project proposal to challenging and questioning our approach to ensure it was robust."



* photo credit: Swinburn

The Remediation Group

Miasma Meter – a novel continuous, internet-connected landfill gas monitoring solution





IMCRC's financial support and Deakin's technical expertise, enabled us to expedite the commercialisation path of our Miasma Meter[™], and thus helped us diversify The Remediation Group's business offering.

JON MILLER MANAGING DIRECTOR, THE REMEDIATION GROUP



Automated monitoring of landfill gases in real-time is critical for understanding a site's impact on its surrounding environment, particularly the risks it poses to human health, infrastructure and adjacent properties. By providing insights into a landfill's dynamic condition, the captured data is used to proactively manage and remediate gas leaks and help determine a site's lifecycle stages including when it is ready for reclamation.

In 2021, The Remediation Group (TRG), which traditionally specialises in large-scale treatment systems for sites with impacted soil and groundwater, partnered with IMCRC and Deakin University to advance the first prototype of the Miasma Meter[™] - a unique, continuous passive, low-cost and low-power, standalone and programmable sensing gas monitoring solution.

Designed to measure the risks associated with both landfill gas concentration and flow, the Miasma Meter[™] continuously monitors landfill gas pressure and, via telemetry, automatically collects and transmits data in real time.

Over the course of the collaboration, the team progressed the Miasma Meter[™] from a manufacturing readiness level (MRL) 5 to MRL8, with Deakin researchers field-testing the 3D printed prototypes, optimising the design and functionality for manufacture in Australia. At the end of the project TRG was set to commence low-scale production, the next step in its path to commercialisation. The company is currently looking for a local manufacturing partner.

"IMCRC's support over the past 15 months expedited the prototype development process and enabled us to bring our idea to life in a timeframe that met our business' strategic needs," said Jon Miller, TRG's Managing Director.

"We have a fully functional, field-tested prototype that we can demonstrate as we engage with potential stakeholders, drive investment conversations and pursue initial sales opportunities. We are now ready to embark and execute our commercialisation strategy.

"Without Deakin and IMCRC, it would have been far more challenging and time consuming to reach this point. They have been critical to our success."

Recognising the challenges of COVID 19, TRG was pleased with the outcome of the collaboration, and the flexibility and creativity of all involved.

"What we have achieved to date is a great credit to Deakin and IMCRC; their ingenuity and desire to make things happen, their progressive mindset and collaborative culture," Jon concluded.



Lightning Protection International (LPI)

Smart coatings for the next generation of lightning strike protection devices



The whole project, and especially the management of it, was straightforward. Swinburne and IMCRC were very supportive of our needs and requirements.

DR FRANCO D'ALESSANDRO CHIEF TECHNOLOGY OFFICER, LP





Lightning protection devices, commonly called air terminals, are positioned on the top of buildings and other structures to prevent them from sustaining damage during electrical storms by capturing the lightning stike. But because they are installed outdoors, the devices often get coated in a layer of pollution and dirt that can impact their performance (much like insulators in high voltage facilities).

In 2020, leading manufacturer of protection devices, Lightning Protection International Pty Ltd (LPI), partnered with Swinburne University of Technology to develop a self-cleaning product. With co-funding from IMCRC, the project explored different chemical compositions to create a sprayable coating for the device that repelled surface contaminants.

"Our project had two key goals. We needed to ensure the coating was functional, and we needed it to be something that could be easily and cost-effectively applied by LPI using conventionally available technology," said Dr Hannah King, Postdoctoral Research Fellow at Swinburne University.

"At the start of the project, we were lucky enough to visit LPI's factory in Tasmania. Having insight into how the devices were manufactured ensured we could more seamlessly integrate our science into LPI's production."

For Hannah, another key factor that shaped the project was IMCRC's input.

"IMCRC was more than a financial partner. The team were able to provide their unique insights and expertise in research and manufacturing to help guide the project," she said.

The research was a success, and despite some delays due to COVID-19, delivered a functional coating that is set to optimise the performance of LPI's lightning protection devices.

"We're currently testing the coated device in Europe using simulated lightning. It's early days, but the results look promising, and we're hoping to move onto commercialisation later this year," said Franco.

Franco added that because of its industry-led approach, IMCRC facilitated a project that delivered a commercially viable outcome.

"LPI is competing with companies globally, so cost is a big factor in our decision-making. Because of IMCRC's strong focus on commerciality, we avoided avenues of research that were not cost-competitive, which can be atypical of university research.

"I think that's the key to a successful collaboration. Both the research and industry partners need to consider each other's needs and be 'hands-on' from the outset."



* photo credit: LP

Renaissance Battery Management Systems (BMS) Development

IMCRC's strategic approach throughout this project helped us identify our priorities and brought us closer to our vision of developing an Australian-designed and made clean energy storage ecosystem.

HOWARD LOVATT CHIEF TECHNICAL OFFICER, ENERGY RENAISSANCE





hoto credit: Energy Renaissance

With a passion for Australian-made, battery manufacturer Energy Renaissance, in partnership with Australia's national science agency CSIRO, set out to develop a defence-grade Battery Management System (BMS) for its family of batteries. One that could be developed and manufactured locally.

The BMS acts as the "nerve centre" of the battery and is critical to its operating efficiency, monitoring and reporting on its usage, lifespan, and faults through a mobile network. And this addition to its suite of offerings enables Energy Renaissance to provide its customers with a complete battery energy storage solution.

Howard Lovatt, Chief Technology Officer at Energy Renaissance, said they wanted to work with CSIRO due to its battery development experience and its understanding of the unique requirements of the Australian customer.

"Unlike internationally manufactured products, our systems need to withstand temperatures between 10 and 40 degrees Celsius," he said. "Working with partners that understood the technical requirements and shared the same vision as us – building a clean energy supply chain for Australians – was of paramount importance.

"The collaboration with CSIRO and IMCRC was a huge success. With IMCRC's guidance keeping us focused and on track, we worked collectively toward our goal, and we officially launched our BMS in 2022." The project wasn't without its challenges. In fact, COVID-19 and downstream supply chain issues resulted in considerable obstacles that had to be collaboratively overcome.

The original microprocessor destined for use in this project was no longer available, and a smaller microprocessor had to be sourced. And to make that work, new code was required, which added time and effort to the project.

Commenting on the journey, Dr Adam Best, Principal Research Scientist at CSIRO, said, "IMCRC shouldn't underestimate just how much we appreciate the investment it made in this project. Without its support, we wouldn't have been able to achieve what we have.

In addition to the delivery of the BMS, the project also created opportunities for research internships, one of which resulted in employment at CSIRO.

"We had six interns supporting various apsects of the project. Two of them designed the switch gear for the BMS, which vastly reduced its size and utilisation of space. I'm proud that we were able to provide these students with practical, real-life opportunities and were eventually be able to hire one of them," said Adam.





* photo credit: Energy Renaissance

CADwalk

CADwalk - XR - Industry 4.0





IMCRC's support was critical to the development of CADwalk Mini. The team shared our vision and understood the requirements for commercial success.

GERHARD (KIM) KIMENKOWSKI FOUNDER, CADWALK



photo credit: IMCRC

Five years ago, no one could have predicted what the world would look like today, including the pace at which spatial visualisation would evolve.

Thus, building design company CADwalk and the University of South Australia (UniSA) took an incredible leap of faith when they partnered to develop a technology that allowed CADwalk's customers to visualise the design of high-value infrastructure projects.

With support from IMCRC, CADwalk and UniSA completed five year-long research and development (R&D) sprints that explored the use of technologies such as augmented, virtual and mixed reality.

The R&D resulted in CADwalk Mini - a commercially ready product that visualises paper-based plans and enables users and their collaborators to experience the design using virtual models.

The portable, integrated hardware and software system can showcase the design and layout of a new factory or building, vastly improving users' understanding of the design by enabling immersive interaction with the environment.

"By bringing 2D building plans to life, CADwalk Mini helps our customers make better decisions about their design, ergonomic and workflow requirements," said Gerhard Kimenkowski, CADwalk Founder.

"IMCRC's collaborative and flexible approach to research collaboration enabled us to collectively

pursue different ideas and the stage-gate process helped us assess individual research outcomes and adjust future milestones accordingly."

Professor Bruce Thomas, Research Lead and Director of the Australian Research Centre for Interactive and Virtual Environments, said the challenge forced the team to stretch their thinking and adopt a commercially viable mindset.

"As part of the application process, IMCRC required us to think future-state and describe the research and commercial outcomes, and work back from that," he said. "This manufacturing-led approach to innovation enabled us to translate the research into a commercial product, optimising at every phase of the project.

"IMCRC was very accommodating of us throughout the project, providing their unique insights and helping us integrate with and learn from industry."

Gerhard agreed. "We're hugely appreciative of the support that IMCRC provided. The team was the backbone of this project."



* photo credit: IMCRC

INNOVATIVE MANUFACTURING CRC (IMCRC)



photo credit: IMCRC

ABOUT IMCRC

Who We Are

The Innovative Manufacturing CRC (IMCRC) has been an independent and for-impact cooperative research centre that has helped catalyse the transformation of Australian manufacturing.

By investing in research-led innovation in manufacturing products, processes and services, we brought together forward-thinking businesses and some of Australia's best universities and the CSIRO to collaborate, address pressing industry challenges and develop solutions that lead to commercial outcomes - helping those involved to scale up, transform their business operation and become more innivative, competitive and resilient.

Since our inception in 2016, we have been working with start-ups, small, medium, large and multinational manufacturing companies across all primary industry sectors – defence, mining equipment and resources, medical technologies and pharmaceutical, building and construction, energy, transport, and others – to establish pathways that help them:

- invest in new ideas, emerging technologies, research and development (R&D) and innovative business models
- connect and collaborate with scientists and researchers to solve industry-specific problems and identify solutions that translate into commercial outcomes
- improve manufacturing expertise and capabilities to move up the value chain
- discover new business opportunities that strengthen partnerships and enable expansions into different supply chains and markets in Australia and around the world
- attract and develop new manufacturing talent to future-proof their operations
- focus on transformation and commercialisation to boost their productivity, scale, and competitiveness.

We have purposefully invested \$34 million of Commonwealth and other funding to advance Australian manufacturing, catalysing more than \$250 million in collaborative research, manufacturing innovation and education across Australia.

With Australian manufacturing being critical to a modern Australian economy, we want the public perception of a capital- and labour-intensive brand of manufacturing shift to one that embraces industrial transformation, in which companies leverage digital technologies, including Industry 4.0, to deliver innovative business models and design, make and sell new products, services and solutions to a global market.
What We Do



Our Vision

is for Australian manufacturing to be thriving, relevant and globally integrated

Our Mission

is to help catalyse the transformation of Australian manufacturing through collaborative investment, research impact and innovation



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What We Value



Applying commercial rigour and good business practices that ensure high-impact outcomes from the transformative projects and partnerships we invest in

Industry-led focus and collaboration

Building strong partnerships between industry and research organisations with open, respectful conversations that inspire bigger thinking and leverage 'collective genius' to strengthen Australian manufacturing



Thinking and acting creatively and adventurously and providing the insights and advice necessary to activate a spirit of enterprise, ambition, willingness and risk taking

Inspirational yet humble leadership

Combining experience and expertise to deliver positive impact that is needed to bring about industrial transformation. Prepared to question the norm, find better solutions and drive outcomes

Passionate advocacy

Energising, engaging and inspiring individuals and the wider community to get behind the transformation of Australian manufacturing



Our Team

Through open and respectful conversations, IMCRC's management team and staff connected and collaborated with industry, research organisations, government and the wider manufacturing community.

In FY2022-23, before the official wind-up of the CRC, Dr Jason Coonan left the organisation to pursue a new career opportunity. As Deputy CEO, he provided cultural, stategic and organisational leadership to the CRC team.

IMCRC also engaged Mr Rohann Chapman from 6Step as project manager (part-time) to support the Industrial Transformation Program.

DAVID CHUTER CEO AND MANAGING DIRECTOR



DR MATTHEW YOUNG MANUFACTURING INNOVATION MANAGER



SAMEERA SILVA FINANCE AND IT MANAGER



DAVID CHANDLER PROJECT RESEARCH AND SYSTEMS OFFICER



DR JASON COONAN DEPUTY CEO



SIMON DAWSON INDUSTRIAL TRANSFORMATION DIRECTOR



LYDIA GUNAWAN PROJECT RESEARCH AND EDUCATION OFFICER



JANA KUTHE COMMUNICATIONS, MARKETING AND EVENTS MANAGER

Our Board

IMCRC was governed by an independent Board of Directors that oversaw the organisation's research and worked in creating long-term impact for Australian manufacturing. The Board represented a broad range of industry, research and government expertise.



HON IAN MACFARLANE INDEPENDENT DIRECTOR, CHAIR



MR DAVID CHUTER MANAGING DIRECTOR (AND CEO)



PROFESSOR MARY O'KANE, AC INDEPENDENT DIRECTOR



DR ALEXANDER GOSLING, AM INDEPENDENT DIRECTOR



MR INNES WILLOX, AM NON-INDEPENDENT DIRECTOR (INDUSTRY NOMINEE)



MR SIMON MARRIOTT



DR JENS GOENNEMANN INDEPENDENT DIRECTOR (GROWTH CENTRE)



MR ROBERT COHEN NON-INDEPENDENT DIRECTOR (RESEARCH NOMINEE)



PROFESSOR ROY GREEN NON-INDEPENDENT DIRECTOR (RESEARCH NOMINEE)



DR JENNI LIGHTOWLERS ACTS AS IMCRC COMPANY SECRETARY

Our Partners

IMCRC believes in collaboration. By connecting companies and research organisations, and sharing knowledge and resources, we aim to make Australian manufacturing innovative, effective, resilient and relevant.

Industry



41



Research

Other













RMIT UNIVERSITY



ST VINCENT'S HOSPITAL





Flinders

CHAMPIONING MANUFACTURING INNOVATION



Executive Summary

IMCRC's mission has been to help catalyse the transformation of Australian manufacturing through collaborative investment, research impact and innovation.

The future of Australian manufacturing is bright. With the establishment of the National Reconstruction Fund the Australian Government has set course to rebuild Australia's industry base. By stimulating investments in new ideas, technologies and research capabilities, more opportunities are being created for local businesses to pursue manufacturing innovation, collaborate and develop products, processes and business models with commercial potential that will benefit the economy and strengthen Australia's manufacturing sector.

Delivering home-grown innovation

Since 2016, IMCRC has purposely invested in a broad range of R&D projects designed to lift Australian manufacturing capability and capacity. In FY2022-23, IMCRC has successfully delivered 71 industry-led manufacturing projects, spanning four multidisciplinary research programs:

- 1. Additive manufacturing processes
- 2. Automated and assistive technologies
- 3. High-value product development
- 4. Industrial transformation

Diverse in nature and spanning multiple sectors, IMCRC's projects explored, developed and applied key enabling technologies to create ground-breaking manufacturing solutions, with industry partners such as Verton, HYDAC and Sleep Corp already reaping in the commercial benefits and transforming their business operation.

With FY2022-23 being IMCRC's final year of

operation, the team solely turned its attention towards the successful completion of all remaining 43 research projects during the reporting period. Safeguarded by IMCRC's proven governance framework, which aligns industry, research and other supporting partners at each step of the innovation journey, all projects were finalised without any significant technical or scientific impediments by the end of December 2022.

Reporting on manufacturing impact

Having successfully invested \$34 million of Commonwealth and other funding across 71 R&D projects, IMCRC commissioned advisory firm ACIL Allen to examine the economic, social and environmental benefits of those collaborations. The report found that IMCRC has generated estimated financial benefits of almost \$4.2 billion for industry by 2030, including \$3.7 billion in additional revenue.



Further benefits to 2030 include the creation of over 6,000 ongoing jobs, 224 collaborations and new partnerships between researchers and businesses and \$2 billion of planned industry investment in future R&D

Earlier in the reporting period, IMCRC engaged the Centre for Transformative Innovation at Swinburne University of Technology to review and evaluate the impact of futuremap[®], IMCRC's business diagnostic and education platform. The report highlighted the importance of educating, in particular, smaller organisations about technological advances that can help them unlock their business potential. It sited that manufacturing SMEs that had participated in futuremap[®] were found to be growing faster and innovating more than their closest peers.

Another initiative with a significant impact on manufacturing SMEs has been IMCRC's partnership with APR.Intern. Through the collaboration 25 SMEs (three in FY2022-23) were able to harness the expertise of a highly skilled PhD student to solve specific R&D challenges within their business

Celebrating industry-led research collabrations

In November 2022, IMCRC invited industry, academia and government to celebrate Australian manufacturing innovation at the Timber Yard in Port Melbourne. Over two days, the CRC showcased the innovative outcomes of 40 plus projects, demonstrating the depth and breadth of Australia's research capability. With over 200 visitors in attendance, participants shared their insights and engaged in conversations about how researchled innovations create opportunities for Australian manufacturing.

Throughout the reporting period, IMCRC participated in more than 25 industry events, including webinars and workshops. futuremap® has been the key driver of IMCRC's industry engagement. In collaboration with its deployment partners - Swinburne University of Technology, University Technology Sydney and the Advanced Robotic for Manufacturing (ARM) Hub -IMCRC facilitated 14 futuremap workshops in FY2022-23, encouraging 60 manufacturing SMEs to embrace Industry 4.0 and digital technologies. To date, over 1,000 manufacturing businesses across Australia have used futuremap to assess their business capabilities and identify opportunities to design, develop and apply smart technology solutions to help them grow. Building on the positive contribution futuremap has made to raising Industry 4.0 awareness and adoption amongst manufacturing SMEs, IMCRC has partnered with Swinburne University to expand futuremap[®]'s diagnostic capabilities by developing a "Towards Net Zero" module that helps businesses prepare for and embrace the transition to a low-carbon economy.

As champion for manufacturing innovation and advocate for the transformation of Australia's manufacturing sector, IMCRC actively supported events such as the InnovationAus Awards for Excellence, the Australian Technology Competition and the inaugural National Innovation Policy Forum, hosted by Cooperative Research Australia in November 2022.

Icon Reference

Primary Industry Sector



Media



Dr. Matthew Young Manufacturing Innovation Manager

in @

Based on our collective experiences from within industry and research organisations, we reimagined the model for research collaboration and designed a framework that bridges the divide between industry and universities, creating a way for them to come together with a shared purpose and vision for success.

Matthew brings to IMCRC the knowledge and many benefits derived from his career in manufacturing, materials and process engineering.

He has a PhD in Materials Sciences and worked and led in the fields of research, development and application of materials and manufacturing processes, initially in primary metals production and processing and later in aerospace composites manufacturing before making the transition to IMCRC.

As IMCRC's Manufacturing Innovation Manager, Matthew has provided significant contribution in driving business development, working with industry partners and universities in the creation and execution of research projects. Given his extensive and diverse industry background, it is no coincidence that IMCRC's projects span the breadth of the manufacturing sector as well as the full spectrum of transformative Industry 4.0 technologies.

Matthew's experience has also been invaluable in supporting the participant research and industry teams to navigate the many challenges and disruptions of COVID-19.

Central to his stewardship approach to IMCRC projects is his collaborative philosophy that you get out what you put in. For project participants this translates to defining the parameters of project success and then being united as one team to achieve that singular vision of transformation.

What are you most proud of during your time at IMCRC?

"Undoubtedly what we have achieved for, and with, our partners, but it would be impossible for me to choose between projects. Therefore, my proudest achievement is how we at the IMCRC have worked together as a very lean, close-knit team playing to each other's respective strengths to achieve our collective vision for Australian manufacturing. I know we have made a real difference."

Areas of focus:

- Commercialisation
- Business development
- Project management
- Stakeholders

Research Projects from 2017-2022

						'17			4	18			'1	9			'20				'21			'2	2	'23
#	Program	Industry Partner	Project Title	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1 2	2 3	4	1	2	3 4	4 1
СҮ	2017																									
1	I	SPEE3D	Machine vision for Industry 4.0 high-speed 3D printing				••••	••••	••••	••••	•															
2		CADwalk	Visualisation tools for the design of manufactured high-end instrumented facilities			••••	••••	••••	••••	••••	••••	••••	••••	••••	••••	••••	••••	••••	••••	••••	••••	••••	• • • • •	•••••	•	
3	I	Stryker Australia	Just in time patient specific tumour implants				•••••	••••	••••	••••	••••	••••	••••	••••	••••	•••••	••••	••••	••••	•••••	••••	••••	••••	•••••	•	
4	II	UAP Australia	Design robotics for mass customisation manufacturing					••••	••••	••••	••••	••••	••••	••••	••••	••••	••••	••••	••••							
5	Ш	SuperCool	Smart electric compressor for refrigeration and air conditioning on electric vehicles				••••	• • • •	••••	••••	••••	••••	••••	••••	••••	•										
6	Ш	BluGlass	High performance normally OFF GaN High Electron Mobility Transistors (HEMT)					••••	••••	••••	••••	••••	••••	••••	•											
СҮ	2018																									
7	П	Tradiebot Industries	Tradiebot						••••	••••	••••	••••	••••	••••	••••	••••	••••	••••								
8	III	Corin (Global Orthopaedic)	Antimicrobial nanosurface for orthopaedic implants						••••	••••	••••	••••	••••	••••	••••	••••	••••	••••	••••	••••	••••	••••	••••	••••		
9	I	RUAG Australia	Application of additive metal technology to operational aircraft							••••	••••	••••	••••	••••	••••											
10	I	Mineral Technologies	Revolutionising mineral separation using additive manufacturing						•	••••	••••	••••	••••	••••	••••	••••	••••	••••	••••	••••	••••	•••●				
11	III	Whiteley	A novel approach to biofilm disruption and removal						•	••••	••••	••••	••••	••••		••••	••••	••••	••••	••••	••••	••••	••••	••••		
12		Carbon Revolution	Industrialisation of composite wheel technology							•	• • • •	• • • • •	••••	••••	• • • •	••••	••••	• • • • •	• • • •	••••	• • • •	•••●				
13	111	BLT, Allegra	Xenograft using kangaroo tendon as substitute for ligament reconstruction							•	••••	••••	••••	••••	••••	••••	••••	••••	••••	••••	••••	••••	•●			
14	I	Titomic	Additively manufactured titanium complex structures									••••	••••	••••	• • • •	••••	••••	(
15	111	Vaxxas	Innovative vaccine delivery technology								•	• • • •	••••	••••	• • • •	• • • • •	••••	••••	• • • •	• • • • •	• • • •	••••	••••	• • • • •	•	

FY2022-23 IMCRC activate Project commenced Project completed

						'17				'18				'19				'20			4	21			'2:	2	'23
#	Program	Industry Partner	Project Title	1	2	3	4	1	2	3	4	1	:	2 3	4		2	3	4	1	2	3	4	1	2	3 4	1
CY	2019																										
16	1111	Sleep Corp	A novel virtual manufacturing system approach)	••••	••••	•••	••••	••••	••••	••••	••••	••••	••••	••••	\bullet		
17	111	Speedpanel	Manufacture of the next generation Speedpanel)	••••	••••	•••	••••	••••	••••	••••	•••						
18	III	MTHING	Automated monitoring and analytics for geotechnical and structural performance using the internet of GNSS things												• • • •	• • • •	• • • • •		• • • • •		• • • • •		• • • •	• • • • •	••••	•	
19	I	SPEE3D	Automated part repair using 3D scanning and supersonic 3D deposition											••••	• • • •	••••	••••	••••	••••	••••	••••	•●					
20	111	Codex	Engineering an advanced, high value bioreactor system for research and clinical applications											••••	••••	••••	••••	••••	••••	••••	••••	••••	••••	••••	••••		
21	Ш	Xefco	Atmospheric plasma coating system												••••	••••	••••	••••	••••	••••	••••	••••	••••	•••••	••••	•	
22	III	ESN Cleer	Preventing heart attacks with nanotechnology-enabled biomarker sensors												••••	••••	••••	••••	••••	••●							
23	111	Lava Blue	Value adding Australian minerals												••••	••••	••••	••••	••••	••••	••••	••••	••••	••••	••••	•	
24		Verton	Accelerated commercialisation of world's first and ground-breaking technology to manage suspended loads													••••	•••		•••	• • • •	••••	• • • •	• • • •	••••	••••	•	
25		Hazer Group	Developing and optimising advanced carbon materials													••••	••••	• • • •	••••	• • • •	••••	• • • •	••••	••••	••••		

FY2022-23 IMCRC activate 🔴 Project commenced 🌑 Project completed

					"1	7			' 18			'19			'20			'21		'22		'23
#	Program	Industry Partner	Project Title	1	2	3	4	1	2	3 4	1	2	5 4	1 2	3	4	1 2	3	4 1	2 3	4	1
СУ	′ 2020																					
26	III	Neometals	Value adding the Australian lithium mining sector: cutting-edge manufacturing proces to convert aluminosilicate mining wast to zeolites											•…	•••••		•					
27		BAE Systems Australia	Accelerating the uptake and diffusion of innovative manufacturing technologies in Australian shipbuilding and supply chain: the human factor											•…		••••	••••	• • • • • • •	• • • • • • • •	• • • • • •	••••	
28	1111	Nutromics	R2R printing for cost effective manufacturing of a smart patch for health monitoring											•…	•••••	••••	•••••	(
29	III	Telix	Centralised manufacture of Molecularly-targeted Radiation (MTR) drugs for cancer treatment											•…	••••	••••	••••	• • • • • • •	•••••	••••)	
30	III	LPI	Smart coatings for the next generation of lightning strike protection devices													••••	••••	••••	•••••)	
31	III	Boral	Ultra sustainable concrete with high SCM content												•	••••	•••••	•••••				
32		BAE Systems Australia	The application of interactive narrative visualisation and big data to improve high-value manufacturing												••		•••••	•••••		•		
33	III	Alcolizer	Rapid point of care SARS-CoV2 detection, using a sensitive antigen screening test												•	••••	•••••)				
34		Melbourne Water	Investigating Virtual Reality (VR) Low Voltage (LV) electrical safety rescue simulation for utilities and manufacturing sectors													••		•••••	• • • • • • • • •	••••)	
35		LaserBond	Delivery of high-quality laser clad coatings for heavy wear and corrosion protection in slurry pumps													•••	•••••	••••	• • • • • • • •	••••)	
36	III	3D Dental	Development of novel 3D BNNT ceramic composite for advanced dental applications													•••	••••	•••••	••••			
37	III	Questsemi	SiC diode manufacturability and characterisation for commercialisation by Questsemi Australia													•••		•••••	••••			
38	1111	FormFlow	High volume, scalable manufacturing cell for enhanced building products													•••		•••••	••••			

FY2022-23 IMCRC activate Project commenced Project completed

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#	Program	Industry Partner	Project Title	1	2	3 4	۱ I	2	3	4	1	2	3	4	1	2	3	4	1	2	3 4	1	2	3	4	1
C١	/ 2021																									
39	1111	Australian Red Cross Lifeblood	Design and development of a work cell for the robotic folding of whole blood donation packs															(•••	••••	••••	••••	•••●			
40	II	HYDAC	Explosion diagram based virtual and augmented reality maintenance training for industrial machines																•••	••••	••••	•••				
41	II	Energy Renaissance	Renaissance BMS development																•••	••••	••••	••••	•••••	•		
42	I	AML3D	New Al-Sc welding wires for the emerging Australian arc additive manufacturing sector																••••	••••	••••	••••	•••••	•		
43	II	The Remediation Group	Miasma meter - a novel continuous, internet connected, landfill gas monitoring solution															(•••	••••	••••	••••	•••••			
44	111	Rux Energy	Scaling up high-performance hydrogen storage Metal Organic Framework (MOF) materials manufacture for field trial prototypes of Hydrogen (H2) storage systems in heavy trucking and hydrogen hubs															(••••			••••		•		
45		gTET	High-speed permanent magnet rotor post assembly magnetisation and power conversion systems manufacture															(•••	••••	••••	••••	••••	•		
46	111	BiomeBank	Gut like hydrogel based perfusion bioreactor to engineer stable gut microbial composition for treating gut infections															(•••	••••	••••	••••	•••			
47	П	Ausdrill	High Access Localised Operations (HALO)																(•••	•••••	••••	•••			
48	I	SPEE3D	Cold spray additive manufacturing product development via material dataset																	•••	••••	••••	•••			
49		Cablex	Automated closed loop verification of UV-C disinfection of COVID-19 using commercial off the shelf pulsed xenon source and detectors, certified by COVID testing on a range of surfaces																	•••	• • • • •	•••				

FY2022-23 IMCRC activate 🔶 Project commenced 🌑 Project completed

					"	17			' 18	8			' 19)			'20	>			'21				'22		'23
#	Program	Industry Partner	Project Title	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1 2	2	3 4		1 2	3	4	1
СУ	2022																										
50	I	Allegra Orthopaedics	Improving manufacturability of Sr-HT coated orthopaedic implants																			••••	• • • •	•••••	•••		
51	I	TFM	Upscaling and optimisation of titanium swarf ECAP process																			••••	• • •	••••	•••		
52	Ш	Ozcut Abrasive	Surface functionalization of ceramic alumina abrasive																			••••	•••				
53	III	SuperCool	Smart voltage regulators and control module for refrigeration compressors on heavy vehicles																				• • • •	••••	•••		
54	1111	Revo Group	PoleWatch																				• • • •	• • • • •	•••		
55	Ш	Callidus Welding	Advanced engineered surfaces for hydrometallurgy ball valves																			••••	•••	••••	••●		
56	Ш	HeiQ	Bio-based materials for next generation textile treatments																				• • • •	••••	•••		
57	I	InfraBuild	Cold spray deposition of titanium on a complex metal substrate																			••••	• • •	••••	••●		
58	Ш	Xefco	Textile dyeing via atmospheric plasma coating																				•••	•••••	•••		
59		Impact Absorbing Systems	Energy absorbing traffic lights		-																		•••	••••	•••●		
60	Ш	Dentroid	Development of a miniaturised robotic laser device for ultra-precise and pain-free dentistry																				•••	••••	•••		
61		Speedpanel	A new advanced manufacturing technology to manufactur fire rated and acoustic panel systems																				•••	•••••	•••		
62	I	ANCA	Additively manufactured cutting tools																				•••	••••			
63	III	entX	Development of a novel, prototype thermovoltaic energy device																				•••	•••••	•••		

FY2022-23 IMCRC activate 🔴 Project commenced 🌑 Project completed

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#	Program	Industry Partner	Project Title	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4 1	ı :	2 3	4	1	2	3	4 1	1
C	Y 2022																										
64	i I	Singular Health	Rapid prototyping and point of care 3D-print manufacture of patient specific ostomy seal device)	•••••	•		
65	; 111	GeoInventions	Development of smart sensor system for soft soil engineering and construction safety																				••••	••••	•●		
66	5 III	Xefco/Survivon	Sustainable functional metallised textiles																					••••	•		
67	I	Conflux	Alloy development for additively manufactured heat exchangers																				•	••••	•●		
68	8 111	Humble Bee Bio	Sustainable DWR textile coatings inspired by Australian bee biopolymers																				•	••••	•●		
69)	Thales Australia	Development of lightweight Australian composite overwrapped gun barrels																				•	••••	•●		
70	»	MotorOne Group	Industrial internet-of-things solution for real-time assessment of product quality																					••••	•		
71	111	Gale Pacific	Non-combustible fabric development																						••••		
F	FY2022-23	IMCRC activate	Project commenced Project completed																								



Program 1: Additive Manufacturing Processes

Additive manufacturing, or 3D printing, has emerged as a competitive, viable and scalable manufacturing technology in its own right. Recognising its potential, Australian manufacturers have adopted the technology to fast-track product development, shorten the time to market, reduce waste and product cost.

As the technology matures into production ready applications, industry research and development requirements shift. IMCRC's research program focuses on:

- developing and utilising existing and novel materials, process control, characterisation and surface engineering
- advancing additive systems such as multi-material systems
- tailoring additive manufacturing design including shape and topography optimisation, integration of creative design and additive process engineering.



In FY2022-23, nine 'Additive Manufacturing Process' projects were completed, bringing the total to 14 completed research projects.

IMCRC activate



3D printed heat exchanger

* photo credit: Conflux

IMCRC activate



Render of ostomy seal

* photo credit: Singluar Health

Alloy development for additive	y manufactured heat exchangers
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Industry	Research	Total Project Value	IMCRC Funding	Start	Duration
Partner	Partner	(AUD)	(AUD)	Date	(Years)
Conflux	Deakin	\$665,037	\$124,456	07/01/22	9 months

Outcome

• developed novel aluminium alloy compositions that improve the overall thermal conductivity performance of additively manufactured heat exchangers

Rapid prototyping	and point of care 3	D-print manufacture of pat	tient specific ostom	y seal devic	es
Industry Partner	Research Partner	Total Project Value (AUD)	IMCRC Funding (AUD)	Start Date	Duration (Years)
Singular Health	CSIRO	\$410,400	\$98,639	01/11/21	11 months

Outcome

• advanced Singular Health's 3Dicom software application by developing a 'surface scan to model' extension that adds 3D visualisation capability to the software

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Additively manufact	ured cutting tools				
Industry Partner	Research Partner	Total Project Value (AUD)	IMCRC Funding (AUD)	Start Date	Duration (Years)
ANCA	CSIRO	\$625,456	\$150,001	01/10/21	1

Outcome

• developed novel 3D printing technology to manufacture tungsten-carbide tools with the aim of replacing the current production process of mould pressing, sintering, brazing and grinding

Cold spray depositio	n of titanium on a com	nplex metal substrate			
Industry Partner	Research Partner	Total Project Value (AUD)	IMCRC Funding (AUD)	Start Date	Duration (Years)
InfraBuild	CSIRO	\$463,881	\$103,693	01/09/21	1

Outcome

• validated the potential of cold spray metal and metal composite coatings using recycled titanium waste powder as a viable coating for highly corrosive soils using CSIRO's patented Cold Spray ZAPTM technology



Grinding tools

* photo credit: ANCA

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InfraBuild manufacturing plant

* photo credit: InfraBuild



IMCRC activate



Titanium swarf

* photo credit: IMCRC





Novel coating process

* photo credit: Swinburne

Upscaling and optimisation of titanium swarf ECAP process

Industry	Research	Total Project Value	IMCRC Funding	Start	Duration
Partner	Partner	(AUD)	(AUD)	Date	(Years)
TFM	Deakin	\$581,318	\$144,102	01/07/21	

Outcome

• optimised and scaled up an Equal Channel Angular Pressing (ECAP) process of converting titanium swarf into a high value product with better material properties while consuming less energy

Improving manutacturability of Sr-HT coated orthopaedic implants								
Industry Partner	Research Partner	Total Project Value (AUD)	IMCRC Funding (AUD)	Start Date	Duration (Years)			
Allegra	Swinburne, RMIT	\$374,262	\$59,170	01/07/21	15 months			

Outcome

Orthopaedics

· prototyped a new coating manufacturing process using a liquid suspension plasma spray system to deposit Allegra's proprietary bioceramic material onto orthopaedic implants



David Chuter Chief Executive Officer and Managing Director

As IMCRC's Chief Executive Officer and Managing Director, David ensures the Commonwealth funding his team is tasked with overseeing delivers substantial and scalable research and commercial outcomes for Australian manufacturing.

With a background in engineering and an extensive manufacturing industry career of over 30 years, David considers each project's challenges and opportunities through the perspective of all stakeholders to find winwin outcomes for all parties involved.

He understands how to design programs for success, to push industry participants beyond their comfort zone, to surpass any preconceived limitations and boundaries and embrace the opportunity to achieve transformational change rather than mere incremental improvements. David's unwavering focus on achieving transformation is the fundamental principle that sets IMCRC apart, both operationally and in its approach to inspiring that same drive and ambition in industry participants. He relentlessly pursues 'what could be done' and not just 'what should be done'.

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IMCRC's unique futuremap® SME education platform, as well as the establishment of the Advanced Robotics for Manufacturing (ARM) Hub, the Tonsley Manufacturing Innovation (TMI) Hub, and most recently Stryker's Australian R&D Lab, are all cases in point of David's vision for IMCRC being a platform to catalyse change and investment in the broader ecosystem. Our philosophy is to stretch the ambition and thinking of every aspect of every project to optimise and maximise the opportunity for all parties involved. We are constantly looking at how we can inspire and add value to our participants and partners - to both catalyse genuine transformational change and to use our platform to do that proactively and transparently.

IMCRC HIGHLIGHTS REPORT 2021-22

What has been your most important learning over your time at IMCRC?

"I have come to appreciate the incredible amount of untapped potential in Australia's universities that should be better utilised to support our national endeavour of a truly modern manufacturing sector. What we lack is a collaborative framework at scale that makes it easy for manufacturers of all sizes to engage and partner with universities to develop new solutions and to achieve transformational change that in turn drives greater commercial outcomes."

Areas of focus

- Advocacy and a catalyst for positive change
- Manufacturing industry transformation
- Governance and operations
- Stakeholder engagement and investment



Industry Partner Mineral Technologies

Research Partner UTS

Total Project Value (AUD) \$9,309,045

IMCRC Funding (AUD) \$1,800,000

Start Date 01/04/18

Duration (Years)

4.5

To find out more about the project outcome click here.



Revolutionising mineral separation using additive manufacturing



Sidewinder: 3D printer that is capable of printing a functional, full-size spiral

* photo credit: UTS

Outcomes

- demonstrated how composite polymers can be used to manufacture precision-engineered mineral separation and mining equipment
- · redesigned the helically shaped gravity concentrator using complex and efficient geometries in a way suited to an existing 3D printing technology. A product specific 3D printing machine will then be designed and prototyped to optimise the manufacturing process of the gravity concentrator
- delivered additive manufactured products with embedded Internet of Things (IoT) connected sensors • providing feedback about the product performance as well as insights into equivalent wear and structural characteristics for specific minerals and ore concentrations

Just in time patient specific tumour implants





Prototypes of 3D printed musculoskeletal tumour implants

* photo credit: RMIT

Outcomes

- transformed the way musculoskeletal tumour implants are developed, manufactured and supplied, shifting the paradigm to a local, bespoke setting within the hospital
- developed image analysis and implant design tools that allow a precise robotic resection of the tumour
- combined the specialised imaging with additive manufacturing techniques for the construction of customised implants capable of achieving multi-density/property cross-sections and surfaces. Manufactured using just-in-time supply chain principles, these implants can then be inserted during the operation
- established Stryker's global R&D Hub in Brisbane, QLD, to further invest in Australian collaborative research and development



Industry Partner Stryker Australia

Research Partner RMIT, UTS, St Vincent's Hospital Melbourne, Melbourne University, Sydney University

Total Project Value (AUD) \$17,956,046

IMCRC Funding (AUD) \$2,999,359

Start Date 01/07/17

Duration (Years) 5.2



IMCRC HIGHLIGHTS REPORT 2021-22





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Aluminium-alloy welding wire

* photo credit: AML3D





SPEE3D calibration scan

* photo credit: SPEE3D

New Al-Sc welding wires for the emerging Australian arc additive manufacturing sector

Industry	Research	Total Project Value	IMCRC Funding	Start	Duration
Partner	Partner	(AUD)	(AUD)	Date	(Years)
AML3D	Deakin	\$758,612	\$135,860	01/03/21	1.5

Outcome

• developed new commercially viable aluminium-alloy welding wire tailored for a new emerging technology - wire additive manufacturing (WAM) to replace existing welding wire solutions

Cold Spray Additive Manufacturing product development via material dataset								
Industry Research Partner Partner		Total Project Value (AUD)	IMCRC Funding (AUD)	Start Date	Duration (Years)			
SPEE3D	Swinburne	\$380,211	\$50,005	01/05/21	1			

Outcome

• developed standard operating procedures for common industrial materials - aluminium and copper - using SPEE3D's LightSPEE3D machine to 3D print reliable and repeatable material and mechanical properties



Working at IMCRC has taught me that you have to truly believe in what you set out to achieve. You are far more likely to succeed if you do.

David Chandler Project Research and Systems Officer



David brings a varied skillset to IMCRC and primarily works within the project management and systems areas of the organisation. He administers half of the CRC's project portfolio and is also responsible for developing and maintaining the internal business systems.

David provides account management services to help research programs progress, overcome any challenges and remain within scope. He is the day-to-day contact for research and industry project leaders and uses his relationship and stakeholder management expertise to ensure the desired outcome is achieved.

Prior to joining IMCRC in 2017, David worked in the natural chemistry field and brings a deep scientific understanding to his role, as well as marketing and account management experience. He has delivered multiple transformative projects that have resulted in positive outcomes for Australian manufacturers.

Additionally, David develops and maintains internal systems designed to create a streamlined and efficient working environment for IMCRC.

What has interested you most during your time at IMCRC?

"The variety of the research projects that we are involved with. So many products, processes, business models and services, across multiple industries, depend on the manufacturing sector. I feel privileged to meet and work alongside experts from a range of fields, including robotics, healthcare, automation, data analytics and advanced materials."

What is the most important lesson you have learned while working at IMCRC?

"I have gained a greater understanding of leadership and the role it plays in complex innovative research projects. To catalyse the transformation of manufacturing, each initiative needs to start with a clear direction, inspiring vision and project pathway. This knowledge is applicable outside of manufacturing and I know it will be valuable in future roles."

Areas of focus:

- Project management
- Stakeholder management
- Client services
- Systems expertise



Industry Partner SPEE3D

Research Partner UTS

Total Project Value (AUD) \$979,687

IMCRC Funding (AUD) \$204,551

Start Date 01/04/19

Duration (Years)

2.5

To find out more about the project outcome click here.



Automated part repair using 3D scanning and supersonic 3D deposition



Automated part repair using 3D scanning and supersonic 3D deposition

* photo credit: SPEE3D

Outcomes

- developed automated supersonic 3D deposition technology for maintenance
- upsized and integrated the scanning technology developed in the IMCRC project "Machine vision for Industry 4.0 high speed printing" in SPEE3D's next generation WarpSPEE3D machine
- demonstrated technologies required to automate and digitalise the repair process enabling and expanding the application of SPEE3D technology

Additively manufactured titanium complex structures



Additively manufactured titanium complex structures

* photo credit: Titomic

Outcomes

- tested 'Additively Manufactured Titanium Monocoque Structures' for use in commercial operations, and thus
 validated Titomic Kinetic Fusion[™] as a competitive and novel advanced manufacturing solution
- evaluated and optimised Titomic Kinetic Fusion™ technology, titanium alloy powders, deposition paths, heat treatment and design for specific properties
- incorporated Industry 4.0 enabled post-manufacturing processes to enhance manufacturing capability across multiple industry sectors



Industry Partner Titomic

Research Partner CSIRO, RMIT

Total Project Value (AUD) \$3,219,505

IMCRC Funding (AUD) \$470,303

Start Date 01/11/18

Duration (Years)

2



Industry Partner RUAG Australia

Research Partner RMIT

Total Project Value (AUD) \$1,150,781

IMCRC Funding (AUD) \$124,809

Start Date 01/03/18

Duration (Years)

2

Application of additive metal technology to operational aircraft



Application of additive metal technology to operational aircraft

* photo credit: RUAG Australia

Outcomes

- developed an additive manufacturing process that addresses corrosion and stress-corrosion damage affecting the structural integrity of components in operational aircraft
- explored geometry restoration using laser deposition technology to solve problems associated with corrosion/ cracks in wing planks without the need for traditional major structural repair or component replacement

Machine vision for Industry 4.0 high-speed printing



Machine vision for Industry 4.0 high-speed printing

* photo credit: UTS

Outcomes

- automated the process of 3D metal printing by developing 3D scanning technology, which, using image sensing, digitally acquires the shape printed by the machine and thus validate the printed part
- developed a 3D geometry processing software which can be used by CNC mill or suitable post processing equipment. Effectively, this "retrofit scanning solution" allows the part to be positioned for milling while being scanned at the same time. The imagery is then fed back to the part build software resulting in improved accuracy during manufacture



Industry Partner SPEE3D

Research Partner UTS

Total Project Value (AUD) \$1,312,342

IMCRC Funding (AUD) \$349,763

Start Date 01/03/17

Duration (Years)

1.4





Program 2: Automated and Assistive Technologies

In today's world of unprecedented disruption and market turbulence, manufacturers are forced to rethink and adjust their business operations to stay ahead.

The adoption of automated and assistive technologies helps them simplify and streamline manufacturing processes and build capabilities to support their overarching business strategy.

Under Program 2 - Automated and assistive technologies - IMCRC engages in the research and development of agile manufacturing technologies that improve the performance and operational effectiveness of short run and personalised production systems. The program aims to help industry develop:

- assistive robotics and support systems (e.g. vision) that provide real-time, physical support to the workforce
- automated technologies with perception and situational awareness capabilities that interact safely with their environment including other assistive technologies and the workforce across the manufacturing process
- distributive heterogenous collaboration technologies that enhance OH&S, skill augmentation and continuous quality control and assessment.

66

hoto credit: IMCRC

In FY2022-23, six projects continued their research into automated and assistive technologies to support their organisation. All projects were successfully completed within the reporting period.

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Industry	Research	Total Project Value	IMCRC Funding	Start	Duration
Partner	Partner	(AUD)	(AUD)	Date	(Years)
Dentroid	Griffith	\$734,677	\$100,000	23/09/21	1

Outcome

• designed and developed a high-power laser micro-electro-mechanical systems (MEMS) mirror to control the laser within the mouth robotic assistive device

Miasma Meter – a novel continuous, internet connected, landfill gas monitoring solution								
Industry Partner	Research Partner	Total Project Value (AUD)	IMCRC Funding (AUD)	Start Date	Duration (Years)			
The Remediation Group	Deakin	\$804,515	\$150,000	01/03/21	1.6			

Outcome

• developd a low cost, real-time surface landfill gas (LFG) monitoring solution that remotely collects and assesses LFG data to ensure regulatory requirements are met and necessary control measures are applied



Common land fill site

* photo credit: TRG



Industry Partner Energy Renaissance

Research Partner CSIRO

Total Project Value (AUD) \$2,487,116

IMCRC Funding (AUD) \$563,210

Start Date 01/02/21

Duration (Years)

1.7

Renaissance Battery Management Systems (BMS) Development



SuperCube

* photo credit: Energy Renaissance

Outcome

• developed a defence-grade cybersecure Battery Management System (BMS) for its super storage family of batteries that monitors and reports on the battery's usage, lifespan and faults to ensure real-time data, analytics and remote management

To find out more about the project outcome click here.



Accelerated commercialisation of world's first and ground-breaking technology to manage suspended loads



A remote-controlled load-management system for suspended loads

* photo credit: Verton

Outcomes

- advanced its remote-controlled load-management system for suspended loads by improving the energy management and storage capabilities of the device
- streamlined production processes and reduce the overall manufacturing costs by integrating advanced manufacturing technologies such as robotics, sensing and data-analytics
- optimised the performance of the equipment and overall operation of the crane using data generated from the sensors within the new technology



Industry Partner Verton

Research Partner QUT

Total Project Value (AUD) \$3,901,405

IMCRC Funding (AUD) \$370,724

Start Date 10/10/19

Duration (Years)

3





There is a strong desire amongst Australian manufacturers to be the best in the world. IMCRC is committed to growing the number of Australian manufacturers able and ready to compete on the world stage through catalysing research collaboration and innovation.

Dr. Jason Coonan Deputy CEO



A self-confessed continuous learner, Jason's professional pathway to IMCRC has been underpinned by one consistent theme: innovation.

After earning his PhD, Jason started his career in neuroscience research before transitioning to innovation law, becoming a qualified patent and trade mark attorney along the way. He later moved to, and subsequently led, the commercialisation team of a leading Australian university and, from there, made the transition to CRCs.

Jason joined the IMCRC as Chief Operating Officer in 2016 and immediately found the breadth of industry participants and research projects focussed on Industry 4.0 technology invigorating. Passionate about the power of innovation, Jason has been inspired by the focus and determination of both industry leaders and researchers taking on the risk to create something new in what is a challenging and rapidly evolving sector.

He has been able to apply his experience as a researcher and his understanding of Australia's research and commercialisation ecosystem to support IMCRC's industry participants to maximise the impact of their collaborative research projects.

Jason recently completed an MBA which has given him further insight into the commercial realities facing IMCRC's industry participants.

Whether in his professional or personal life, Jason has a strong ethos of giving back and works to ensure he is contributing towards positive social outcomes for the communities he is a part of.

What has most inspired you in your time so far at IMCRC?

"It is a privilege to partner with Australia's world-class industry and research organisations operating at the bleeding edge of innovation and to work with the incredible visionaries who make them what they are."

Areas of focus:

- · Organisational leadership
- Business operations
- · Intellectual property commercialisation
- Stakeholder management

Automated monitoring and analytics for geotechnical and structural performance using the Internet of GNSS Things



Kurloo: automated monitoring system for geotechnical and structural performance

Outcomes

- developed an effective IoT solution to automatically measure civil structures using low-medium-end Global Navigation Satellite System (GNSS) sensors
- designed the hardware and advance the manufacturing process to produce lower power GNSS IoT sensors
- established a four-level IoT reference framework (sensors, networks, service platform and applications) to simplify the development, deployment, service and upgrade of each GNSS IoT component
- introduced a new business model that automates the monitoring of structures which reduces the risk and cost in the construction and maintenance of infrastructure assets.



Industry Partner MTHING

Research Partner QUT

Total Project Value (AUD) \$4,726,531

IMCRC Funding (AUD) \$875,300

Start Date 01/04/19

* photo credit: QUT

Duration (Years) 3.4



IMCRC HIGHLIGHTS REPORT 2021-22



Industry Partner CADwalk

Research Partner UniSA

Total Project Value (AUD) \$6,533,980

IMCRC Funding (AUD) \$1,060,629

Start Date 01/04/17

Duration (Years)

5.5

To find out more about the project outcome click here.



Visualisation tools for the design of manufactured high-end instrumented facilities



Visualisation tools for the design of manufactured high-end instrumented facilities

* photo credit: CADwalk

Outcomes

- developed and productised a set of novel industry specific design tools that enable clients to experience and modify high-value spaces such as factories, distribution centres, submarines and hospitals in a life-size scale
- demonstrated design concepts in real time using Spatial Augmented, Virtual and Mixed Reality which allows clients to walk around, physically touch and modify the proposed layout / interiors
- demonstrated alternative manufacturing opportunities to existing local businesses and encouraged the development of new strategies to offer specialised services to industry
- developed and commercialised the unique CADwalk mini solution
| High Access Localised Operations (HALO) | | | | | | | |
|---|---------------------|------------------------------|------------------------|---------------|---------------------|--|--|
| Industry
Partner | Research
Partner | Total Project Value
(AUD) | IMCRC Funding
(AUD) | Start
Date | Duration
(Years) | | |
| Ausdrill | UTS | \$440,889 | \$73,145 | 15/04/21 | 1 | | |

Outcome

• advanced a high access localised operations (HALO) platform by integrating robotic and virtual reality (VR) technologies with the aim to improve the efficiency and safety of traditional rock scaling operations

Explosion diagram based virtual and augmented reality maintenance training for industrial machines								
Industry Partner	Research Partner	Total Project Value (AUD)	IMCRC Funding Start (AUD) Date		Duration (Years)			
HYDAC Australia	Deakin	\$484,024	\$78,359	25/02/20	1.1			

Outcome

- developed and demonstrated a virtual and augmented reality training package that guides maintenance staff and trainees on how to assemble and disassemble HYDAC's most complex hydraulics components
- won the 2022 Endeavours Award for Excellence in Manufacturing Skills Development









Robotic and Virtual Reality (VR) technologies

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* photo credit: UTS
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HYDAC's hydraulics components

IMCRC HIGHLIGHTS REPORT 2021-22



Industry Partner UAP

Research Partner QUT, RMIT

Total Project Value (AUD) \$6,609,469

IMCRC Funding (AUD) \$1,195,599

Start Date 01/07/17

Duration (Years)

4

To find out more about the project outcome click here.



Design robotics for mass customisation manufacturing



The Design Robotics team at UAP in Brisbane

* photo credit: UAP

- · developed robotic vision systems and software user-interfaces to support the custom design-to-manufacture cycle
- integrated the systems with industrial robots and improved the manufacture of high-value, complex products in time and cost
- set up a Design Robotics Open Innovation Network that enabled peer-to-peer business knowledge transfer through the establishment of a Living Laboratory network which led to the formation of the Advanced Robotics for Manufacturing (ARM) Hub in Brisbane
- won the CRC Association's 2020 Award for Excellence in Innovation and the QUT Design Robotics team was honoured for their collaboration at the Australian Financial Review (AFR) Higher Education Awards 2022

Tradiebot



Tradiebot

* photo credit: Tradiebot

Outcomes

- demonstrated a "Repair-bot" that integrates 3D printing, 3D scanning and robotics for in-situ automotive part repairs, with the replacement part being directly printed on the damaged component and thus reducing repair cost, time, waste and environmental impact
- created novel polymer material solutions compatible with standard 3D printing processes



Industry Partner Tradiebot Industries

Research Partner Swinburne

Total Project Value (AUD) \$1,842,498

IMCRC Funding (AUD) \$359,045

Start Date 18/01/18

Duration (Years)

2





Program 3: High Value Product Development

With new business models emerging and the entire manufacturing sector re-inventing itself, Australian manufacturers need to invest in and deploy new product innovations to future-proof their business.

Program 3 - High Value Product Development - aims to develop for instance new electronic devices, diagnostic tools and implantable materials that utilise key enabling science and manufacturing technologies. These will enable Australian manufacturers to rapidly develop, produce, supply and support new products and technologies into international markets and supply chains.

* photo credit: IMCRC

IMCRC co-funded 39 'High Value Product Development' research projects, with 23 projects being completed in FY2022-23.

Sustainable DWR textile coatings inspired by Australian bee biopolymers

Industry	Research	Total Project Value	IMCRC Funding	Start	Duration
Partner	Partner	(AUD)	(AUD)	Date	(Years)
Humble Bee Bio	Deakin	\$625,873	\$70,000	28/02/22	7 months

Outcome

• developed a formulation and production method for suitable durable water repellent (DWR) coatings using Humble Bee Bio's novel biopolymer

Development of lightweight Australian composite overwrapped gun barrels							
Industry Research Partner Partner		Total Project Value (AUD)	IMCRC Funding (AUD)	Start Date	Duration (Years)		
Thales Australia	Deakin	\$279,352	\$51,567	07/02/22	7 months		

Outcome

• specified and sourced suitable carbon fibres, select appropriate resin and develop a new sizing agent to create new composite-metal interface for overwrap gun barrels and other civil applications







Durable water repellent (DWR) coatings

* photo credit: Humble Bee Bio





Composite-metal interface

* photo credit: Thales Australia



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* photo credit: Gale Pacific

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Metalic coating

* photo credit: Xefco

Non-combustible fabric development								
Industry Partner	Research Partner	Total Project Value (AUD)	IMCRC Funding (AUD)	Start Date	Duration (Years)			
Gale Pacific	Deakin	\$426,489	\$70,045	01/02/22	8 months			

Outcome

• developed a lightweight, flexible and formable fabric with commercial applications across different industry sectors including construction, defence, mining and agriculture

Sustainable functional metallised textiles								
Industry Research Partner Partner		Total Project Value (AUD)	IMCRC Funding (AUD)	Start Date	Duration (Years)			
Xefco and Survivon	Deakin	\$641,722	\$99,448	01/12/21	9 months			

Outcome

· improved the durability of already-developed antiviral and heat-reflective metallic coatings for textiles

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Development of a smart sensor system for soft soil engineering and construction safety

Industry	Research	Total Project Value	IMCRC Funding	Start	Duration
Partner	Partner	(AUD)	(AUD)	Date	(Years)
Geoinventions	Griffith	\$515,058	\$62,500	25/11/21	11 months

Outcome

• developed a smart geotechnical sensor to monitor the safety of Australian coastal roadways using micro-electro-mechanical systems (MEMS) technology

Development of a novel prototype thermovoltaic energy device								
Industry Partner	Research Partner	Total Project Value (AUD)	IMCRC Funding (AUD)	Start Date	Duration (Years)			
entX	UniSA	\$393,708	\$68,637	01/11/21	9 months			

Outcome

• advanced entX beta-voltaic technology and build a set of prototypes that will convert infrared energy from waste heat sources into electicity



Geotechnical sensors on roadways

* photo credit: GeoInventions







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Speedpanel team at Deakin

* photo credit: Speedpanel

IMCRC activate



Atmosheric plasma coating

* photo credit: Xefco

A new advanced manufacturing technology to manufacture fire rated acoustic panel systems

Industry	Research	Total Project Value	IMCRC Funding	Start	Duration
Partner	Partner	(AUD)	(AUD)	Date	(Years)
Speedpanel	Deakin	\$614,129	\$99,665	01/10/21	1

Outcome

• established a continuous manufacturing process for high volume production of the outer steel shell component of Speedpanel's acoustic and fire rated panel system

Textile dyeing via atmospheric plasma coating							
Industry Partner	istry Research mer Partner		IMCRC Funding (AUD)	Start Date	Duration (Years)		
Xefco	Deakin	\$740,573	\$99,828	01/09/21	1		

Outcome

• evaluated atmospheric plasma pre-treatment processes as an alternative to conventional textile dyeing to improve dye absorption and diffusion in textiles, and immobilise dyes aimed to enhance colour fastness

80

Bio-	based	mate	erial	s f	or nex	e genera	tion	texti	e	trea	tment	S
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Industry	Research	Total Project Value	IMCRC Funding	Start	Duration
Partner	Partner	(AUD)	(AUD)	Date	(Years)
HeiQ	Deakin	\$573,706	\$99,560	01/09/21	1

Outcome

• developed innovative technologies and treatment option to use bioderived biodegradable sources such as natural waxes and oils for functional fibre coatings

Advanced engineered surfaces for hydrometallurgy ball valves						
Industry Partner	Research Partner	Total Project Value (AUD)	IMCRC Funding (AUD)	Start Date	Duration (Years)	
Callidus Welding	Deakin	\$692,787	\$99,922	01/09/21	1	

Outcome

• developed a surface engineering solution that delivers a "fused" coating system that has a complete metallurgical bond with the substrate by modifying, in this case, the two dominate alloys in hydrometallurgical reactors - titanium alloys and super duplex stainless steel





Natural waxes and oils

* photo credit: IMCRC





Welding

* photo credit: IMCRC

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Test of energy absorbing bollard (EAB) concept * photo credit: UnisSA





SuperCool's smart compressor

* photo credit: SuperCool

Energy absorbing traffic lights						
Industry Partner	Research Partner	Total Project Value (AUD)	IMCRC Funding (AUD)	Start Date	Duration (Years)	
Impact Absorbing Systems	UniSA	\$736,469	\$126,701	15/08/21	1	

Outcome

• modified an existing energy absorbing bollard (EAB) concept to suit the shape, length, size and location of common traffic lights

Smart voltage regulators and control modules for refrigeration compressors on heavy vehicles						
Industry Partner	Research Partner	Total Project Value (AUD)	IMCRC Funding (AUD)	Start Date	Duration (Years)	
SuperCool	Griffin	\$522,719	\$80,000	01/08/21	1	

Outcome

• developed a range of smart voltage regulators and control modules tailored for SuperCool's 600V electric swashplate compressor, making it accessible for other vehicle and industrial applications







Hydrogen storage

* photo credit: IMCRC

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High-speed permanent magnet (PM)

* photo credit: gTET

Scaling up high-performance hydrogen storage metal organic framework (MOF) materials manufacture for field trial prototypes of Hydrogen (H2) Storage systems in heavy trucking and hydrogen hubs

Industry	Research	Total Project Value	IMCRC Funding	Start	Duration
Partner	Partner	(AUD)	(AUD)	Date	(Years)
RUX Energy	University of Sydney	\$1,232,954	\$99,776	01/03/21	1.75

Outcome

scaled up the manufacturing process of high-performance hydrogen storage metal organic framework (MOF)
material from batch to continuous processing, and allow for pilot production volumes and demonstration of
prototype hydrogen storage tanks

High-speed permanent magnet rotor post assembly magnetisation and power conversion systems manufacture					
Industry Partner	Research Partner	Total Project Value (AUD)	IMCRC Funding (AUD)	Start Date	Duration (Years)
gTET	RMIT	\$478,443	\$63,494	01/03/21	1.45

Outcome

• developed a post-assembly magnetiser for high-speed permanent magnet (PM) machine rotor magnetisation, and high-speed PM compressor power converter as an energy efficient solution to gas boilers

IMCRC HIGHLIGHTS REPORT 2021-22



Industry Partner LaserBond

Research Partner UniSA

Total Project Value (AUD) \$3,175,445

IMCRC Funding (AUD) \$486,594

Start Date 15/10/20

Duration (Years)

2

Delivery of high-quality laser clad coatings for heavy wear and corrosion protection



LaserBond's laser cladding technology

* photo credit: LaserBond

- refined LaserBond's laser cladding technology for resilient mineral processing equipment
- adjusted coating composition to the component and the dominant wear mechanism

Smart coatings for the next generation of lightning strike protection devices



LPI air terminal

* photo credit: LPI

Outcomes

- developed smart coatings that optimise the performance of corona-minimising technologies and can be additively deposited onto air terminals
- assessed the materials' suitability for industrial-level scale-up to manufacture
- built and field-tested the performance of full-scale prototypes



Industry Partner Lightning Protection International

Research Partner Swinburne

Total Project Value (AUD) \$1,256,730

IMCRC Funding (AUD) \$194,324

Start Date 01/06/20

Duration (Years) 2.3





Industry Partner Telix Cyclotek iPhase Technologies Genesis Care

Research Partner University of Melbourne

Total Project Value (AUD) \$3,097,888

IMCRC Funding (AUD) \$499,215

Start Date 03/02/20

Duration (Years)

2.7

Centralised manufacture of Molecularly-Targeted Radiation (MTR) drugs for cancer treatment



Manufacture of Molecularly-Targeted Radiation (MTR) drugs

* photo credit: Telix

- advanced Australian manufacturing capabilities for MTR drugs for prostate, kidney and neuroendocrine cancers
- developed a more efficient, centralised manufacturing process that increases the shelf-life of MTR drugs using long-lived radioisotopes and supports early-phase clinical evaluation
- transferred and consolidated the manufacturing process by applying internationally recognised Good Manufacturing Practice (cGMP) standards

Developing and optimising advanced carbon materials



Developing and optimising advanced carbon materials

* photo credit: Hazer

Outcomes

- optimised the synthesis and functionalisation of advanced carbon materials (ACM) for a) high purity graphite for Li-ion batteries, b) functionalised activated carbon for water purification and c) graphitic additives for lubrication
- investigated innovative technologies and design manufacturing processes to optimise the properties and performance of the ACM at a small scale, and once optimised, initiate larger scale production at Hazer's existing pilot plant (10 tonnes per annum)
- tested scaled application with specialty industry collaborators



Industry Partner Hazer

Research Partner University of Sydney

Total Project Value (AUD) \$5,875,319

IMCRC Funding (AUD) \$1,166,459

Start Date 01/11/19

Duration (Years) 2.5



IMCRC HIGHLIGHTS REPORT 2021-22



Industry Partner Lava Blue

Research Partner QUT

Total Project Value (AUD) \$12,522,518

IMCRC Funding (AUD) \$1,521,233

Start Date 23/09/19

Duration (Years)

3

To find out more about the project outcome click here.



Value adding Australian minerals: Advanced manufacturing of high purity alumina for batteries, sapphire glass and LEDs



Advanced manufacturing of minerals

* photo credit: QUT

- developed a resilient, agile and highly competitive manufacturing process to transform kaolin, an aluminumbearing clay, into high-purity alumina (HPA)
- designed and established a pilot manufacturing plant that applies advanced manufacturing principles and incorporates inline monitoring technology to support and progress Lava Blue's HPA production
- integrated feedback loops that will enable Lava Blue to tailor the process to potential customer requirements, upscale the pilot into a modular commercial plant with optimal financial returns and reduced risk

Atmospheric plasma coating system



Atmospheric plasma coating system

* photo credit: Xefco

Outcomes

- advanced conventional coating equipment and develop a commercially viable plasma deposition solution that improves current coating and treatment methods for textiles and substrates used in the garment, geotextiles, packaging and medical industry
- addressed known functional and environmental issues, such as water contamination, pollution and use of harmful chemicals, within the textile manufacturing and processing industries
- altered the way industry approaches treatment of commercial textiles and substrates by improving resource consumption and coating applications



Industry Partner Xefco and Proficiency Contracting

Research Partner Deakin

Total Project Value (AUD) \$5,381,501

IMCRC Funding (AUD) \$825,003

Start Date 01/06/19

Duration (Years) 3.3



IMCRC HIGHLIGHTS REPORT 2022-23



Industry Partner Codex Research

Research Partner University of Sydney

Total Project Value (AUD) \$6,197,738

IMCRC Funding (AUD) \$1,069,879

Start Date 01/04/19

Duration (Years) 3.4

To find out more about the project outcome click here.



Engineering an advanced, high value bioreactor system for research and clinical applications



Codex blood vessel pump

* photo credit: IMCRC

- developed an advanced perfusion bioreactor technology that mimics biological environments in vitro to • facilitate material research of vascular grafts
- · manufactured custom design components of the bioreactor technology by applying advanced manufacturing technologies such as 3D printing and robotics
- · integrated automated, flexible manufacturing strategies to facilitate the production of the bioreactor and use advance sensing technology to achieve real-time monitoring and control of its physical parameters

Innovative vaccine delivery technology



Innovative vaccine delivery technology

* photo credit: Vaxxas

Outcomes

- assessed the technology, manufacturability and environmental impact of supply chain logistics and highlighted the cost-effectiveness of the vaccine delivery technology, the environmental sustainability and potential Industry 4.0 applications
- conducted an end-user usability study to ensure that the vaccine delivery technology meets clinician and patient requirements
- undertook an acceptability study as part of a Phase 1 clinical study to gather information how well this novel, needle-free vaccination technology is received by subjects



Industry Partner Vaxxas

Research Partner University of Sydney

Total Project Value (AUD) \$3,910,917

IMCRC Funding (AUD) \$556,230

Start Date 01/11/18

Duration (Years) 3.8



Industry Partner Whiteley Corporation

Research Partner

University of Sydney, UNSW

Total Project Value (AUD) \$5,422,755

IMCRC Funding (AUD) \$975,573

Start Date 01/04/18

Duration (Years)

4.7

To find out more about the project outcome click here.



A novel approach to biofilm disruption and removal



IMCRC meeting the Whiteley research team

* photo credit: Whiteley

- developed a new approach to resolving bacterial biofilm problems in humans and industrial settings, through mimicking natural and synergistic multimodal strategies
- produced several new therapeutic treatments for biofilm mediated infection that effectively disrupt the formation of biofilm and eradicate underlying bacteria found, for instance, in the lungs of cystic fibrosis patients, chronic urinary tract infections, burn wounds
- created and manufactured small/highly customisable high-value formulated products for different applications and carriers (e.g. gels, foams and coatings) using advance manufacturing design methods and processes

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Surface functionalisation of ceramic alumina abrasive						
Industry Partner	Research Partner	Total Project Value (AUD)	IMCRC Funding (AUD)	Start Date	Duration (Years)	
Ozcut Abrasive	Swinburne	\$311,476	\$39,418	01/08/21	10 months	

Outcome

• developed a stable surface functionalisation process that treats ceramic alumina and is compatible with phenolic thermoset resin systems

xenon source and detectors, certified by COVID testing on a range of surfaces						
Industry Partner	Research Partner	Total Project Value (AUD)	IMCRC Funding (AUD)	Start Date	Duration (Years)	
Cablex	Swinburne	\$655,899	\$28,912	01/06/21	9 months	

Automated closed loop verification of LIV-C disinfection of COVID-19 using commercial off the shelf pulsed

Outcome

• developed a sensor array to capture the energy distribution of a miniaturised pulsed xenon UV disinfection system and characterisation of the ability of the system to disinfect pathogens based on the energy distribution **IMCRC** activate

IMCRC activate



Sensor array

Metal cutting wheel

* photo credit: IMCRC



IMCRC activate



Hydrogel

* photo credit: RMIT





SiC Schottky Diodes

* photo credit: Griffith

Hydrogel-based perfusion bioreactor to engineer stable gut microbial composition

Industry	Research	Total Project Value	IMCRC Funding	Start	Duration
Partner	Partner	(AUD)	(AUD)	Date	(Years)
BiomeBank	RMIT	\$613,638	\$99,317	15/03/21	1.3

Outcome

• developed a cellulose hydrogel-based bioreactor that mimics the human gut to allow the large-scale manufacture of a complex microbial therapy or synthetic Faecal Matter Transplant (FMT)

SiC diode manufacturability and characterisation for commercialisation by Questsemi Australia					
Industry Partner	Research Partner	Total Project Value (AUD)	IMCRC Funding (AUD)	Start Date	Duration (Years)
Questsemi	Griffith	\$1,553,549	\$143,701	1/11/20	1.1

Outcome

• established a simple and cost-effective manufacturing process of SiC Schottky Diodes, with the performance of the technology being tested in a pilot production facility that also supports early production runs

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IMCRC activate

Development of novel 3D BNNT ceramic composite for advanced dental applications

Industry	Research	Total Project Value	IMCRC Funding	Start	Duration
Partner	Partner	(AUD)	(AUD)	Date	(Years)
3D Dental Technology	Deakin	\$1,046,848	\$149,992	15/10/20	1.4

Outcome

• enhanced the mechanical and material property of two dental ceramics by optimising the percentage of Boron Nitrate nanotubes (BNNT) and establish new manufacturing methods for these BNNT reinforced ceramics



Dental ceramic oven

* photo credit: IMCRC

Industry Partner Boral

Research Partner UTS

Total Project Value (AUD) \$7,020,178

IMCRC Funding (AUD) \$900,077

Start Date 01/07/20

Duration (Years)

2.5

Ultra-sustainable concrete with high SCM content



Boral ultra-sustainable concrete, placed in St George Street, Sydney

* photo credit: Boral

- developed advanced technology for manufacturing, placing, and curing new ultra-sustainable concrete with an increased binder content of 70% supplementary cementitious materials (SMCs)
- mastered strength development and improved surface finishing techniques
- delivered significant environmental benefits and CO2 reduction opportunities



R2R printing for cost effective manufacturing of a smart patch for health monitoring



Dr Summeet Walia working in the Nutromics laboratory

* photo credit: RMIT

Outcomes

- developed a cost-effective manufacturing process to produce a wearable smart patch designed to elicit positive lifestyle behaviour changes to reduce the risk of developing chronic disease like Type 2 diabetes
- combined different technologies including microneedles, microfluidics and soft electronics to targets specific biomarkers as well as monitor health progress which is referred back to a deep learning AI engine
- demonstrated using roll-to-roll (R2R) printing the smart patch can be mass produced on a large substrate area at high speeds using automated systems with minimal human involvement



Industry Partner Nutromics Romar Engineering

Research Partner RMIT, Griffith

Total Project Value (AUD) \$5,716,952

IMCRC Funding (AUD) \$929,023

Start Date 01/02/20

Duration (Years) 1.75



Industry Partner BLT Allegra Orthopaedics

Research Partner University of Sydney

Total Project Value (AUD) \$7.489.828

IMCRC Funding (AUD) \$1,306,363

Start Date 01/09/18

Duration (Years)

3.6

Xenograft using Kangaroo tendon as substitute for ligament reconstruction



Using kangaroo tendon as substitute for ligament reconstruction

* photo credit: IMCRC

- produced innovative xenograft material that will refine the future of ligament reconstruction and repair
- · manufactured kangaroo-derived ligament xenografts using novel decellularisation and sterilisation technique that will not impair mechanical performance and allow a range of surgical reconstruction applications
- designed and 3D printed a screw using bioresorbable Sr-HT-Gahnite to fix the decellularised, sterile • kangaroo tendon to the bone

Industrialisation of composite wheel technology



Industrialisation of composite wheel technology

* photo credit: Carbon Revolution

Outcomes

- increased the manufacturing capacity and efficiency of its unique carbon fibre composite wheel technology
- developed new resin and fibre systems as well as optimised key enabling technologies such as binders, filler material and release agents that support high volume production
- developed data-driven statistical analysis techniques to automate processes and support intelligent manufacturing



Industry Partner Carbon Revolution

Research Partner Deakin

Total Project Value (AUD) \$16,033,497

IMCRC Funding (AUD) \$2,998,630

Start Date 01/07/18

Duration (Years) 3.5





Industry Partner Corin

Research Partner UniSA University of Adelaide

Total Project Value (AUD) \$14,098,144

IMCRC Funding (AUD) \$2,267,864

Start Date 28/02/18

Duration (Years)

4.3

Antimicrobial nanosurface for orthopaedic implants



Antibacterial surface modification

* photo credit: Corin

- explored nano-modification technology based on the structure of the dragonfly wing to create antimicrobial surface for orthopaedic implants
- proofed the safety of medical implants with the antimicrobial surface "smart surface" and tested their bacteria-killing properties
- developed a manufacturing infrastructure that allows the antimicrobial nano-surface to be engineered onto existing medical devices

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MCRC activate

Rapid point of care SARS-CoV2 Detection,	using a sensitive antigen screening test

Industry	Research	Total Project Value	IMCRC Funding	Start	Duration
Partner	Partner	(AUD)	(AUD)	Date	(Years)
Alcolizer	UTS	\$1,472,719	\$245,751	21/09/20	1

Outcome

- developed a point of risk saliva test for the COVID-19 virus that uses existing hand-held devices and a new process to upconvert nanoparticles to detect virus antigens for symptomatic and asymptomatic subjects
- advanced the design and testing of the prototype to accelerate commercialisation



Virulizer: rapid COVID-19 testing

* photo credit: Alcolizer



IMCRC HIGHLIGHTS REPORT 2022-23



Industry Partner BluGlass

Research Partner Griffith

Total Project Value (AUD) \$2,096,662

IMCRC Funding (AUD) \$330,001

Start Date 01/09/17

Duration (Years)

2.2

High Performance Normally OFF GaN High Electron Mobility Transistors (HEMT)



BluGlass laboratory

* photo credit: BluGlass

- developed a commercially viable Normally OFF fail-safe, lower cost and smaller Gallium nitride (GaN) based high electron mobility transistors (HEMT)
- combined two Australian enabling technologies BluGlass' deposition technology called Remote Plasma Chemical Vapour Deposition (RPCVD), a revolutionary low temperature approach for the manufacture of semiconductor materials and Griffith University's Queensland Microtechnology Facility (QMF) Atomically Smooth SiC on large Si (SiC on Si) wafers
- delivered world leading enabling technology platform and processes (RPCVD) for the manufacture of GaN Commercially viable SiC on Si substrate that addresses manufacturing cost, difficulty in engineering and the IP 'minefield' that is a barrier to wider manufacturing adoption

Smart electric compressor for refrigeration and air conditioning on electric vehicles



Smart electric compressor for refrigeration and air conditioning on electric vehicles

* photo credit: SuperCool

Outcomes

- developed an intelligent semi-hermetically sealed electric swash plate compressor for use in mobile airconditioning and refrigeration applications for passenger and commercial vehicles and equipment
- built an Internet of Things (IoT) enabled smart compressor with onboard diagnostic systems, which provides valuable information for quality control, maintenance and development, leading to a shorter product improvement cycle and providing service provision to end-users
- designed a compact, robust and suitable for harsh Australian environments, technology that will offer transformational services to electric air-conditioned and refrigerated vehicle and equipment operators worldwide



Industry Partner SuperCool

Research Partner Griffith

Total Project Value (AUD) \$2,370,366

IMCRC Funding (AUD) \$ 296,325

Start Date 01/09/17

Duration (Years) 2.5



The following three industry partners withdrew their research projects from the program due to COVID-19 disruptions and a change in industry partner strategic priorities in FY2020-21.





Lithium mining sector

* photo credit: Neometals



ESN product

* photo credit: ESN Cleer





Speedpanel lab

* photo credit: Speedpanel

Value adding the Australian lithium mining sector: cutting-edge manufacturing
process to convert aluminosilicate mining waste to zeolites

Industry	Research	Total Project Value	IMCRC Funding	Start	Duration
Partner	Partner	(AUD)	(AUD)	Date	(Years)
Neometals	QUT	\$898,886	\$62,552	01/01/20	1

Preventing heart attacks with nanotechnology-enabled biomarker sensors							
Industry Partner	Research Partner	Total Project Value (AUD)	IMCRC Funding (AUD)	Start Date	Duration (Years)		
ESN Cleer	RMIT	\$1,582,082	\$252,709	15/09/19	1		

Manufacture of the next generation Speedpanel						
Industry Partner	Research Partner	Total Project Value (AUD)	IMCRC Funding (AUD)	Start Date	Duration (Years)	
Speedpanel	Swinburne	\$2,919,396	\$400,010	01/02/19	2.5	



I feel privileged to work alongside colleagues who communicate openly and are united by a common purpose. I believe this has helped us catalyse and achieve the best outcomes for our industry and research partners.

Sameera Silva Finance and IT Manager

With over 9 years' experience working within the manufacturing and research space, Sam brings a deep understanding of the financial management of cooperative research centres (CRC) to his role at IMCRC.

As the Finance and IT Manager, he is responsible for end-to-end financial management including analysis, budgeting, reporting and providing recommendations to IMCRC's Audit and Risk Committee and the Board. Additionally, he guides the technological direction of IMCRC, overseeing the IT services, network security and cloud management. Sam's financial management and corporate governance skills have been critical in IMCRC successfully allocating all available Commonwealth and other funds to innovative projects.

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What has inspired you most during your time at IMCRC?

"Since rebooting IMCRC six years ago, I have been inspired by the non-traditional, industry-led approach we have taken to running the CRC. As part of our unique business model, the intellectual property is owned by the industry and research partners (rather than the CRC) and that has enabled us to drive commercial outcomes that are contributing significantly to Australia's manufacturing capability. I am also very proud of the way we have been able to successfully allocate all available Commonwealth funds to manufacturing research projects and also provide additional funding to support shorter-term, high impact projects during the COVID-19 pandemic through IMCRC's activate program. Our ability to do so demonstrates in my view the commercial strength of IMCRC's business model."

Areas of focus:

- Financial management
- IT and cyber security
- Corporate governance
- Compliance





Program 4: Industrial Transformation

Industry 4.0 – while creating new opportunities for Australian manufacturers through connected, more efficient production and new business models – impacts the market dynamics across the entire sector, affecting, in particular, SME manufacturers along the value chain.

IMCRC's Industrial Transformation Program seeks to advance the wider cause of manufacturing transformation in Australia through industry education and public advocacy. It creates and provides resources that particularly help SME manufacturers assess and adopt emerging digital technologies and new business models.

In FY2022-23, the Industrial Transformation Program has successfully:

- collaborated with IMCRC's futuremap delivery partners Swinburne University of Technology, University Technology Sydney (UTS) and the Advanced Robotics for Manufacturing (ARM) Hub - and hosted 14 futuremap workshops across Australia, encouraging a further 60 Australian manufacturing SMEs to commence or accelerate their Industry 4.0 and innovation journey
- continued the collaboration with Investment NSW and the Department of Education – Training Services NSW, helping refine the 'Driving Digital Skills Pilot Program' by offering feedback and providing insights of how NSW manufacturers can develop digital skills and broaden their understanding of Industry 4.0

- engaged the Centre of Transformative Innovation at Swinburne University
 of Technology to evaluate the overarching impact of futuremap, IMCRC's
 business diagnostic and education platform, with the aim to get a better
 understanding of how participating in a futuremap workshop / assessment has
 accelerated businesses' transition to Industry 4.0
- partnered with Swinburne's Factory of the Future' to develop a new 'Towards Net Zero' futuremap module which was successfully incorporated into the education platform in October 2022. A series of five pilot futuremap Net Zero events was then hosted across Victoria and Queensland to test the content, informing 41 manufacturing SMEs about possible pathways to achieve net zero emissions
- conducted three Industry 4.0 assessments in collaboration with Swinburne University's Factory of the Future including the assessment of MotorOne Group as part of their IMCRC activate project. Three more assessments are planned in Q1 2023, with each delivering comprehensive insights into a company's business maturity and making recommendations for a successful implementation of Industry 4.0
- informed Australian manufacturing SMEs where they sit on the Industry 4.0 adoption scale, using the aggregated futuremap data of 819 manufacturing SMEs that have completed the business diagnostic since its launch in 2018. In a series of thought and action leadership articles, IMCRC highlighted how even small investments into technologies, processes and people can help SMEs achieve operational efficiency, increase productivity and accelerate their business growth
- prepared the transition of futuremap to a new custodian who is committed to uphold and invest in the development and deployment of the business diagnostic and education platform once IMCRC's operation has ceased.



In FY2022-23, five projects were completed.



IMCRC activate



MotorOne Group team at the new factory

* photo credit: Swinburne





Power line poles

* photo credit: Revo Group

PoleWatch					
Industry Partner	Research Partner	Total Project Value (AUD)	IMCRC Funding (AUD)	Start Date	Duration (Years)
Revo Group	Deakin	\$736,256	\$99,985	15/08/21	1

Outcome

• advanced PoleWatch, a prototype of a pole monitoring device, to continuously capture and analyse data affecting the health of utility poles and provide information for predictive and preventative maintenance

Industrial Internet-ot-Things solution for real-time assessment of product quality						
Industry Partner	Research Partner	Total Project Value (AUD)	IMCRC Funding (AUD)	Start Date	Duration (Years)	
MotorOne Group	Swinburne	\$346,730	\$63,420	15/02/22	6 months	

Outcome

• designed and built an Industrial Internet-of-Things solution that seamlessly integrates sensing, communications and data analytics to assess and support the production processes in real time

108
Investigating virtual reality (VR) Low Voltage (LV) electrical safety rescue simulation for utilities and manufacturing sectors



Investigating Virtual Reality (VR)

* photo credit: Deakin

Outcomes

- advanced the application of virtual reality to train and improve the safety of current and future utility industry workers
- developed an electrical safety simulator that applies advanced robotics and control algorithms to create training scenarios



Industry Partner Melbourne Water

Research Partner Deakin

Total Project Value (AUD) \$1,571,906

IMCRC Funding (AUD) \$200,000

Start Date 01/10/20

Duration (Years)

2

109



Industry Partner BAE Systems Maritime Australia

Research Partner UniSA

Total Project Value (AUD) \$4,260,917

IMCRC Funding (AUD) \$897,080

Start Date 1/07/20

Duration (Years)

2.4

The application of interactive narrative visualisation and big data to improve high-value manufacturing



Hunter Class Frigate Program

* photo credit: UniSA

Outcomes

- developed narrative visualisation and big data processing to define and shape the manufacturing environment for the Hunter Class Frigate Program and its supply chain
- built a "big data dashboard" that autonomously consolidates and analyses multiple Industry 4.0 data streams

Accelerating the uptake and diffusion of innovative manufacturing technologies in Australian shipbuilding and supply chain: the human factor



Hunter Class Frigate Program

* photo credit: ASC Shipbuilding, BAE Systems Australia

Outcomes

- developed and piloted Industry 4.0 technologies to support the progress and delivery of the Hunter Class Frigate Program
- captured and addressed the challenges associated with the implementation of the Industry 4.0 technologies throughout the project
- worked with local manufacturing SMEs to drive digital transformation through advanced robotics, assistive manufacturing, and readiness utilisation both inside the shipyard and more widely in the Australian supply chain



Industry Partner BAE Systems Maritime Australia

Research Partner Flinders

Total Project Value (AUD) \$9,512,951

IMCRC Funding (AUD) \$1,472,893

Start Date 17/02/20

Duration (Years) 2.7





IMCRC activate



Automated folding process of donation packs * photo credit: Swinburne





Corrugated steel strips

* photo credit: FormFlow

Design and development of a work cell for robotic folding of whole blood donation packs

Industry	Research	Total Project Value	IMCRC Funding	Start	Duration
Partner	Partner	(AUD)	(AUD)	Date	(Years)
Australian Red Cross Lifeblood	Swinburne	\$423,214	\$79,104	01/02/21	1.4

Outcome

automated the folding process of whole blood donation packs, including their process data collection, to • advance the digitalisation of Lifeblood's production operation and improve the work, health and safety for blood processing staff

High volume, scalable manufacturing cell for enhanced building products					
Industry Partner	Research Partner	Total Project Value (AUD)	IMCRC Funding (AUD)	Start Date	Duration (Years)
FormFlow	Deakin	\$900,036	\$103,497	01/11/20	1.3

Outcome

• established an Industry 4.0 enabled manufacturing cell equipped with smart vision technologies to trace, evaluate and continuously monitor forming loads and the profile share of corrugated steel strips to enable robuts and high-volume production

A novel virtual manufacturing system approach for integrated flexible low-cost manufacturing to enhance cost competitiveness, value differentiation and market focus



SleepCorp new factory

* photo credit: SleepCorp

Outcomes

- set up a novel Virtual Manufacturing System (VMS) that connects robotics-based machinery to a digital twin for a faster and more flexible manufacturing approach
- integrated all manufacturing operations ranging from tailoring, cutting, sewing to packaging into the VMS application which then will be linked to SleepCorp's Enterprise Resource Planning (ERP) and Data Analysis/ Analytics for enhanced visibility across the manufacturing value chain
- delivered a model system for an adaptable Industry 4.0 enabled production line that accommodates mass customisation to deliver the right product at the right time to the right quality the customer expects



Industry Partner SleepCorp

Research Partner Swinburne

Total Project Value (AUD) \$3,434,610

IMCRC Funding (AUD) \$406,515

Start Date 01/01/19

Duration (Years) 3.5



IMCRC HIGHLIGHTS REPORT 2022-23



Technology is changing the industry landscape, and we help to interpret that for manufacturers, acknowledging that it is different for everybody. IMCRC has a role and responsibility in facilitating manufacturing and industrial transformation to ensure they can see what is possible.

Simon Dawson Industrial Transformation Director



Simon describes his 30-year career in the manufacturing industry across both in-house and consulting roles as the perfect proving ground for his position at IMCRC.

As the Industrial Transformation Director, Simon's role is at the heart of what drives IMCRC - supporting manufacturers, regardless of their size, who want to embrace transformation, and guiding them on the pathway to realising it.

Simon works with predominantly SME manufacturers to chart and progress their journeys towards a greater uptake of Industry 4.0 technologies using education and training diagnostic such as IMCRC's futuremap[®]. An ice hockey coach in his spare time, there are parallels with preparing his players and his role as an Industry 4.0 transformation mentor to SMEs. Whether it is understanding the fundamentals of new skills and techniques or how to overcome challenges as a team, Simon is passionate about accelerating performance and helps those he works with to see and understand, the art of the possible.

What's the most important thing you've learned so far while at IMCRC?

"The shift to Industry 4.0 globally is only going to keep accelerating. The time is now for Australian manufacturing to rapidly embrace these technologies - because our competitors are, and we cannot afford to fall behind."

How are you using your skills and experience to build a better world?

"After delivering lean process improvement over many years in previous roles I understand that for change to succeed it is the chosen path that is important, not just the tools. Transformational change is an outcome of leadership - it's not just the advanced manufacturing machines and tools; it's how you establish the culture, share knowledge and embed a change mindset."

Areas of focus:

- Manufacturing performance
- Education and training
- Stakeholder management
- Driving transformational change

futuremcep®

Australian manufacturers know about the benefits of Industry 4.0: smarter, more efficient and sustainable business operations. What's hard is getting started and turning that knowledge into action, particularly for manufacturing SMEs.

With that in mind, IMCRC as part of its Industrial Transformation Program designed futuremap®, a business diagnostic and education platform that addresses the challenges and inertias of Australian manufacturing SMEs around Industry 4.0 and digital transformation.

Across 13 key areas of industrial and manufacturing competitiveness the diagnostic prompts manufacturers (business owners and executives) to reflect on their business' current performance as well as encouraging them to think ahead two years - highlighting key ambition gaps and areas of potential focusas well as action. By combining this detailed diagnostic with a workshop filled with relatable use cases, manufacturers have the opportunity to discuss latest advancements and use their futuremap[®] results to prioritise areas of innovation and define their own pathways to integrate Industry 4.0 technologies across their organisation.

Since the launch of futuremap in 2018, over 800 Australian manufacturing SMEs have taken part in workshops or one-on-one discussions so far, using the opportunity to outline the first or next step in their digital transformation journey. Reviewing the aggregated data of those who participated in futuremap® shows that many SME manufacturers will be increasing their investment in Industry 4.0 and key enabling technologies over the coming years. Importantly, the more ambitious companies also look beyond simple investment and see the potential for bigger benefits by integrating Industry 4.0 across their entire value chain and developing a robust innovation culture.

Helping SMEs innovate and grow

An independent evaluation of the impact and effectiveness of futuremap® conducted by the Centre for Transformative Innovation at Swinburne University of Technology in July 2022 revealed that manufacturing businesses that engaged in a futuremap® workshop were found to be growing faster and innovating more than their closest peers, reporting an average increase of 15.5% in sales, 21.5% in wages and 6.6% in staff. Also, by them prioritising investments in marketing and sales, operational transformation and human capital, the report suggests, futuremap® has encouraged manufacturers to think differently and complement their existing business strengths.



For more information visit futuremap.org.au

Towards Net Zero

The science is clear: to keep global temperatures from rising 1.5°C above pre-industrial levels, Australia along with the rest of the world has to significantly reduce its greenhouse gas emissions by 2030 and reach net zero by 2050.

To help manufacturers prepare for and embrace the transition to a carbon neutral economy, IMCRC partnered with Swinburne University of Technology to expand the diagnostic capabilities of futuremap[®] to demystify the "ins and outs" of decarbonising Australia's manufacturing sector.

Tapping into the unique futuremap[®] experience, the team has developed a "Towards Net Zero" module that provides industry insights and addresses the following key drivers

- market
- leadership
- clean energy
- decarbonisation

for successfully setting up and/or transitioning to a resource-efficient, carbon neutral business and operation model. Considering the implications of emissions, manufacturers, as part of a faciliticated workshop, are given the opportunity to

- refect on the complexities of net zero
- uncover their business and market potential
- · identify investment and innovation priorities
- review practical pathways to reduce emissions and manage their environmental impact.

The aim of futuremap[®] "Towards Net Zero" is to help Australia's manufacturers understand the implications of transitioning to net zero and encourage them to take action based on environmentally sound business decisions both now and in the future.



Industry 4.0: Are you ready?

Strategically positioned at the intersection of design, business, engineering and information systems, Swinburne University of Technology has played an integral role in delivering IMCRC's Industrial Transformation Program.

Swinburne University of Technology has been a pioneer in computer - integrated manufacturing, long before the Fourth Industrial Revolution commenced, or the term Industry 4.0 was coined. Since the 1990's, the university has provided industry with unparalleled facilities and equipment to explore conceptual ideas for manufacturing next generation products, making it an ideal deployment partner for IMCRC's Industrial Transformation Program.

In 2018, Swinburne University received \$2 million in funding from the Victorian Government to establish the Advanced Manufacturing Industry 4.0 Hub and pioneer a new model of university-industry collaboration where businesses and universities not only co-create technology but also business strategy. At the core of the collaboration model sits futuremap[®] - IMCRC's business diagnostic and education platform. Since then, Swinburne University has used futuremap[®] to help over 150 Victorian manufacturing SMEs asses their business capabilities, define their digital strategies and redefine how to create and capture value in their business. To unlock further opportunities that exist with Industry 4.0, Swinburne University has provided 24 local manufacturing SMEs with a more in-depth and comprehensive assessment of their manufacturing capabilities by applying futuremap®'s Industry 4.0 Readiness Assessment. The assessment, which is based on the German Fraunhofer Institute's Industry 4.0 Readiness Assessment, allows Swinburne, through a series of workshops, to road-test businesses' current manufacturing processes and determine their Industry 4.0 readiness. Once completed, Swinburne works closely with the organisations to develop a digitalisation strategy that will help them not only lift their digital maturity but also become more innovative and grow their business.

As a result of the Readiness Assessment, research collaborations have emerged, as for example with Sleep Corp, that have allowed researchers and students to work side-by-side with industry to develop and co-create new digital technologies and business practices.



SME Engagement

Australian manufacturing SMEs are the backbone of Australia's economy. However, economic uncertainty, disruptive technologies and new business models are changing the business landscape, putting increased pressure on businesses to develop new ideas, new products and services to maintain their competitive advantage.

For SMEs this presents further challenges as they are often limited by access to the funding, facilities and expertise that is needed to assist their business in adapting for growth and transformation.

IMCRC engages with manufacturing SMEs across Australia, offering them different pathways to explore, adopt and implement emerging digital technologies and business models to support their business and improve their productivity.

In FY2022-23, IMCRC:

- completed 36 industry-led manufacturing research projects involving small and medium sized businesses from a diverse cross section of industries and location, all meeting IMCRC's SME collaboration requirements
- invested \$1.45 million in matched cash in IMCRC's activate program which allowed 23 manufacturing SMEs to engage in shorter term, industry-led research projects in innovative manufacturing and digital technologies

- conducted 14 futuremap® workshops that offered 60 manufacturing SMEs the opportunity to learn about Industry 4.0 and assess their business capabilities across thirteen key areas of industrial and manufacturing maturity using IMCRC's business diagnostic and education platform
- expanded futuremap's diagnostic capabilities by introducing a new "Towards Net Zero" module which is designed to help manufacturing SMEs understand their role in supporting Australia's vision of Net Zero by 2050. 41 businesses participated in a series of pilot events in October 2022
- supported four Industry 4.0 hubs SME@ UTS, the Advanced Robotics in Manufacturing (ARM) Hub, Swinburne's Factory of the Future and the Tonsley Manufacturing Innovation (TMI) Hub - in their quest to accelerate the uptake and diffusion of innovative manufacturing technologies among SMEs
- connected three manufacturing SMEs with PhD students via the Australian Mathematical Sciences Institute (AMSI) APR.Intern program. The short-

term internships have enabled SMEs to harness the expertise of emerging manufacturing talent to tackle certain R&D challenges within their business

- discussed industry trends, challenges and opportunities impacting SME manufacturers at more than 25 industry events, including webinars and workshops. With IMCRC's Manufacturing Innovation Showcase in November 2022, IMCRC created a unique platform for manufacturing SMEs to see and experience the possibilities of industryled research collaboration in Australia
- published several thought leadership articles, media releases and commentaries in publications such as Manufacturers' Monthly, @aumanufacturing and Australian Manufacturing that promoted the outcomes and impact of IMCRC's 71 R&D projects and Industrial Transformation Program
- supported NERA's LET's Pitch Australia and the Australian Technology Competition - two programs designed to help SMEs find new growth opportunities and solidify their market position



At IMCRC, we champion manufacturing innovation. Working with innovative people that see things from a different perspective and are not afraid to push boundaries, whether it's within business, research or their life outside of work, is very rewarding.

Jana Kuthe Communications, Marketing and Events Manager



Since joining IMCRC in 2017, Jana has helped to build IMCRC's brand as a champion of innovation and industrial transformation within Australia's manufacturing industry.

Jana is a strong advocate for the power of industry collaboration and embodies that spirit in her engagement with IMCRC's stakeholders. Working closely with IMCRC research and industry partners, Jana is responsible for ideating and executing strategic marketing communications activities that demonstrate the impact, value and benefits of industry-led research collaboration. With extensive experience in establishing new brands within the technology industry, she brings to IMCRC a passion for telling the stories of innovators, no matter how big or small as well as a wealth of technical marketing knowledge and skill. Over the past five years, Jana has delivered milestone initiatives that have successfully positioned IMCRC as a leading voice and catalyst for industry transformation with stakeholders. These have included IMCRC's conference which created a forum for authentic and compelling conversations about the role of research, development and innovation in the future of the Australian manufacturing industry.

Outside of work, as a volunteer for Marketing Women Inc, a not-for-profit association that inspires, educates and supports young female marketers, Jana uses her experience working collaboratively with partners and across multiple teams to connect and support women throughout their careers.

What has inspired you most during your time at IMCRC?

"Realising the power of industry-research collaborations to positively impact and transform manufacturing businesses - big or small.

I believe that when passionate people with great minds come together to achieve a shared goal, new ideas are created, and anything is possible."

Areas of focus:

- Brand
- Marketing Communications
- Public Relations
- Events

Education and Training

IMCRC's Education and Training activities focus on helping to catalyse the transformation of the Australian manufacturing sector. A large component of this involves engaging directly with manufacturing SMEs via the Industrial Transformation Program and also helping skill the manufacturing workforce of the future through PhD and Masters scholarships and industry internships.

In FY2022-23, IMCRC continued to build on the foundations it established in previous years and focused on

Student Engagement and Development

- As part of IMCRC's 71 industry-led R&D projects, 24 PhD and nine Masters students have worked alongside research experts from eight universities to explore advanced manufacturing technologies, develop cutting-edge solutions and test their effectiveness in the real world. Eight PhD and four Masters students are bound to complete their candidature successfully throughout the reporting period, with another six PhD students set to finish their research by 2026.
- In November 2022, IMCRC invited all its PhD and Masters students to display their research at IMCRC's 'Manufacturing Innovation Showcase' at The Timber Yard in Port Melbourne. The two-day event featured the outcomes of over 40 research collaborations, demonstrating how innovative

technologies such as additive manufacturing, robotics, data analytics, augmented and virtual reality can help solve complex problems and thus transform Australian manufacturing. More than 200 people from industry, research and Government attended the event, including a group of Year 7 students from Port Melbourne Secondary College.

- IMCRC fulfilled its partnership with the Australian Mathematical Sciences Institute's APR.Intern program supporting a total of 25 internships (two more than originally planned) with Australian manufacturing SMEs. Three highly skilled PhD students started their short-term research projects in the reporting period, all due to be completed in early 2023. Of the 25 PhD interns placed, nine have gone on to secure ongoing employment with their internship partner, eight in newly created roles and one in an existing position. Overall the feedback from industry was very positive, with 87% reporting that project outcomes were directly implemented in the company.
- IMCRC granted one \$5,000 Masters by Coursework scholarship, which, alongside two other scholarships, was completed during the reporting period. Since the launch of the scholarship program in 2021, IMCRC has supported nine students in an industry-focused, semester long research project, exploring additive manufacturing as a potential career path.

Industry Training

 Since the launch of futuremap[®] in March 2018, over 1,000 manufacturing businesses have participated in either a futuremap[®] workshop or one-on-one session to assess their business capabilities and define pathways to adopt Industry 4.0 technologies across their organisation. In collaboration with its deployment partners, IMCRC hosted 14 futuremap workshops in FY2022-23, helping 206 manufacturing executives demystify Industry 4.0 and encouraging them to take their first or next step in their digital transformation journey.

- The Australian Government has released its long-term emissions reduction plan to achieve net zero emissions by 2050. To help manufacturers understand their role in supporting the Government's vision, IMCRC has developed a bespoke "Towards Net Zero" futuremap module which highlights technologies and pathways to reduce energy emissions. 41 manufacturing businesses participated in a series of pilot futuremap workshops.
- In partnership with Swinburne's Factory of the Future, utilising Fraunhofer's Industry 4.0 Readiness Assessment, IMCRC helped three manufacturing

businesses, including IMCRC's project partner MotorOne Group, gain a deeper understanding of their Industry 4.0 needs. A further three Readiness Assessments are planned in early 2023.

 In early November 2022, IMCRC demonstrated the breadth and depth of Australian manufacturing innovation at The Timber Yard in Port Melbourne. Over 40 of IMCRC's project partners participated in the two-day showcase, displaying the transformative technologies that they had explored, developed and successfully applied as part of their research collaborations. In his opening address Minister for Industry and Science Ed Husic commended IMCRC's successful demonstration of how successful the CRC model can be. Marking the end of IMCRC's funding term, the event brought together more than 200 people from industry, research and government.

 IMCRC participated in more than 25 industry events in various formats and capacity in FY2022-23. As sponsor of the Australian Tech Competition and InnovationAus' Awards, IMCRC highlighted the importance of investing and translating Australian research into commercial outcomes to build a resilient and globally relevant manufacturing industry.





IMCRC's Manufacturing Innovation Showcase

* photo credit: IMCRC

IMCRC plays a critical role supporting the commercialisation of research. I'm proud to work for an organisation so focused on driving positive outcomes for Australia's manufacturing industry and our nation more broadly.

Lydia Gunawan Project Research Officer



As IMCRC's Project Research Officer, Lydia is responsible for account managing over 30 of IMCRC's industry-led collaborative projects. She works closely with both industry and research partners to oversee their administrative commitments, including reporting requirements, and makes sure each project achieves its milestones.

Lydia also manages IMCRC's Masters by Coursework Scholarship program, which enables students to contribute to a manufacturing-focused research project as part of their degree.

With a Bachelor of Veterinary Science and Master of Applied Science, and extensive experience working in medical research, Lydia brings a wealth of scientific knowledge to IMCRC. Prior to joining the team in 2021, Lydia spent 10 years working on a preclinical study developing therapeutic treatment for Parkinson's and Alzheimer's disease.

Although she now focuses on the management side of research and development, Lydia retains her passion for the human-centric nature of the work, which often links back to making life better for people.

What are you most proud of during your time at IMCRC?

"I'm most proud of the work I have done supporting students through our 'Masters by Coursework Scholarship' program. As a former international student, I've experienced firsthand some of the challenges these students face when undertaking study. Because of this, it's especially rewarding to help them participate in industry-led projects and build invaluable connections. I can really see the difference the scholarships make in their lives and in turn, the value they create for our industry partners."

Areas of focus:

- Project management
- Education
- Client services

Australian Manufacturing SMEs benefit from PhD Expertise

In 2019, IMCRC partnered with Australian Postgraduate Research Intern (APR.Intern) – Australia's only PhD internship program spanning all sectors, disciplines and universities – to help small to medium enterprises (SMEs) lift their advanced and digital manufacturing capabilities and to take advantage of the fourth industrial revolution (Industry 4.0).

Through the partnership, IMCRC subsidised 50% of the cost to each business for short-term internships that explored the adoption of Industry 4.0 technologies and business models to address manufacturing-specific challenges. Over the course of four years, 25 manufacturing SMEs from across Australia have taken advantage of the program and secured the support of a skilled intern.

Tapping into research expertise and talent

Working with all universities across Australia and operating as a single point of access, APR.Intern makes it easy and cost-effective for manufacturing SMEs to tap into the specialised skills they need to take the first or next step to advance an in-house R&D project.

After defining the business problem, APR.Intern finds a suitable PhD student who brings the right expertise - be it automation, robotics, artificial intelligence, additive manufacturing or augmented reality - to the manufacturing table. With the support of the student over three to six months, SMEs then have the opportunity to rapidly prove, develop and scale their new product, process or service - enabling them to turn ideas into reality. And importantly, the SME retains the IP and benefits over the long term.

APR.Intern National Program Manager, Lisa Farrar, said the partnership with IMCRC had received overwhelmingly positive feedback from industry and universities alike.

"The subsidy that IMCRC provided has undoubtedly strengthened industry-university collaboration within the sector. 90% of businesses that utilised the subsidy were start-ups or SMEs, providing them with muchneeded support to engage in research collaborations and fast-track innovative R&D," she said.

"Upon completion of the internship, 87% of industry reported that project outcomes were directly implemented in the company, and 75% reported they were seeking co-funding to continue the research."

Creating career opportunities

The APR.Intern program has provided students with invaluable industry expertise and real career

opportunities. Of the 25 interns placed, nine have continued to work with the industry partner since finishing their internship, eight in newly created roles and one in an existing position. This is a testament to the unique potential of the program, especially in the manufacturing sector. By accessing the skillsets and expertise needed to accelerate their R&D, businesses are seeing the value in embedding researchers into their workforce moving forward.



hoto credit: IMCRC

APPENDIX



photo credit: IMCRC

Glossary

Innovative Manufacturing Cooperative Research Centre		
Australian Charities and Not-for-profits Commission		
Annual General Meeting		
The Australian Industry Group		
Advanced Manufacturing Industry Growth Centre		
Australian Postgraduate Research Intern		
Audit and Risk Committee		
Australian Securities and Investments Commission		
BDO Australia - Certified Public Account		
Company Board of Directors		
Chief Executive Officer		
Cooperative Research Centre		
Calendar Year		
The Commonwealth Scientific and		
Fiscal (financial) Year		
Griffith University		
Innovation Investment Committee		
Intellectual Property		
Industrial Transformation Program		
Managing Director		

MRL	Manufacturing Readiness Level
MTP Connect	Medtech and Pharma Industry Growth Centre
MOU	Memorandum of Understanding
NRC	Nominations and Remuneration Committee
R&D	Research and Development
SCM	Supplementary Cementitious Material
SME	Small and Medium Enterprise
SUT	Swinburne University
Sydney	University of Sydney
тс	Transition Committee
ТМІ	Tonsley Manufacturing Innovation Hub
TRL	Technology Readiness Level
UniSA	University of South Australia
UTS	University of Technology Sydney
UTSA	University of Tasmania
QUT	Queensland University of Technology



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