



RAPID PRODUCT DEVELOPMENT ASSOCIATION OF SOUTH AFRICA

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**2021 CHAIRMAN'S REPORT**

**November 4<sup>th</sup>, 2021**

**RAPDASA  
Annual General Meeting**

**CSIR, International Convention Centre  
Pretoria**

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## 1. Introduction

The Rapid Product Development Association of South Africa (RAPDASA) was formally founded at the First Annual General Meeting of the Association on 8 November 2000, at the CSIR Conference Centre in Pretoria. Today, we are celebrating our 22nd annual conference, back at the CSIR ICC, where we started over two decades.

During the last two years, the world has been faced with many challenges and South Africa has certainly not been the exception. The pandemic made an impact to our lives in many unforeseen ways and certainly changed the world in ways difficult to quantify. In some ways, the pandemic placed focus on 3D printing as a distributed supply chain, but to many in industry, this was (and still is) an extremely challenging era. COVID restrictions also had an impact on RAPDASA as an association where we had to rethink the ways in which we foster networking in South Africa.

After the 2020 conference, which was mostly an online conference, the RAPDASA management committee made the decision to continue with a dual medium conference for 2021. This was a first for RAPDASA and posed a tremendous set of financial and physical limitations on the association, and specifically on our conference host. I would like to take this opportunity to congratulate and to thank the CSIR, the host of the 2021 RAPDASA conference as well as the organising team, for taking on the challenge and hosting a successful conference in a time of uncertainty.

This year, RAPDASA also took hands with IEEE, and we were joined at our annual conference by RobMech for their 14th conference on 'Robotics and Mechatronics', as well as PRASA for the 32nd 'Pattern Recognition Association of South Africa' conference. In a world of digital transformation, inter-disciplinary collaboration seems key, and we hope that this collaboration will foster a new era of innovation in South Africa.

Although industry certainly had to rethink the usage of their resources, and research institutions and academia were faced with the difficulties of online operations, there were still some major developments in South Africa during this time and I am proud to include some of these in this report.

## **2. RAPDASA Management Committee**

The RAPDASA management committee for 2021 was elected during the virtual Annual General Meeting held on 5 November 2020. The management committee for 2021 was as follows:

Marius Vermeulen	(Chairperson)
André van der Merwe	(Vice Chairperson)
Pauline Bullock	(Treasurer)
Rynette Coetzer	(Secretary)
Clive Hands	
Duncan William Gibbons	
Hencharl Strauss	(Conference organiser)
Jean-Pierre Serfontein	(Website, electronic media, and marketing)
Imdaadulah Adam	(Design competition)
Tsepo Dube	
John McEwan	

RAPDASA Executive Committee and Management Committee meetings were held on 25 November 2020, 26 February 2021, 15 April 2021, 12 May 2021, 4 June 2021, 2 July 2021, 6 August, 2021, 5 October 2021 and 22 October 2021.

## **3. 2021 Annual Conference**

This year, RAPDASA took hands with IEEE and we were joined by the RobMech (Robotic and Mechatronics) and PRASA (Pattern recognition association of South Africa) conferences. The theme for the conference was “Digital Manufacturing Industrializing Africa” and the conference was held from 3 – 5 November at the CSIR International Conference Centre. The conference was hosted by the CSIR and it was run as a full hybrid conference with delegates attending in person and online.

The conference had a total of 206 delegates of which 148 was registered to attend in person and 58 for online participation. The pre-conference seminar had a total of 63 delegates of which 43 attended in person while the rest was booked for online participation.

The main conference track boasted more than 80 papers, while an additional 27 papers were presented in the industry track which was broadcasted on an open-access online stream.

We received 52 papers and 15 extended abstracts. 45 papers were accepted during the review process of which 38 will be published in IEEE Xplore and 6 papers will be published in a special issue of SAJIE (South African Journal of Industrial Engineering).

The title of the IEEE Xplore proceedings will be: *“2021 Rapid Product Development Association of South Africa - Robotics and Mechatronics - Pattern Recognition Association of South Africa (RAPDASA-RobMech-PRASA)”*

I would like to extend a special thanks for our sponsors and exhibitors which continue to contribute to RAPDASA and without whom the conference would not be possible.

The sponsors for this year’s conference are:

- DSI
- SIMTEQ Engineering
- EOS / Rapid 3D
- CUT
- VUT
- 3D Printing Systems
- CSIR

Over and above our sponsors, we also had the following exhibitors:

- Weartech
- Aditiv Solutions
- Elogium Pty Ltd
- Reach 3D Pty Ltd

I would also like to thank and congratulate Hencharl Strauss, the conference organiser, as well as his team. I also extend my gratitude to the technical team which supported them in managing the online streams.

Organising team:

- Hencharl Strauss
- Darryl Naidoo
- Wayne Koen
- Monnamme Tlotleng
- Sisa Pityana
- Attie Hendriks
- Lerato Tshabalala
- Ntombe Mathe
- Duwan Bester

- Cobus Jacobs
- Justin Harrison
- Sarah Mothapo
- Puseletso Tlhareseng
- Jovan Joseph
- Shaniel Davrajh

Technical team:

- Francois du Rand
- Duncan Gibbons
- Daniel Kirkman
- Tshepo Dube

Finally, a special thanks to the following people who made a tremendous contribution to the conference.

- Willie du Preez, who is serving as the editor for RAPDASA and managed the academic side of the conference, including the paper review and publication processes.
- Jean-Pierre Serfontein for managing the marketing and electronic media for RAPDASA throughout the year, as well as for the conference. His dedication throughout the year has made a tremendous impact on the conference, while he also put several processes in place for managing this process into the future.
- Devon Hagedorn Hansen for the countless website updates and social media posts.
- Rynette Coetzer for always smiling while tirelessly managing RAPDASA, all of us, as well as the conference administration.

#### **4. Marketing and Electronic Media**

Jean-Pierre Serfontein took charge of marketing and electronic media for RAPDASA in 2021. The strategy for 2021 marketing focussed on the improvement and alignment of the various social media platforms, and to increase the current footprint of the RAPDASA name.

This has been successfully accomplished with the Facebook, Instagram, LinkedIn, and YouTube pages aligned. The marketing activities were outsourced later in the year to two parties, Zebrah and HH Industries.

Zebrah was brought in to provide technical writing expertise. HH Industries provided social media and website management that has been the backbone of the marketing pitches leading up to the conference.

Lastly, COVID – 19 has seen many conferences move to a purely digital space. This has opened an opportunity to expand the reach of having RAPDASA available online. The services of Bushbaby communications were made use of to provide live streaming of the event.

## **5. Design Competition**

Imdaadulah Adam was again responsible for the Design competitions. RAPDASA was involved in 2 design competitions this year. The first of these being the major design competition hosted by RAPDASA. The second is a competition that we support that is aimed at scholars and hosted by WhyToyz.

The RAPDASA Design Competition has come to be known as the biggest 3D design competition in South Africa, and in typical fashion, did not disappoint. For the 2020/2021 period, we received 50 design entries. Given the difficulties surrounding in-person gatherings during 2020, the competition entries for last year were carried over and included in this year's competition.

While the themes surrounding the 2020 and 2021 competitions differed, the ultimate goal was achieved where entrants were challenged to be innovative. The theme for 2020 was focussed on making life easier during the difficult pandemic times, while the 2021 the competition took a different direction whereby entrants were given existing components and they were required to really think out of the box in order to re-design the component to be 3D-printable.

We would like to thank our generous sponsors at 3D Printing Systems for sponsoring fantastic prizes in the form of 3D printers for the competition winners.

Running in parallel with the RAPDASA Design Competition is a Design Competition aimed at attracting school kids to the exciting world of additive manufacturing and the 4IR. It's always exciting to see what the kids come up with and this year they surely did not disappoint. This competition ran together with Petra Rees from WhyToyz. It was quite a success, and the kids came up with innovative ways to assist less fortunate communities in a post-covid19 world.

## 6. Financials

RAPDASA currently has a healthy financial status as per treasurer's report. On behalf of RAPDASA, I want to thank our Treasurer, Pauline Bullock, for her tireless contributions in this regard.

## 7. Active Additive Manufacturing projects

This section of the report is aimed at giving a quick overview of some of the major funded projects in South Africa around additive manufacturing.

### **The Collaborative Program in Additive Manufacturing (CPAM)**

Phase 3 of the CPAM program was contracted to the CSIR in November 2020. This phase focusses on the following four program areas:

- Qualification of Metal Additive Manufacturing for Medical and Aerospace applications;
- Design for Additive Manufacturing;
- Polymer Additive Manufacturing;
- Industry Development.

In Phase 3, CPAM now include direct participation and funding of research and development activities at 7 universities through 10 departments at these universities, the CSIR through two Research Groups and two private sector Industry partners.

There are an additional 8 local universities who are participating through student supervision and project collaborations, as well as many international universities. A total of 29 individual projects are supported.

With regards to achievements, the CPAM generated 43 peer reviewed journal publications in 2020 and 39 journal articles this far in 2021. The Covid-19 pandemic impacted the number of conference presentations that could be presented through CPAM support. 49 conference presentation were produced in 2020. This is less than previous years, when more than 70 conference papers were typically presented at conferences.

Since contracting for this phase of CPAM was only completed in November 2020, only 6 technology demonstrators were reported in the 2020/21 financial year. This included 3 technology demonstrators that were developed in direct response to the Covid-19 pandemic to support ventilator development projects, as well as two technology

demonstrators supporting medical applications and a dental related training application.

At the end of the 2020 academic year, there were 104 students working on CPAM project. This included 24 doctoral students and 60 students registered for Masters degrees. In 2021, 114 students are supported of which 30 are at Doctoral level and 60 at Masters level. 8 book chapters were also reported in Sep 2021 based on funding support made available by the DSI's CPAM initiative.

### **DSI MedAdd**

The Department of Science and Innovation (DSI) High-end Infrastructure Programme funded the establishment of a Medical Device Additive Manufacturing Technology Demonstrator (MedAdd) at the Central University of Technology, Free State.

The DSI MedAdd aims to bridge the innovation chasm through using AM for innovation, development, and final manufacturing of medical devices. MedAdd enhances CUT's infrastructure and capabilities, enabling academic and industry partners to demonstrate reproducibility and upscaling of innovative medical devices. CRPM's ISO-13485 certification acts as "safety net" for SMMEs to develop and industrialize new products, de-risking innovative development and commercialization.

A good example of industry adoption is shown in the manufacturing of titanium 3D printed spinal cages. Since 2019, 6324 units were manufactured as part of a 200-product range. This serves as excellent example of MedAdd's support to small companies. The 200-product range included a significant amount of research and development to optimise the design for AM (DfAM). In addition, MedAdd will enable students, researchers and industry personnel to develop the required skills for the development of this new technology and new industry. Cumulative total of users trained from March 2019 to March 2021 amount to 916.

The MedAdd -project enabled the successful application for EUREKA funding with Lithoz, GmbH, from Austria. The CUT is negotiating with LITHOZ Austria to acquire the first ceramic 3D printer in SA. This ceramic 3D printer can construct complex bio-scaffolds in hydroxy appetite, zirconium and tricalcium phosphate.

The dental application area of the MedAdd project is still in its infancy and various research projects on materials and applications will be conducted. This also adds a

significant Medical AM research impact – especially in terms of the related foci within the CPAM programme (including DfAM, MAM, PAM and AM for Industry). Digital dentistry in South Africa holds great potential but the dental fraternity still requires a great deal of relevant skills development, training, and capacity building to make a move towards a digital workflow.

### **The Photonics Prototyping Facility**

The photonics industry encompasses an entire value-chain which commences from the manufacturing of devices that generate, manipulate and detect light up to including products that are enabled by Photonics-based technology, such as for instance lighting and illumination systems, vision, sensing and photonics-based diagnostic systems and photonics-based data and photonics enabled manufacturing and materials processing systems (such as Additive Manufacturing systems).

To support the establishment of a Photonics industry for South Africa, the CSIR has developed a dedicated facility that can be made available to industry and R&D organisations to support the development of photonics-based prototypes, with the aim to bridge the so-called “innovation chasm” which exist between the R&D phase of technology development and the commercialisation phase of photonics-based products. The projects active in the PPF is generously support by the Department of Science and Innovation, through its Industry Innovation Partnership Fund.

Amongst the projects supported, the PPF supported one Additive Manufacturing project during the past year. A project to support a South African SMME in the development of a metal 3D printer was approved early in 2020 by the PPF Investment Committee, and formally kicked off in August 2020. The project is aimed at the characterisation of the laser and optical systems of the metal 3D printer. This printer already produced the first metal components for a CSIR project for Anglo American.

### **Southern Africa Innovation Support Programme**

The Botswana Institute for Technology Research and Innovation, The University of Botswana and Central University of Technology, Free State, with the support of The Southern Africa Innovation Support Programme (SAIS 2) have launched a project in 2019 intended to develop an Additive Manufacturing (AM) Ecosystem. The project had Botswana and South Africa as participating countries, SAIS as the project sponsor, and BITRI, UB and CUT as the collaborative project partners.

The key objectives of the project were to establish an AM ecosystem through creating awareness, develop institutional capacity for regional innovation capacity, design and manufacture of some ten client-specific implants and devices including identification of AM devices and implants for commercialisation and developing a commercialisation strategy, to develop human capacity through workshops and short courses for joint solutions to medical challenges, as well as to develop institutional competence for regional innovation capacity. (ref: <http://www.bitri.co.bw/bitri-ub-cut-and-sais-launch-additive-manufacturing-project/>)

This project was successfully completed in 2021 and is now creating further development opportunities in Africa.

### **Innovation for African Universities (IAU)**

CUT, in collaboration with Loughborough university, Aston University (UK), disabled People SA (DPSA) and the Southern African Federation for People with Disabilities (SAFOD), have been chosen to participate in the British Council's Innovation for African Universities (IAU), focusing on User-Centred design of assistive devices for people with disabilities, by people with disabilities, and to develop a sustainable entrepreneurship ecosystem using Additive manufacturing (the only project out of 24 chosen with Design for AM and AM as delivery methods) .

## **8. Highlights of the South African AM Industry for 2021**

Upon creation of this report, AM service providers in South Africa were given an opportunity to report on major developments in their respective organisation during 2021. This section includes a summary (in no particular order) of responses received.

### **HH Industries**

This year, HH Industries (with the support from Multitrade 3D Systems, the official agent for GE Additive in South Africa) have purchased their first Concept Laser MLab 200R. HH Industries (Pty) Ltd was established in February 2020 and provides advanced manufacturing and 3D printing services for various industries in Africa. The MLab 200R produces high quality metal parts with a large variety of materials and HH Industries will dedicate the system to perform proof of concept trials, as well as to perform research and development for various industries.

### **Vaal University of Technology**

In 2021, VUT procured a HYRAX system from Aditiv Solutions. VUT already has a strong capability in rapid casting applications and will use the HYRAX platform to extend their services to include metal additive manufacturing. The university will use this opportunity to offer Metal AM (MAM) design and manufacturing services to industry and use the platform to expand their research and training focus areas, which include industry 4.0 applications, general engineering metal AM material development to satisfy industry requirements, applied AM metal training and metal AM application development. The platform is procured through the support of the National Research Foundation (NRF).

### **Stellenbosch University**

At the Resource Efficiency Engineering Management (REEM) group at the Stellenbosch University, the focus this year was on the development of remote machine monitoring systems. They have adopted a policy of developing monitoring systems around MQTT protocol, which is TCP-IP based, but can be employed over RS 485/422, RS232 or RF serial links like LORA. They use ESP based processors and a solid MQTT protocol backbone to provide immediate visual analysis in NodeRed, R, Matlab and others. The monitoring system developed at SUN has reached a workable level of commercial maturity on which manufacturing management systems can be built.

### **Weartech**

At Weartech, this year has seen the introduction of “Headmade Materials” which is now available in South Africa through them. Weartech is the local supplier of Praxair products which received ISO 13485 accreditation in 2021. They are now also supplying some High Entropy Alloy powders, as well as the newly introduced Stellite™ 6AM.

### **3D Solids**

In 2021, 3D Solids announced the launch of a new desktop 3D Printer, the METHOD X CF built by Makerbot in collaboration with Stratasys. Since the launch of the system in October 2021, 3D Solids has already sold 3 machines, one of which has been installed to produce low volume spares for racing go karts in ASA and Carbon Fibre materials. Also recently announced is a new high temperature soluble support

material, Rapid Rinse, which only requires warm tap water to dissolve the supports. 3D Solids also now sell the Fortus 770 which is a very large format FDM printer.

### **Aditiv Solutions**

During this year, Aditiv Solutions completed the development of the HYRAX metal PBF system and produced their first parts in 304 SS. They also established a BETA partner network for testing of the machines and sold 3 BETA systems to universities in South Africa. Commissioning of the first machine is scheduled for December of this year.

### **Metal Heart**

During 2021, Metal Heart achieved ISO13485 certification for the manufacture and design of medical implants and have successfully produced numerous implants with their partners. They also commissioned and validated the first commercially available Hot Isostatic Press (HIP) in South Africa, with operational volume of 120mm DIA x 200mm. During the year, they also completed successful projects in Additive Manufacturing in the Medical, Tooling, Casting, Aerospace and Defence and Automotive industries through our production of Ti6Al4V Grade 23, Tool Steel 1.2709, Aluminium AlSi10Mg and 316L Stainless Steel.

### **Akhani3D**

Akhani3D reported their biggest production year to date and processed about half a ton of metal powder for the year. They also added a new EOS Formiga machine to their fleet of 3D printers.

### **Fundamentals of Laser Powder Bed Fusion of Metals**

A new book “Fundamentals of Laser Powder Bed Fusion of Metals” was launched by Elsevier in June 2021, with inputs from participants from various countries including South Africa. The book describes the principles and key issues in the most widely used additive manufacturing method for metals, which is often also called selective laser melting, direct metal laser sintering and so on. The correct term for this process is laser powder bed fusion (L-PBF) and the book covers all aspects of this technology in 24 chapters, suitable for quick reference as well as teaching purposes. Free online PowerPoint slides are available for teaching purposes. The book can be found here:

<https://www.elsevier.com/books/fundamentals-of-laser-powder-bed-fusion-of-metals/yadroitsev/978-0-12-824090-8>

## 9. Conclusion

COVID has certainly ensured that 2021 has been a year unlike any other and it is still uncertain what the long-term impact of the pandemic will be.

Although it has had a definite negative impact on our industry, I am glad to report that, even though many activities have been slowed or delayed, many projects and initiatives in South Africa managed to move forward despite the challenges faced. This is clearly evident from the turnout, the representation and the content of the 2021 conference.

I would like to congratulate the AM community in South Africa for withering the storm. In times of crises, organisations tend to streamline processes and resources and it is to be expected that those organisations that survive, end up stronger than before. I would like to thank the RAPDASA management committee for your tireless efforts and support during the year.

Finally, I would like to thank the conference organisers again for orchestrating an excellent event and a truly hybrid conference. It has not been achieved without hard work and dedication and your efforts are noticed and appreciated.

Yours sincerely



Marius Vermeulen  
(Chairman)