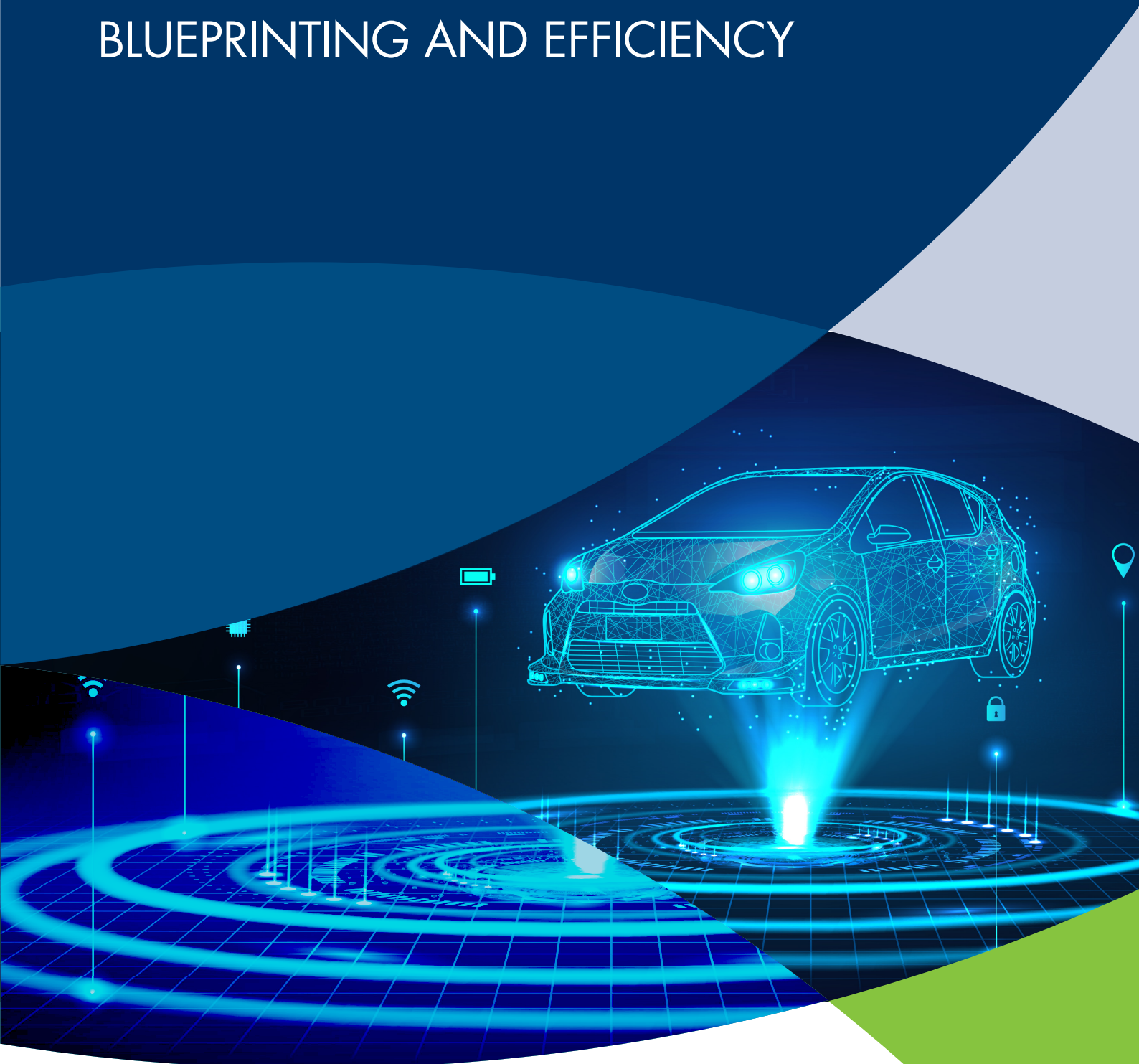


# CSIR DIGITAL MODELLING: BLUEPRINTING AND EFFICIENCY



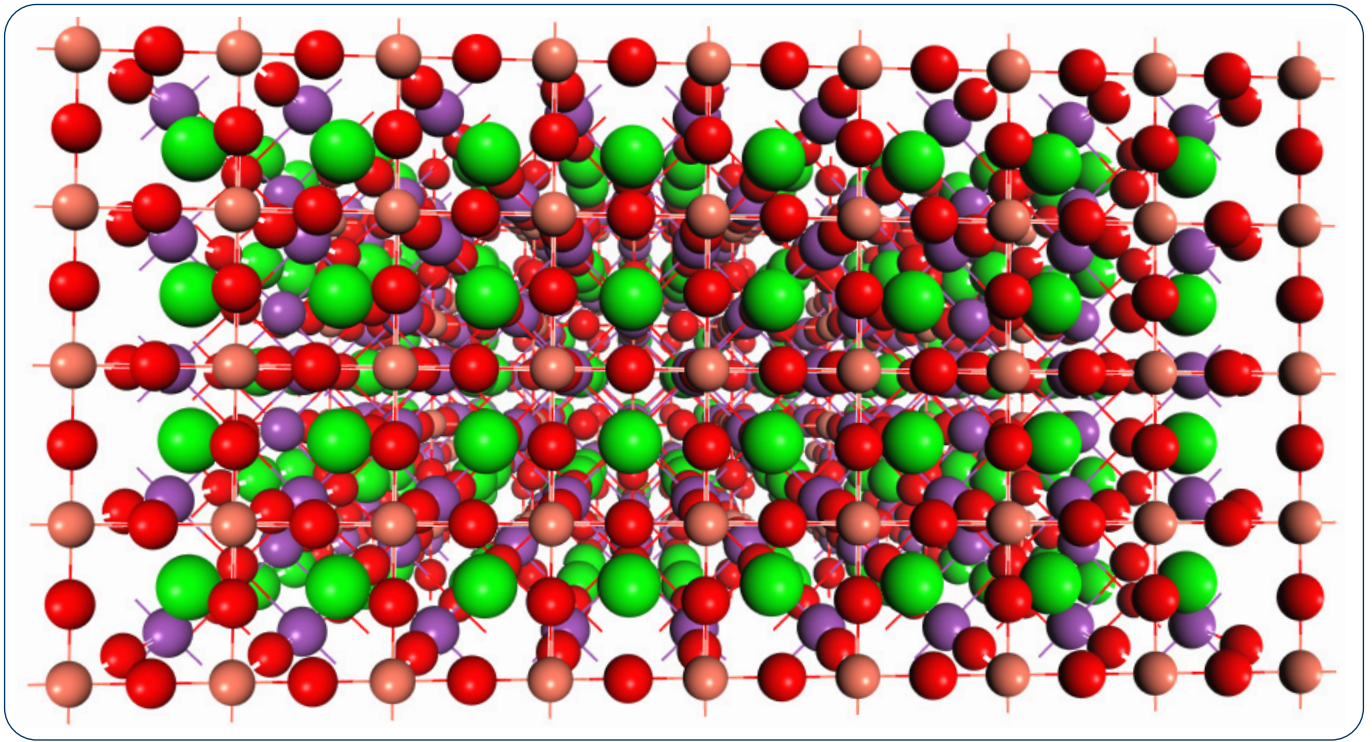
science & innovation

Department:  
Science and Innovation  
REPUBLIC OF SOUTH AFRICA



**CSIR**

Touching lives through innovation



## **CSIR Design and Optimisation Research Group**

The CSIR Design and Optimisation team is well positioned to tackle a wide range of modelling and simulation techniques to enhance business solutions. We are renowned for creating dynamic models that accurately represent complex systems, allowing our partners to visualise and analyse various scenarios by simulating real-world conditions. This process enables us to identify potential challenges and optimise your operations for maximum efficiency.

With our expertise in product design, process optimisation, and supply chain management, we can comfortably guide you through every step of the way. We utilise cutting-edge software tools to create detailed models that evaluate different parameters and variables, enabling us to find the most cost-effective and sustainable solutions for your business.

CSIR design and optimisation services enable collaborators to make informed decisions based on data-driven insights. Our team works closely with you to understand your unique requirements to respond with bespoke strategies that target your specific needs. By leveraging our expertise in modelling and simulation, our partners enjoy reduced costs, improved productivity and enhanced overall performance.

**WE ARE A MULTIDISCIPLINARY AND AGILE RESEARCH TEAM THAT APPLIES MULTISCALE MULTIPHYSICS AND DATA-DRIVEN MODELLING AND SIMULATION TECHNIQUES TO ACCELERATE:**



Design and development of materials, product and processes;



Do what experiments cannot do;






Optimise processes and materials properties; and



Effective decision-making.

## Our stakeholders

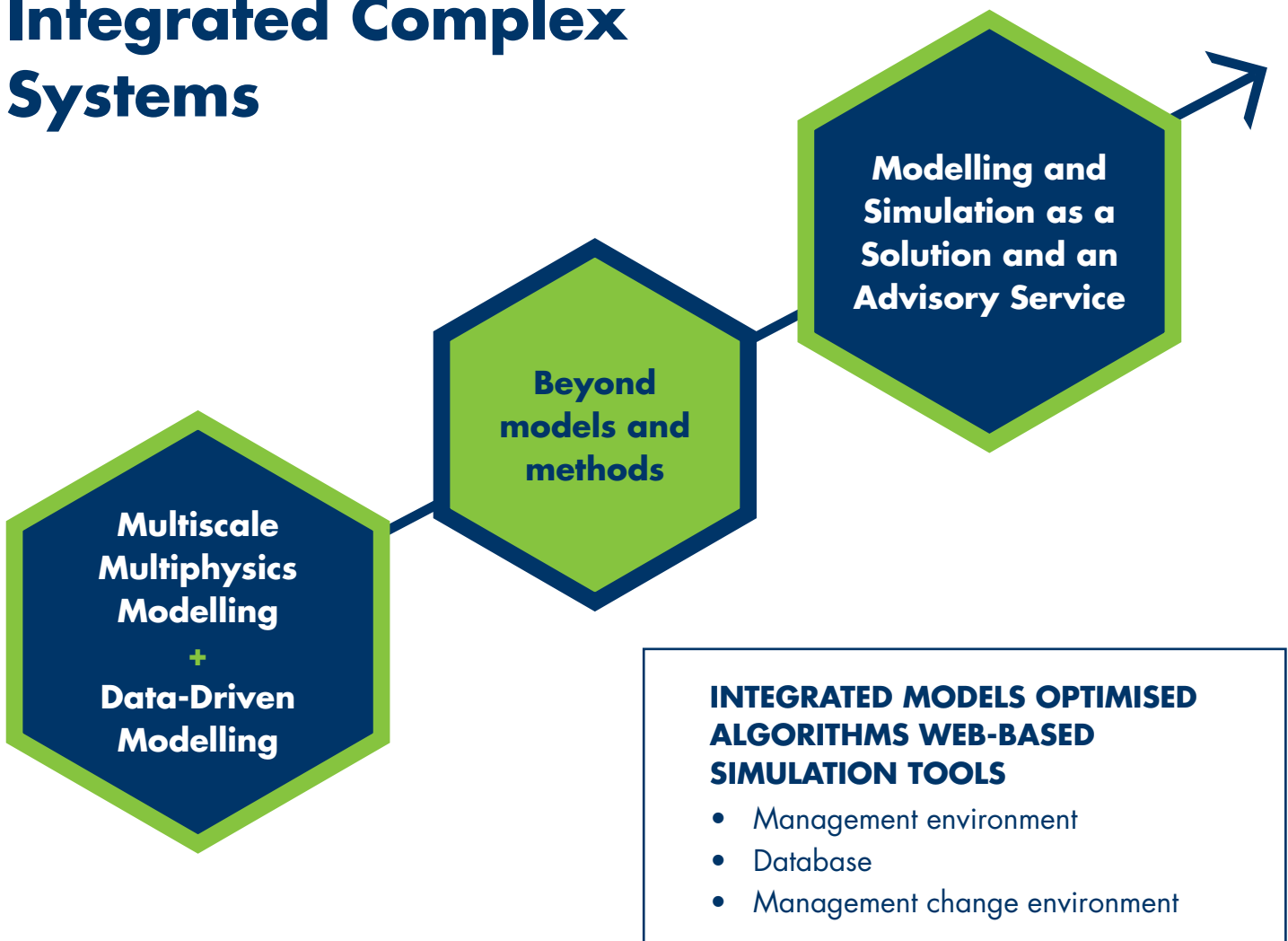
<p><b>PRIVATE SECTOR</b> </p>	<ul style="list-style-type: none"> <li>• Engineering companies (Sasol)</li> <li>• Manufacturing companies</li> <li>• State-owned enterprises (Eskom, Transnet)</li> <li>• Infrastructure companies</li> <li>• Mining industry</li> <li>• Automotive industry</li> <li>• Battery companies</li> <li>• Aeronautics industry</li> </ul>
<p><b>PUBLIC SECTOR</b> </p>	<ul style="list-style-type: none"> <li>• State-owned enterprises (Eskom, Transnet, etc.)</li> <li>• Department of Science and Innovation</li> <li>• Department of Trade, Industry and Competition</li> <li>• Department of Mineral Resources and Energy</li> <li>• Universities</li> </ul>
<p><b>INTERNATIONAL</b> </p>	<ul style="list-style-type: none"> <li>• Materials development companies (Johnson &amp; Matthey)</li> <li>• Fast-moving consumer goods (Unilever)</li> </ul>



## Value proposition

The CSIR Design and Optimisation team strives to be a catalyst for significantly accelerating product design and reducing production costs, as well as improving overall performance. The research group focuses on developing and applying mathematical, computational and machine learning systems and tools to enable effective decision-making that informs design and optimisation of integrated and complex systems.

## Integrated Complex Systems



## Market need

Many companies rely on numerical simulations to effectively and efficiently design and engineer new products as well as to optimise processes to minimise the need for expensive and time-consuming prototyping and testing. Despite its proven capability in fundamental research, modelling is still undervalued as an essential component in commercial or industrial research and development. Yet, a dire need exists for models, improved methods and workflows that generate detailed information for complex systems at a reasonable cost. Also, there is a need to translate industrial/business problems into problems that can be solved using modelling and simulation.

Many industries need more capable, faster, more reliable and optimised models, with related methodologies to sustainably produce and use products in a multitude of applications critical to the functioning of society. The advantages of modelling and simulation include saving time and reducing costs related to the visualisation of systems. It offers a risk-free environment to explore 'what if' analyses, handling uncertainty and providing insight into complex systems.

## Goals

Our overarching objectives encompass various strategic aims with resolute commitment to furnishing cost-effective modeling and simulation solutions, seamlessly integrating advanced technological solutions for modeling and simulation, and expediting the upscaling of computational modeling into viable commercial solutions for our valued partners.

An integral facet of our mission is to instil market confidence in the field of modeling and simulation. As a start, we will focus on the small, medium and micro-sized enterprises while also striving to attract substantial funding from the private sector, further fortifying our pursuit of innovation and progress.



# Challenges

**1**

Lack of systems and tools for integrating complex models.

**2**

Hurdles in the development of complex models.

**3**

Integration of complex models.

**4**

Difficulty to treat real-world complex systems realistically with sufficient details.

**5**

Lack of adequate models to simulate the complex problems predominant in industrial context.

**6**

Lack of adequate methods to simulate complex problems.

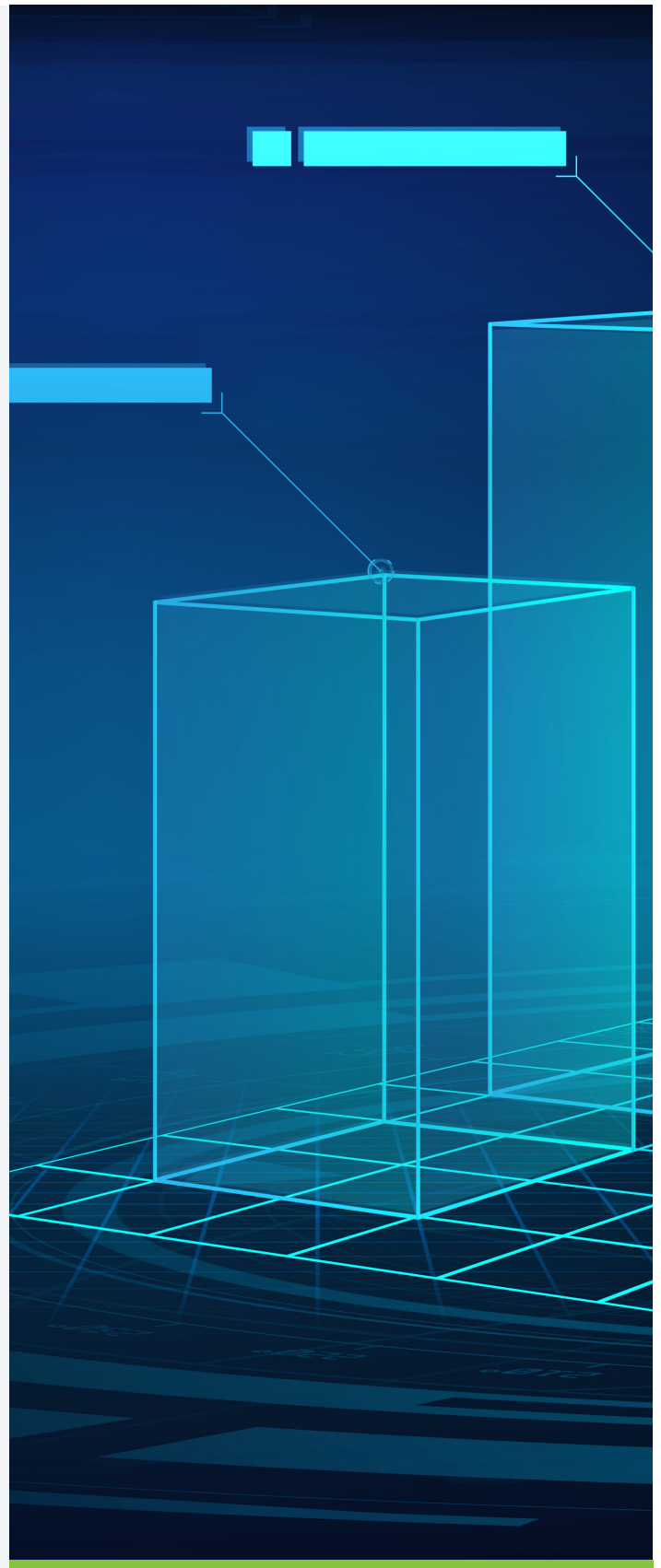
"I want to express my sincere gratitude for the insightful presentation you delivered at the digitisation meeting. It's clear that there are numerous opportunities to put machine learning and modelling techniques into practical use for monitoring water resources. I am enthusiastic about collaborating with you to accomplish the goals and objectives of the digitisation project."



# Technical specifications and expertise

Computational and mathematical modelling capabilities hosted in the CSIR Design and Optimisation Research Group include:

- Fluid structure interaction,
- Molecular modelling,
- Computational fluid dynamics,
- Chemical process engineering,
- Discrete element modelling,
- Data-driven modelling,
- Process integration and numerical optimisations, and
- Numerical solvers development.



**PARTNER WITH THE CSIR TODAY AND UNLOCK THE FULL POTENTIAL OF YOUR BUSINESS. CONTACT US NOW TO LEARN MORE ABOUT HOW WE CAN TRANSFORM YOUR OPERATIONS THROUGH ADVANCED MODELLING TECHNIQUES.**

## **ENQUIRIES**

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