Rail Simulation Modelling Capability Statement

The University of Wollongong is building a $61.8 million world-class research, training and simulation centre to address Australia’s future infrastructure needs. The SMART (Simulation, Modelling and Analysis for Research and Teaching) Infrastructure Facility draws together the University’s expertise in Engineering, Science, Commerce and Information Technologies.

Central to the new facility’s capabilities will be a Simulation Centre which models and simulates the complex interdependencies of interconnected infrastructures. This will extend the University’s existing capability to model engineering, materials, social and economic aspects of infrastructure being researched in other laboratories within the University.

As rail infrastructure is a critical cornerstone of the infrastructure needs of Australia we are also establishing a $20 million SMART Rail Institute, which has been jointly funded by RailCorp. A critical function of this facility will be to perform simulations and analyses of rail, road, and other transport and logistical interdependencies for external clients and stakeholders.

Along with the RailCorp partnership SMART has also established links with key industry stakeholders including the Australian Rail Track Corporation (ARTC), Queensland Rail, BlueScope Steel, BHP Billiton and Xstrata.

The University’s Faculty of Engineering is also one of the founding members of Australia's first National Rail Research Centre, the Cooperative Research Centre (CRC) for Railway Engineering and Technologies, which commenced operations in 2001. In 2007 this was renewed for a further 7 years as Australia’s National CRC for Rail Innovation (http://www.railcrc.net.au/about/). Nearly all the below and above rail operators in Australia are members of this CRC and most of them are already involved in one or more research projects with the University.

The University’s significant track record and experience with the Rail Industry is recognised by the inclusion of Prof Chris Cook, the Dean of Engineering, as a Director and Board Member for the CRC for Rail Innovation. Hence the University is ideally placed to complement its existing substantial relationships with the Rail industry with the very substantial simulation, modelling and analysis abilities funded through the SMART initiative.

Using expertise established over many years in discrete event simulation, agent based modeling and associated graphical interfaces, rail modeling and simulation is a core base for SMART research collaborations.

SMART expertise in the development of graphical interfaces and associated reports will create a model which can be viewed and interpreted by non-specialist social and political
decision makers. This will provide non specialists with a reliable user friendly and interactive visual appreciation of a model and also present the impacts on any stakeholders they may wish to identify.

Recent examples demonstrating the University of Wollongong’s track record in Scheduling, Optimisation, Logistics, Simulation and Modelling include:

- Development of Decision Support Tools for integrated mine/ rail/ road shipping operations
- Simulation and analysis of the whole or part of supply chains eg mine to ship
- Determination of infrastructure capacity requirements, identification and elimination of bottlenecks
- Analysis of alternative transport/materials handling/logistics options
- Testing of alternative operating policies
- Determination of stockpile requirements, stockpiling strategies, material handling modes & capacities
- Exploration and optimisation of alternative plant operating policies & strategies. For example specific issues worked on to date by UOW staff relevant to ports include: Blending products from multiple mine sites; Blending to meet several, contradictory product quality requirements; Multi-period Net Present Value maximisation; Integrated planning/scheduling of pit, plant and rail operations; Shipment Schedules to meet Mill requirements; Train scheduling; Ship/rail scheduling, crew rostering.
- Developing of an understanding of internal and external supply chain linkages (including road, rail, timetable capacity constraints, etc) in collaboration with logistics providers.

How can SMART assist industry?

- By undertaking modelling/simulation work
- Managing strategic analysis/modelling work
- Reviewing modelling/simulation work done by external groups
- Developing customised scheduling/ planning tools
- Providing a software environment allowing clients to ask ‘What-if’ questions and to quantify benefits, drawbacks and cost-effectiveness of different designs, infrastructure expenditures, operating and scheduling regimes, etc.
- Providing visualisation of results of simulations (eg showing queues developing in ‘real-time’) and, more importantly, quantitative measures of cost-effectiveness.

For further information please contact SMART’s Chief Operating Officer, Tania Brown on (02) 4221 5031 or tania_brown@uow.edu.au.