2016 National Research Infrastructure Roadmap Capability Issues Paper: Private Submission

Name	**Professor Roger Wepf**
Title/role	**Director CMM (University of Queensland) Node Director (AMMRF)**
Organisation	**Centre for Microscopy and Microanalysis at UQ/Brisbane (CMM)**

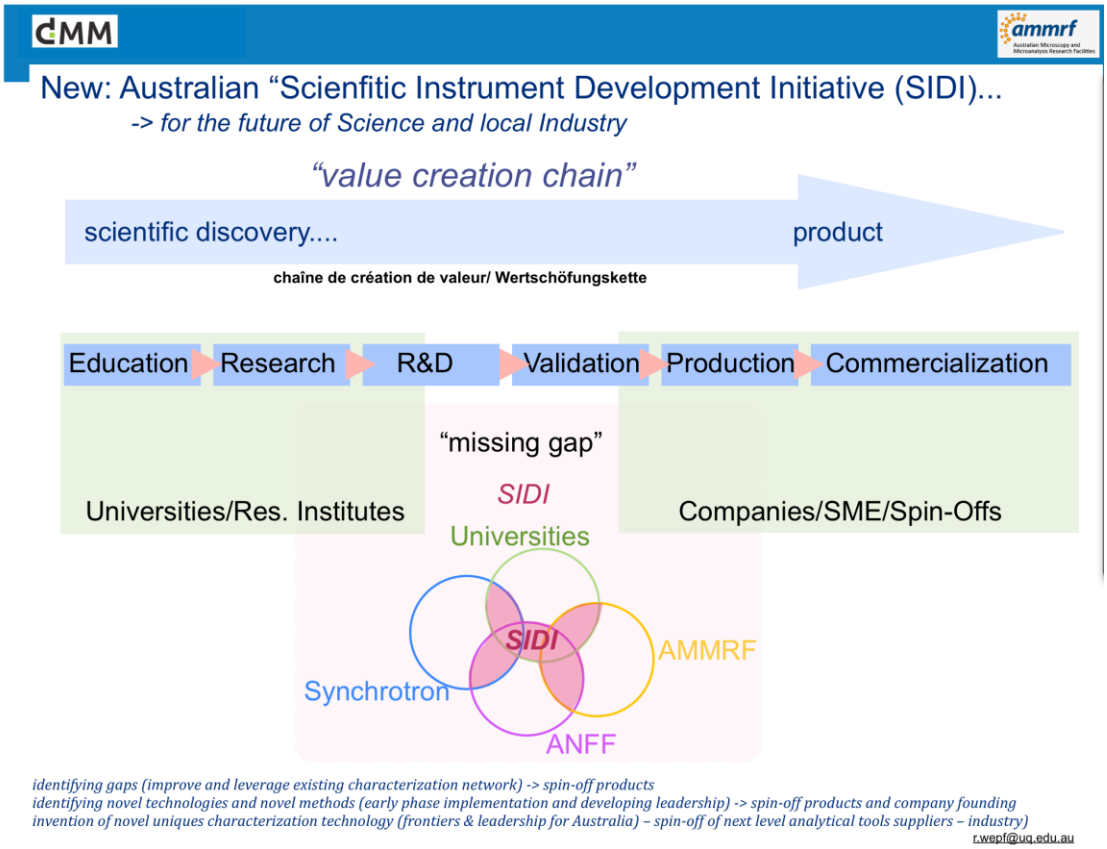
Other comments
Preamble:

Thank you for the opportunity to respond to the 2016 National Research Infrastructure Roadmap Capability Issues Paper. I am contacting you following your visit to Brisbane to further comment on the issue I raised on a future "Scientific Instrument Development Initiative – SIDI" as a missing identified link in the Australian Science Community between Research and Translation to market. As a node director of AMMRF I fully support AMMRF response and answers to all questions of the NCRIS Issue paper and this submission is more what you asked us to contribute during your visit as individual comments against identified "block stoppers" to market or future new ideas.

An Australian "Scientific Instrument Development Initiative" - SIDI:

Scientific instruments are worldwide a multi billion $ market and most of these instruments had their origin at Universities where bright researchers realized a potential application or found a solution for an existing problem. As Australia has many bright scientists in physics, engineering, life sciences and basic science in general there is a huge potential to realize future next generation of scientific instrumentation for the frontiers of R&D and hence become part of a world-wide market. Currently, I see a missing link between the science & research and the translation of such ideas into proof of concept and finally prototypes for product development to marketing.

The "Value Creation Chain" in Fig. 1 highlights this gap between the traditional units along this chain – the "Universities" and the "Companies".



In some cases this gap starts already between the "ideas" and "first realization" as there is to my knowledge no incentive to help these concepts become realized successfully in the lab (outside of high impact publications) and even less support is available to bring such first realization to the interface of product development to market.
The reason is simple – there is no money or grant system established to help during this critical phase to get beyond the proof-of-concept state to a validated state, which is the foundation for product spin-offs. Some institutions such as Synchrotrons have closed this gap with their own instrument development capacities and are operating independently at the forefront of technology (e.g. XRF detector at the Australian Synchrotron).

I personally see an urgent need also at NCRIS supported facilities to get "ideas" out of the labs into real implementation to primarily bring these facilities to the forefront of technology and application (direct benefit) while realizing that this lead could also be of benefit for Australia's economy.

This identified gap could be "closed" or "managed" by a national "impulse program" or initiative by NCRIS to:

i) Identify technological gaps at national facilities and help improve and leverage existing characterization and fabrication NCRIS networks/facilities. (e.g. novel detectors, experimental add-on tools, cryo-extensions, in-situ testing linking and combinatory approaches, unique non-destructive and artifact free sample handling etc.)

ii) Identify novel technologies and novel methods and help to implement them at an early phase to develop leadership for Australia researchers and companies (e.g. new instrument platforms, novel combinatory multimodal instrumentation, novel analytical devices, correlative methodologies etc)

iii) Finally allow the invention of novel unique scientific equipment/characterization technologies to be developed and bring Australia to the frontiers of scientific instrumentation. (e.g. nm resolving cryo-imaging mass spectroscopy combined with EM for material and life-science, atomic structuring and additive manufacturing devices for quantum physical devices etc)

This would give the "Universities" and "NCRIS facilities" the possibilities to:

1) *Have spin-off products coming to market (e.g. supplementary extensions or add-on improvements to existing instruments etc.)*
2) *Realize to train and even create jobs in instrument improvements for future engineers and founding of small companies*
3) *And finally the creation of new companies/suppliers building and selling next level analytical tools for science and industry*

Ideally this could be supported by NCRIS in a "three-step" model to lower the risk of implementation.

1) Step one is a call for proposal, which if approved could obtain initial funding of up to 200k AUD – this would be the final proof-of-concept documentation phase with the aim to implement this method in existing NCRIS supported facilities

2) Out of these project a selection would be allowed to apply for a 2nd tier of financial support to bring this method close to market – this is usually the prototyping phase, where these prototypes can boost existing NCRIS supported facilities directly.

3) The third phase would be to allow the inventors to obtain support to transfer this technology or method to the market – either by "licensing" or ideally by founding new "spin-off" companies. This could be supported by any economical national programs where NCRIS could act as a strong supporter and recommend the selected technology and would have no financial responsibility. In this phase the prototyping is pushed to the first product release phase and is the risk traditionally of a new "spin-off" company or an established supplier in the field.

Alternatively NCRIS could implement a national scientific instrument development facility as a "one stop-in" R&D unit. Such a unit would need to have a kind of project funneling process to collect scientific instrumentation ideas and a "one-stop-in shop" access to help scientist to get their ideas realized. This facility could then also implement novel technology prior to market and transfer these ideas to market directly (revenue) or help the foundation of "Spin-off" companies (job creation). Such a national facility would ideally be located at existing location of expertise e.g. at the Australian synchrotron or at an AMMRF/ANFF node, where modular test-benches for photon, X-ray, electrons and ion beams and electronics are accessible or easily implemented. The advantage of such a solution would be that expensive equipment would not need to be duplicated throughout Australia – the disadvantage would be that "ideas" can not be centralized and may have a hard time to find their way to such a national "lab" and "meet and mate".

This all together will boost existing technology platforms and NCRIS supported facilities in Australia and allow with further system integration, shared exchange and established instrumental connectivity to increase the output of these platforms for science and economy, foster training and translation of hard-core engineering, physics, mathematics and IT into a diverse high-tech market (from ideas to science to market) and finally establishing a "value creation chain" for high quality jobs.

International examples are: "Janelia Farm" - Howard Hughes US; former G. Lippmann Institute in Luxembourg – now Institute of Science and Technology LIST, Institute for Scientific Instr. ISI – Brno Czech Republic to only mention a few.

I hope this "proposal" may help Australia in transforming their local "know-how" and "brain & hand" resources to create locally new high quality jobs instead selling these ideas to other countries or lose-this innovation force.

Thank you for your time and if you need any further information please do not hesitate to contact me again.

With best regards

Prof. Roger Wepf,
CMM University of Queensland
Faculty of Science

r.wepf@uq.edu.au