



Victoria's Future Industries - Medical Technologies and Pharmaceuticals

Swinburne discussion paper

Professor Aleksandar Subic
Deputy Vice-Chancellor (Research & Development)
Swinburne University of Technology
24 Wakefield Street, Hawthorn

14 September 2015

Table of Contents

Medical Technologies and Pharmaceuticals - Swinburne discussion paper	1
Introduction	1
1. Where is the opportunity for growth and job creation in Victoria?	2
1.1 Growth and job creation - medtech industry	2
Recommendation One	3
Recommendation Two	3
1.2 Growth and job creation - complementary health	3
2. What is the opportunity for Victoria in manufacturing and for the State Government in capturing the benefits?	4
Recommendation Three	4
3. How far along the product value chain should we be seeking to take products? How can we retain and maximise the value?	5
Recommendation Four	5
4. What and where are Victoria's world leading areas, particularly those involving several organisations across the value chain? Could these be better aggregated to achieve scale and compete globally?	5
Recommendation Five	5
5. What are the barriers to enterprises realising value from knowledge and services? How can these activities be better supported?	6
6. How can collaboration between key parts of the sector be improved?	6
7. Does Victoria have the right mix of industry bodies and networks?	6
Recommendation Six	6
8. What are the system level barriers impacting collaboration, especially with industry?	6
Recommendation Seven	7
9. What can be done to leverage the State's ICT capability and establish Victoria as a leader in digital health?	7
Recommendation Eight	8
10. How can Victoria ensure it has a skilled and capable workforce to enable sector growth?	8
Recommendation Nine	9
Recommendation Ten	9
11. How can Victoria benefit from and leverage the Commonwealth's activities?	9
Recommendation Eleven	9
Recommendation Twelve	10
12. Are there strategic assets which could be better utilised or leveraged and if so, how?	10
Recommendation Thirteen	10
Recommendation Fourteen	10
13. Is there new enabling infrastructure required to underpin future growth in the sector?	10
14. How can Victoria create an environment that supports a sustainable pipeline of investable opportunities and build investor confidence?	10
15. What would be the value of a sector specific Brand Melbourne/Victoria?	11
Recommendation Fifteen	11
16. The plausibility of this scenario to optimise growth and job creation in the medtech and pharmaceuticals sector, are there alternative approaches?	11

Medical Technologies and Pharmaceuticals - Swinburne discussion paper

Introduction

Swinburne University of Technology (“Swinburne”) is pleased to make this submission to the Victorian Government’s Future Industries taskforce. We believe it is vital for Victorian business, industry, government and communities to have these discussions about how we grow or transition existing industries into new and emerging markets.

Swinburne believes Victoria’s medtech and pharmaceutical industries are in a unique position to positively and directly affect employment and activity across a wide range of Victorian sectors, from health services, manufacturing and digital technologies, through to the innovation and creative industries. Together, we need to focus on our specialist strengths and advanced manufacturing capability in this area, to support emerging trends.

The Swinburne response focuses on the university’s areas of research expertise and knowledge, our new and related initiatives, and our unique perspective of the market. We make a number of recommendations about how we can achieve Victoria’s goals for these sectors.

1. Where is the opportunity for growth and job creation in Victoria?

1.1 Growth and job creation - medtech industry

Victoria has a vibrant clinical trial environment – we have great hospitals and strong product design capabilities; these attributes sit alongside a world-leading fundamental research capability, excellent research infrastructure and a skilled workforce that could readily support a state-based global medical technologies (“medtech”) industry. In all, Victoria has the underlying requirements and a foundation for growth and job creation in the medtech and pharmaceutical industries.

Victoria has established itself as the Australian centre for medical device and point of care patient monitoring development and design, predominantly through the activities of the Bionics Institute, the Hearing CRC, St Vincent's Hospital Melbourne and The University of Melbourne. Swinburne has contributed to the staffing and training needs of these entities for many years but has only recently actively participated in their development. Now, through our emerging role as major partner in the soon-to-be constructed, Aikenhead Centre for Medical Discovery (“ACMD”), Australia's first dedicated Bioengineering Research Institute, Swinburne is well placed to contribute to both developments in medical device technology, and their clinical utilisation and clinical impact. The ACMD will positively impact job creation in Victoria, both related to its R&D activities and also, arguably more sustainably, through the training of a specialised, clinical workforce.

The collaboration between Swinburne and the Clinical Neurosciences unit at St Vincent's Hospital Melbourne (“SVHM”) is another good example of positive outcomes for Victoria in this sector. Through the partnership, significant and rapid advances have been made in the surgical management and treatment of focal epilepsy. Utilising the advanced imaging capabilities and the expertise of the associated research and technical personnel at Swinburne's state-of-the-art Magnetoencephalographic (MEG) imaging facility and our Brain and Psychological Sciences Research Centre, both neurologists and neurosurgeons at SVHM, the Royal Melbourne and Royal Children's Hospitals have been better able to localise the brain tissue associated with abnormal epileptic activity, such that more targeted and successful surgical solutions can be offered. It is expected that this research will redefine clinical practice and as such, require the training of a specialised work force.

Importantly, the role of Swinburne's MEG facility, and associated research expertise, extends well beyond the clinical management of epilepsy. Because MEG provides an unprecedented window into brain function it can help guide the development of more cost effective and easily deployed electroencephalographic (EEG) point-of-care diagnostic and monitoring equipment. Such devices will be increasingly important in the diagnosis and monitoring of treatment in a range of neuro-diagnostic scenarios that include dementia, stroke and the monitoring of depth of anaesthesia. Indeed, a spin-off company from Swinburne, Cortical Dynamics Ltd, which is developing the next generation of depth of anaesthesia monitoring solutions, would be well suited to leverage and take advantage of this extant expertise.

What is missing for Victoria's medtech sector is a high level strategy to attract global players to Victoria to undertake their research and development (“R&D”) and manufacture here, in the

state, and which would link existing industry into the global supply chain. The Victorian pharmaceutical industry has been successful in developing such a model and attracted GSK, CSL and other large pharmaceutical multinationals to the state, which means that Victorian pharmaceutical companies are well connected with the international R&D pharmaceutical sector, and significant manufacturing occurs here as a result. Yet, despite our excellent medical product design capabilities and associated infrastructure, Victoria's medtech sector has not been as successful in attracting international companies to the state.

Swinburne believes that if the government, the medtech industry and our research organisations worked together to develop better strategies that focus on attracting global medtech organisations to the state, it would have significant flow on benefits including industry growth and job creation.

Swinburne notes that Figure 7 of the Discussion Paper ignores the physical sciences and ICT research that underpins the medtech and pharmaceutical sector – fundamental research that enables the translation of research and development into manufacturing and technology. The ARC funds the major share of this research along with the CRC system. The figure also omits the significant steps needed to translate research to a product demonstrator/prototype that is required prior to any thought of commercialisation.

We note that one of the challenges to researchers joining international industry networks is the limited funding available to facilitate the relationships. This may be something as simple as money to cover travel costs to a major U.S. industry meeting, or more significant funds to match project investment opportunities (e.g. EU Horizon 2020). Like all relationships, international research is based on trust and to establish that trust there is a need to meet in person, at least to initiate and develop the connection.

Recommendation One

Swinburne believes it is critical that Victoria implements initiatives to attract international medtech organisations that can connect Victoria's existing medtech industry with the global network and supply chain. We know it is possible, Boeing has shown us how it could work, and even Ford and Holden who are withdrawing from manufacturing in Victoria, are retaining their design and innovation capabilities in the state.

Recommendation Two

That Victorian funding addresses the critical gap of support for the early stage work to initiate and form international research collaborations in the medtech arena.

1.2 Growth and job creation - complementary health

Swinburne believes there is great opportunity for the Australian manufacture of complementary medicines, including quality vitamins, herbals and plant extracts for export. For example, a

recent article in the Weekend Australian¹ indicates the huge potential open to us in the Chinese market.

Swinburne has a strategic relationship with the Victorian-based, global vitamin company Swisse, and one of our lead researchers in the Swinburne CHP, Dr Andrew Pipingas, sits on their scientific advisory board. Several academics from CHP are currently negotiating joint industry-government grants with both Swisse and Latrobe University.

Swinburne's CHP also attracts significant income from international industry bodies to fund high level clinical trials, evaluating the potential for natural products to enhance mental function throughout life; for example with ERA 2012, 25% of the international industry funding for the Psychology FoR came to Swinburne.

2. What is the opportunity for Victoria in manufacturing and for the State Government in capturing the benefits?

With the foundations for a successful medtech industry in Victoria, there is broad-based opportunity for Victoria's manufacturing sector to transition on a larger scale into the industry. From Swinburne's perspective, the key to the transition rests with our manufacturing organisations' ability to link innovative design concepts with sophisticated high throughput, or automated manufacturing.

With a large window of opportunity for Victorian manufacturers to transition into the medtech sector now, a range of fundamental, industry-specific support systems needs to be put into place, to assist manufacturers to move across. Knowledge required by industry includes:

- Understand the regulatory and reimbursement environment that is specific to this industry and how it varies across the world.
- Know how to integrate design-led innovation (as a route to assisting companies to transition from other industries)
- Identify and tailor opportunities to meet their needs and infrastructure (personnel as well as equipment)

Recommendation Three

Swinburne believes that manufacturers transitioning from other industries into medtech should be supported through a structured program that offers expert advice, business case development and medtech specific international insight.

1

http://www.theaustralian.com.au/subscribe/news/1/index.html?sourceCode=TAWEB_WRE170_a&mode=premium&dest=http://www.theaustralian.com.au/business/vitamins-to-china-a-trade-bonanza/

3. How far along the product value chain should we be seeking to take products? How can we retain and maximise the value?

The key question here is: what can be done to ensure that companies who cannot manufacture in Victoria, due to high costs or other barriers, stay in Victoria to develop their next product rather than moving to a low cost manufacturing location? Swinburne believes that the way to ensure companies stay is by giving them access to the right innovation ecosystem that fully supports their development.

Recommendation Four

In order to support serial producers of new products (whether they are companies or individuals) and generate a strong supply of suitably trained employees in the medtech sector, we need Government programs that provide access to expert systems offering knowledge about health economics, reimbursement schemes, health technology evaluations, design, clinical trials and more.

4. What and where are Victoria's world leading areas, particularly those involving several organisations across the value chain? Could these be better aggregated to achieve scale and compete globally?

In the medtech area, medical device development is spread across multiple universities and hospitals, so the knowledge is not readily shared. Swinburne believes that Victorian medtech industry developments need to be aggregated, to foster increased scale and competitiveness of the sector. One of the exciting new initiatives in this space, the ACMD, will assist with this aggregation of knowledge and the government could be looking for other similar types of opportunities.

In the complementary medicine area, the work of Swinburne's CHP on dietary supplementation for cognitive health, is recognised as world leading. For example, CHP received the inaugural international industry-university prize for our work on curcumin, in partnership with an American institution. Additionally, CHP leads the Australian arm of the Abbott Nutrition funded \$2M USD multinational trial into the mechanisms of cognitive enhancement from dietary intervention.

Over the past three years, CHP has received international industry funding of ~\$3M AUD. Swinburne believes that research into dietary supplementation to improve health could be scaled up in Victoria.

Recommendation Five

In the pharmaceutical area, there is great need for increased clinical trials of interventions to abrogate cognitive ageing. Swinburne is uniquely placed to conduct such trials, having both the clinical trials capacity and unparalleled neuroimaging facilities with which to examine the mechanisms of cognitive change.

5. What are the barriers to enterprises realising value from knowledge and services? How can these activities be better supported?

At Swinburne, we believe that value realisation comes down to the talent pool and the creation of an entrepreneurial mindset that accepts that failure is a natural part of new venture creation. The government needs to accept that to develop the medtech sector there will be failure as well as success. There is need for cultural change in Victoria to accept this aspect of innovation and growth.

6. How can collaboration between key parts of the sector be improved?

To increase collaboration in the medtech industry Swinburne believes Victoria needs a US-style Centre for Integration of Medicine and Innovative Technology (“CIMIT”) type of model that is inclusive of a broad range of participants across industry, universities and Medical Research Institutes (“MRIs”).

7. Does Victoria have the right mix of industry bodies and networks?

Networks are essential to the creation and maintenance of links across the value chain. Having the right mix of industry bodies comes down to continuity of the funding that supports these networks. Industry bodies and networks are the trusted independent partners for so many Victorian companies, universities and MRIs. This is because they are organisation agnostic, and only seek to build the strongest outcomes for the state.

Excellent examples in the Victorian medtech arena include STC, Bio Melbourne and Biomedical Research Victoria. Key people within all of these organisations work predominantly out in the community and they are some of the best repositories of knowledge for the Victorian capability map in medtech. Their representatives hear about the issues being faced by industry, know the new developments being planned and critically, understand the challenges faced by all of the participants and can advise government. They are the cheerleaders of the sector, and often the drivers of international partnerships, as they are able to bring the key players together, due to their position of trust. These bodies have the knowledge already; they just need to be given resources to build on it fully.

Recommendation Six

The Victorian government should provide broader resources to the medtech industry bodies and networks to help them foster growth in the sector.

8. What are the system level barriers impacting collaboration, especially with industry?

Swinburne commonly finds that SMEs are often too small to make the best use of the many funds, collaboration possibilities, partnership activities and university collaborations open to them. For SMEs, people are their most valuable and least available resource. Most of the existing collaborative funding models require industry to contribute both cash and in kind, via personnel commitments. Most SMEs do not have the staff available to undertake a collaborative or non-core business project; they have no time available to interface with such a project effectively.

SMEs need the funding to employ someone to undertake the activity or have access to a pool of flexible technical staff – such as a technical services consultancy for the medtech industry. This consultancy would employ staff on retainer to provide a localised speciality service to SMEs to enable partnerships to occur. The model could be similar to that used by Golder Associates for the mining sector - <http://www.golder.com.au>.

Equally, universities do not necessarily have the resources to hand to support projects on the timescales needed by an industry partner. It is not that the funding incentives for universities to collaborate with industry are wrong, they just don't exist! There is an unfortunate misalignment of activity for which universities are rewarded with federal funding and, university activity that serves the needs of industry. Much of what industry would like to do with a university is structured more as consultancy than research, and consultancy is not recognised in the federal government's university funding model. In effect, delivery of a consultancy project that may demonstrate competency and lay the foundation for an ongoing industry partnership is not recognised by federal government funding structures. Given the choice between undertaking a project of this type and writing a publication that is recognised and rewarded within the university funding system, all of the signals tell the academic that the paper is the appropriate choice. The technical services consultancy group model would equally create scope for universities to gain access to skilled staff, which can assist them to deliver on projects with SMEs and translate research knowhow to industry.

The concept of a Medtech/Pharma Technical Services Consultancy sector could be a valuable addition to the local economy and provide avenues for researchers to transition from academia to industry as well as an attractive resource for SMEs and larger companies wishing to establish themselves in Victoria. It could be the route by which employees from other sectors are up-skilled with training programs in regulatory and GMP processes. One model may be to create a partnership between CSIRO, universities and local industry to establish the framework for such an entity and pilot the scheme. Longer term, if successful, the model would be expected to spin out into new companies, who may in turn specialise in specific aspects of the sector.

Recommendation Seven

Facilitate greater collaboration between universities and industry towards the creation of a technical services consultancy sector, that can provide a range of expert, industry specific staffing solutions on a short-term basis to support both industry and university research and development projects in Victoria.

9. What can be done to leverage the State's ICT capability and establish Victoria as a leader in digital health?

Recent world-first digital health technologies developed in Victoria highlight the immense capability of Victoria's ICT sector.

For example, at the Swinburne Software Innovation Lab ("SSIL") recent developments include The Alfred Trauma Reception and Resuscitation System, the world's first decision-support system for trauma centres, designed to assist emergency medical decision making in a fast paced, highly stressful environment. A second project, the Rapid Assessment for Surgical Personnel ("RASP"), was developed by SSIL to complement a specialist training program being

trialled at the University of Maryland in the U.S., which allows subject matter experts to complete an evaluation using a tablet. SSIL is involved in many other digital health projects for Australian and U.S. defence forces and for the aged care sector.

There is enormous potential to grow the ICT capability for Victoria's medtech sector. One of the key ways Swinburne sees for better supporting this sector is to streamline the support for clinical trials for software and ICT based healthcare solutions. Many SSIL projects are significantly delayed due to the current labour intensive administrative processes for clinical trials.

In particular, SSIL are looking for better streamlining of the administrative processes that accompany such trials including managing ethics and collate results as well as more efficient ways to source trial participants.

Swinburne sees that streamlining the administrative processes or creating a new specialist industry to manage clinical trials for universities and industries could assist the whole of the medtech industry.

Recommendation Eight

The Victorian government can look for ways to support the larger clinical trials market for ICT and biodevices, and that the frameworks developed offer an industry-specific path through the administrative processes, rather than being adapted from say the pharmaceuticals industry.

10. How can Victoria ensure it has a skilled and capable workforce to enable sector growth?

At 32 per cent, Australia has the lowest proportion of researchers employed in business relative to the comparator countries (Office of the Chief Scientist, 2014). One of the key issues is that too few students have the opportunity to understand and apply their research skills outside of their specific research project. As a result, they are unable to contextualise where their research skills fit into a broader community, or understand where their skills could be utilised in industry. As a generalisation, industry, particularly SMEs, typically also lack a clear picture of how researchers can contribute to their business growth.

Swinburne's discussions with industry partners have highlighted that Higher Degree Research ("HDR" e.g. Masters by Research or PhD) students often lack team-building and team membership skills. While they are able to give an excellent scientific research talk, they cannot unpack their research skills and explain how their skills may fit into a company's needs, making it difficult for employers to identify where they could 'fit' into their workplace. Students lack formal time-management skills typically associated with project planning and identification of critical task pathways. There are also significant gaps in the high level engineering and entrepreneurial/translational capabilities within the state.

Models do exist which could significantly increase Victoria's workforce capabilities. The Swinburne ARC Training Centre in Biodevices provides a ground-breaking, integrated research training program that transitions HDR students through the innovation and development pathway, providing them with integrated product development, entrepreneurship and

innovation training, within a novel PhD Technology Innovation model (see www.swin.edu.au/biodevices). This model is scalable with the support of government and industry.

In the USA, UK and EU, internships and placements are common for many graduate students. Students spend periods away from their home institution contributing to other projects with industry and other organisations. These projects generally do not link directly to the student's PhD project, but enable them to apply their skills to a new setting. The internship is a key part of the student's research development plan and is targeted to provide them with specific key skills, new expertise and widening their understanding of a specific industry sector. One of the best examples of this comes from Canada, where the Mitacs Accelerate Programme funds industry internships for PhD students. Australia's AMSI Intern model is a step in the right direction to better supporting our medtech interns however the program scope and timing is quite restrictive.

Recommendation Nine

Use Swinburne's ARC Training Centre in Biodevices as a model to increase Victoria's workforce capabilities in the medtech sector.

Recommendation Ten

The Victorian government could use the Canadian Mitacs Accelerate Programme as a foundation for developing a successful Victorian model for student internships and placements, to spread knowledge and understanding of how research can solve challenges for industry and encourage wider use. Likewise, the government could further develop the AMSI Intern model to be less restrictive and offer some incentives in terms of funding for industry, in particular to encourage SMEs to participate.

11. How can Victoria benefit from and leverage the Commonwealth's activities?

One of the current areas where Victoria can better leverage Federal Government funding is through the Industry Skills Fund. The \$600M fund is designed to provide industry with the training programs and skills development they need to improve their local and international positions. If the Victorian government, via its sponsored network groups i.e. BioMed Research Victoria, Biomebourne, AusBioTech, facilitated industry wide skills development programs, the funding for these the development and implementation of the programs could be sought through the Federal Government's Skills Fund.

In the medtech area, Swinburne believes Commonwealth support for a medtech focused CRC would be highly beneficial and advance the Victorian sector.

Swinburne has two recommendations around leveraging the Commonwealth's activities as follows:

Recommendation Eleven

Victorian medtech industry needs to find ways to maximise the opportunities offered by the Federal Government's Industry Skills Fund.

Recommendation Twelve

The Victorian government could seed fund the development of a clear CRC strategy for medtech for the state, and support the development of a bid/bids to be led by industry.

12. Are there strategic assets which could be better utilised or leveraged and if so, how?

In the medtech area, Swinburne believes support for the development of research hotel-type models, utilising existing infrastructure such as the ANFF-Vic, Synchrotron, and in the future the new ACMD. International examples of a research hotel-type model are the Sheffield Bioincubator and the University Enterprise Laboratories in Minneapolis – which offer shared infrastructure platforms around which companies have project-oriented labs. Similar systems are envisaged for the South Australian Tonsley lab. The key here is co-working/co-research spaces which have easy access to a wide range of facilities. They then create their own ecosystem.

Many of Victoria's existing infrastructure investments offer great equipment to industry but constantly struggle to find funding for the expert personnel to drive their operations and pursue new business. This creates a risk for industry as there is no guarantee of continuity of service, or ongoing support, if an investment into an infrastructure dependent project is made.

Recommendation Thirteen

Investigate support of research hotel-type models for using Victoria's existing research infrastructure to grow our medtech industry.

Recommendation Fourteen

Explore the creation of ongoing funding programs to support expert personnel to manage Victoria's research infrastructure to maintain knowledge and skills in the sector.

13. Is there new enabling infrastructure required to underpin future growth in the sector?

Swinburne's view is that we need to ensure that the existing infrastructure is working to full capacity before making significant new investment in Victorian infrastructure.

14. How can Victoria create an environment that supports a sustainable pipeline of investable opportunities and build investor confidence?

In order to create the right environment and build investor confidence, Victoria needs to look at both the talent pool being created by our industries and the ability to support translation of research from MRIs and other research based institutions into technology that can be transferred to commercial reality. That is, review the pipelines and build on the investment in those spaces to deliver sustainability for that sector. In this space the ability for investors to access the research ideas, envisage how they can be translated and ensure there is a clear IP position is essential. We need an educated research workforce that is connected to industry

communities. We need to ensure that industry/venture capitalists are brought into the translation space as early as possible because they understand how to convert ideas and bench top outcomes into products. This open access approach would also enable the middle layer of technology-led research to be integrated as a key step in the translation pathway. Universities and CSIRO have huge STEM-led translational capabilities and are looking for 'wicked' clinically-driven issues upon which to apply their knowledge. If we create a strong, open MRI-Clinical-University-CSIRO-Industry nexus, we create a strong connected pipeline for Victoria.

15. What would be the value of a sector specific Brand Melbourne/Victoria?

Swinburne considers Brand Melbourne and Brand Victoria very important.

We see from international reputational rankings that too few people outside our immediate field know about the capabilities we have in Victoria. When international people visit they are impressed by the environment we have and then tell people about us, but until or unless they visit, there is little understanding.

Recommendation Fifteen

Swinburne sees one opportunity may be to develop a VESKI visiting fellowship that would support key opinion leaders to spend say one month in Victoria as an entrepreneur/innovator/thinker/connector in residence. One of their key roles would be to assist different companies, researchers etc., to connect into their network in their home country and explore opportunities for partnerships.

16. The plausibility of this scenario to optimise growth and job creation in the medtech and pharmaceuticals sector, are there alternative approaches?

This scenario is certainly plausible, but we need to take some care in using direct employment within the sector as the key metric. We need to look further than the primary company and into the network of companies they interact with and the impact on jobs in those companies and other service providers.

The presence of a vibrant medtech sector creates the drivers for service-oriented skills based companies to create new local capabilities and employ staff to support these enterprises. These include the business development (i.e. KPMG, Deloitte etc.), patent law and IP (i.e. DCC, Phillips Ormonde Fitzpatrick etc.), product development houses (i.e. PI, Outerspace etc.), and of course clinical trials specialists.

Swinburne believes Victoria's medtech industry is in a unique position to directly affect employment and activity across a very wide range of sectors from health services, manufacturing and digital technologies through to the innovation and creative industries.

Swinburne thanks the following for their contribution to this paper:

[Professor Sally McArthur](#), Discipline Leader for Biomedical Engineering
[Professor Paul Stoddart](#), Director, ARC Training Centre in Biodevices
[Professor David Liley](#), Brain and Psychological Sciences Centre
[Professor Andrew Scholey](#), Director, Centre for Human Psychopharmacology
[Dr Andrew Pipingas](#), Centre for Human Psychopharmacology
[Dr Rajesh Vasa](#), Head of R&D, NICTA Swinburne Software Innovation Lab
[Jane Ward](#), Director, Collaborations & Partnerships
[Belinda Anson](#), Senior Manager, Collaboration & Partnerships

Sincerely,

[Professor Aleksandar Subic](#)
Deputy Vice-Chancellor (Research & Development)
Swinburne University of Technology