THE MATERIALS ACCELERATOR: A NATIONAL NETWORK IN MANUFACTURING MATERIALS

Karnika de Silva[1], Ralph P. Cooney[1], Mark P. Taylor[1]

[1]The Materials Accelerator, Tamaki Innovation Campus, The University of Auckland,

Private Bag 92019, Auckland 1142, New Zealand

Keywords: Multi-materials, industry pull, R/D partnership, commercialization

Abstract

The Materials Accelerator (MA) is a national capability network which seeks to develop transformational multi-material products in cooperative R&D partnership with innovative high-technology companies. MA has teams of researchers drawn from eight NZ research institutions with multi-materials expertise in composites, plastics, conducting polymers, nanotechnology, and metals; and in prototyping, virtual manufacturing, materials analysis and characterization, modeling and interfacial analysis. The MA Network includes contributions from universities and government laboratories, and there are approximately 100 researchers associated with the Network.

Some research projects administered by MA that are beneficial to the MA commercial platforms and to NZ generally are presented here. These proposals are interfacial in their focus and bridge more than one type of material. The proposals include mechanisms for preserving the knowledge within the MA business model, its strategy, and its aspirations for new product and market development, as well as outlining the technical and research issues raised by potential R&D projects.

Introduction

The Materials Accelerator was established in April 2009 with funding from FRST's High-Tech Transformational Research Science and Technology scheme. The aim of the program is to accelerate the growth of high-technology manufacturers, by developing collaborative R&D projects focused on new export products. In pursuing economic growth in a small economy like New Zealand we urgently need to adopt a 'NZ Inc.' approach to innovation and commercialization. By focusing NZ's specialized R&D resources on market-led innovation, the Materials Accelerator has the potential to turbo-charge the development of high-technology

exports. The creation of virtual prototyping and testing/evaluation facilities at the Tamaki Innovation Campus will accelerate commercial product development and greatly reduce the cost and risk for firms. These facilities will be discussed in more detail later in this paper.

The Materials Accelerator has developed a new model, unique in the New Zealand manufacturing sector, for accelerating the innovation process by bridging the gap between basic research and commercialization:

The model*:*

• Aims to transform New Zealand manufacturing companies through an innovative alliance to translate research into export dollars.

• Brings companies and researchers from five universities and three Crown Research Institutes together at the beginning of the commercial market and product development process, through a 'one-stop shop' approach driven by the needs of the company, and the opportunities for researchers to contribute ideas and basic research once they are given the detailed market context by company executives.

• Requires that **s**pecific industry needs drive the Network researchers involved and the research priorities from the outset. It avoids mis-alignment between business and researchers since both quickly become part of the same team, opening a window for faster commercialization of new technologies and products.

The new model addresses a serial weakness of basic research, which is the lack of execution of tasks that relate to commercial applications. In the MA process, each project team has not only a Principal Investigator but also a professional Project Manager drawn from the MA team. This person is accountable for driving the research tasks and outcomes to the timetable required by the company to achieve commercial success.

Focus*:* -

Through the above strategy, the Materials Accelerator aims to bridge the gap between basic research and commercialization in the New Zealand manufacturing sector.

The focus is on working with companies to develop win-win, cooperative research programs to deliver high-value export products that incorporate multiple materials, such as plastics, metals, composites, ceramics, conducting polymers, biomaterials, and coatings. Some of these technologies will be sufficiently advanced to be commercialized within the next four years.

Other technologies that have potential for outstanding returns (but are medium-term commercialization prospects) will also be supported.

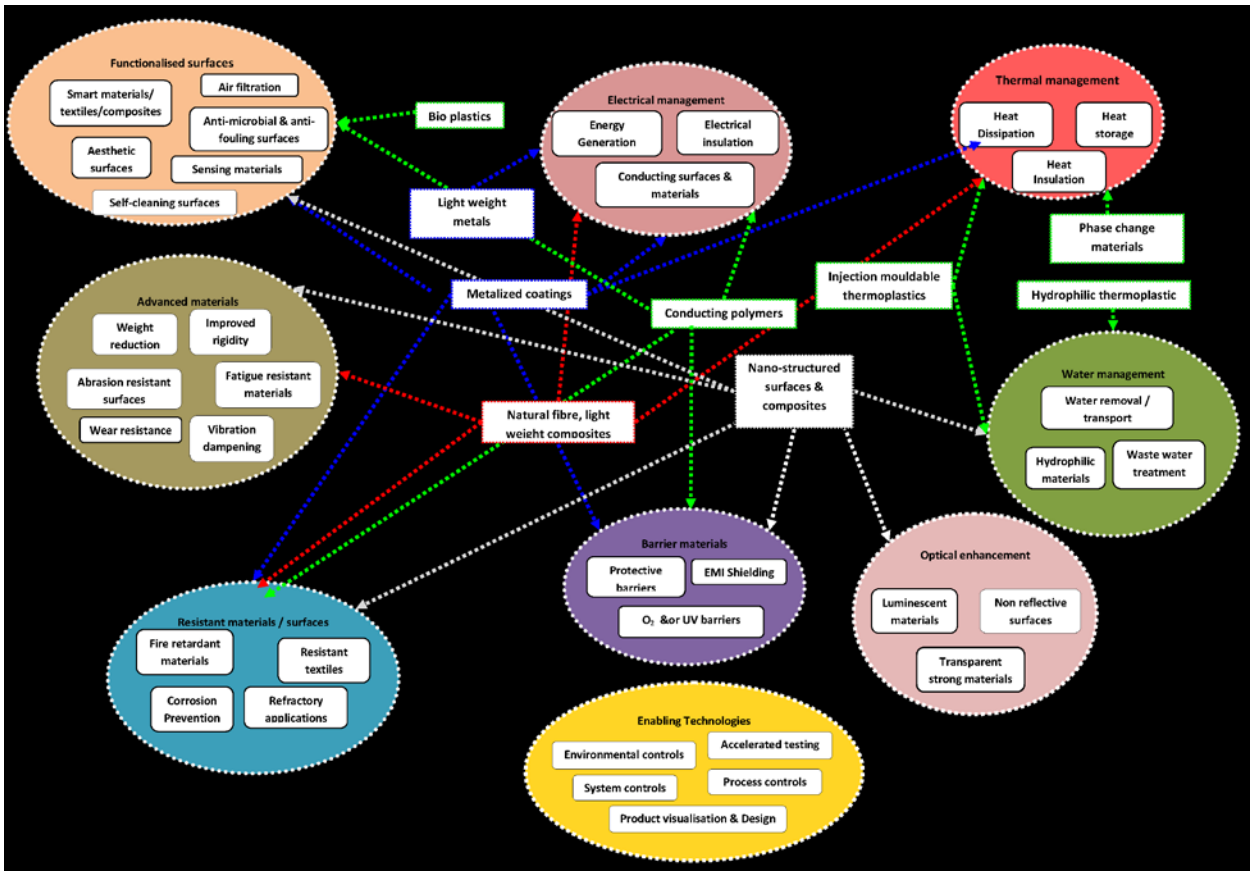

Figure 1 - Manufacturing Materials, Technologies and Applications Landscape

<u>The Manufacturing Materials Network/Our Research Partners:</u>

The core of the Materials Accelerator is the national Manufacturing Materials Network, made up of more than 100 leading materials researchers, drawn from Engineering and Science faculties of the University of Auckland together with the seven partner organizations Scion, IRL, GNS Science, AUT University, Massey University, Victoria University of Wellington, and Canterbury University. Their expertise spans light metals and alloys, polymers and conducting polymers, composites, biomaterials, and fibers, materials interfaces, industrial design, modeling and process control, including virtual prototyping.

Materials Accelerator is hosted by The University of Auckland, with its Light Metals Research Centre (LMRC), Centre for Advanced Composite Materials, Plastics Centre of Excellence, and six other University of Auckland centers playing a key role in a materials development program

that aims to transform New Zealand's manufacturing sector through partnerships between research and industry.

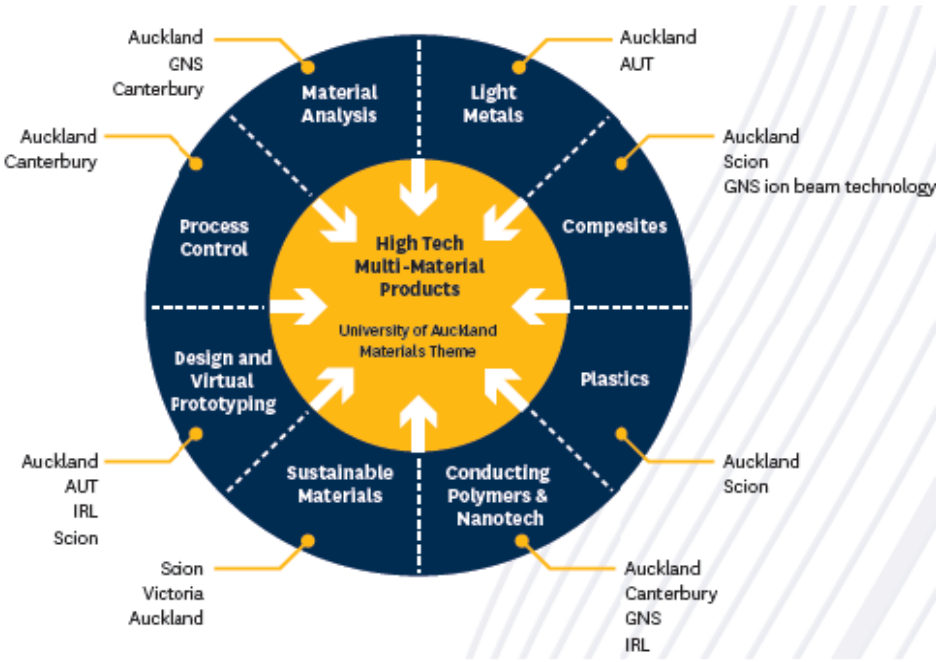

Figure 2 - Manufacturing Materials Network and Our Research Partners

The Materials Accelerator also builds on existing linkages between research organizations and industry via industry sector associations Plastics New Zealand, Light Alloy Manufacturing, the Composites Association of New Zealand, the Packaging Council of New Zealand, and the NextSpace (Virtual Manufacturing) Cluster.

Working model:

The intent is to identify and engage with companies that have a vision of how R&D can transform their business, are able to undertake collaborative R&D, and have the requisite management expertise and existing channels to export markets.

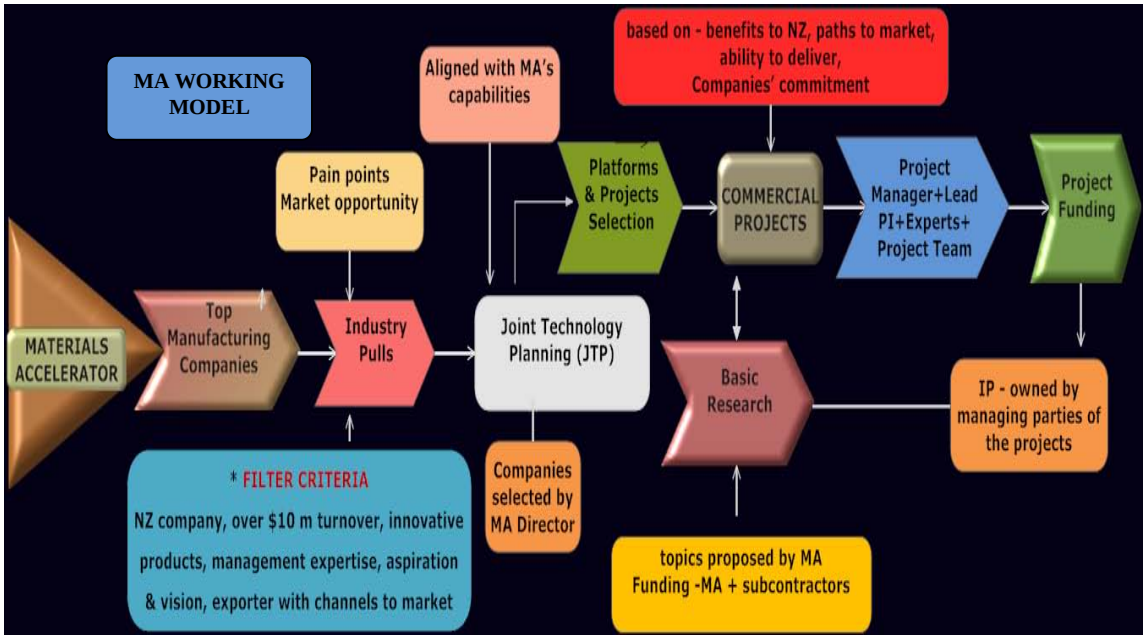

Figure 3– Materials Accelerator Working Model - Industry pull, Joint Technology Planning meetings, platform development, industry advice, basic research, commercial projects, intellectual property and project execution

Industry pulls:

From late 2009 the Materials Accelerator undertook a significant piece of work to identify and understand the industry 'pull' for manufacturing materials research in New Zealand. A long list of innovative companies was created with the assistance of FRST, NZTE and the MA Advisory Board. More than 200 companies were approached, initially by letter, with a follow-up interview by phone to understand the companies' 'pain points' and aspirations, especially with respect to export market opportunities that could be unlocked by R&D. Candidates for JTP meetings are identified from our industry pull work, industry roundtables, and contacts generated by the Business Development Manager and Advisory Board recommendations.

Joint Technology Planning process (JTPs):

JTP is our principal mechanism for initiating collaborative R&D relationships with selected companies identified from Industry Pull surveys, and from relationships initiated by our Principal Investigators (PIs). When organizing a JTP we take into account the multidisciplinary nature of technology transfer and the consequent need to involve researchers with distinct capabilities in deployment and transfer of new technology.

Up to five initial planning meetings take place with a company once the potential for an R&D partnership is identified. A meeting is then scheduled, typically involving 2-5 representatives from the company and 10-15 relevant experts from the Network. The company begins by outlining its strategy, business model, and the market opportunities that it believes R&D can unlock. Such meetings offer an in-depth insight into a company's aspirations for new product and market development, as well as outlining the technical and research issues raised by potential R&D projects.

Possible projects are outlined, with the experts each providing a view on how their expertise could be brought to bear on the issue. The company is asked to identify first projects that are adaptive, then 1-2 which would be transformational. Subsequently the company reviews the notes of the meeting and estimates the value to them (in dollar terms) of the potential projects, ranking them in terms of importance to the company. At this point we initiate a discussion that is intended to lead to Term Sheet and contract (R&D agreement, with the company's contribution depending on total project costs). A Project Manager is assigned to the company and manages subsequent technical meetings leading to the development of the project scope and project team.

Industry advice – Multi-Materials Advisory Board (MMAB):

Access to well-founded industry advice from senior company executives is critical to the Materials Accelerator's success. To that end an independently chaired industry Advisory Board was set up. MMAB members are asked to adopt a 'NZ Inc' approach: they are not representing their employer, their personal business interests, or their industry group or association. All have signed Non-Disclosure Agreements to allow confidential and commercially sensitive matters to be discussed. The Board's advice has been sought on industry consultation, company engagement, and technology platform development. MA has established three research platforms: Turnkey Construction; Transportation; Appliances and Devices. In each platform the MA is engaging with a lead company, each of which has well-developed market channels and growth opportunities based on its particular competitive advantages.

Underpinning Basic Research projects:

MA has also approved 6 PhD projects based on basic research proposals, within broader multi-materials science horizons, that will underpin future commercial opportunities in the commercial technology Platforms. These projects are commencing now or early in 2011.

In assessing the proposals, the following factors were taken into consideration.

1. Benefit to the MA commercial platforms and to NZ generally. This also favored research teams composed of two or more research partners, and including the Network researchers and the companies taking the technology to the global markets and bringing the smaller companies into the value generating process.
2. The proposal is interfacial in its materials focus and bridges more than one type of material.
3. The proposal includes a mechanism for preserving the knowledge within the MA.

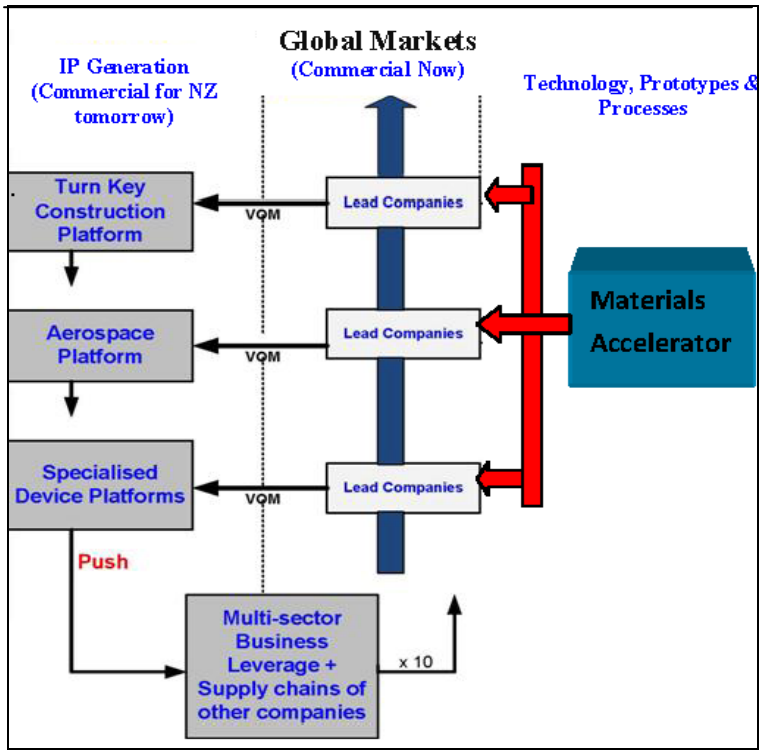

Figure 4 - Value Stream – Maximizing Commercial Benefits to NZ

Project planning and execution:

The success of the Materials Accelerator program depends critically on execution of the R&D from the company's point of view. We apply project management disciplines learned from international projects run by Research Centers within the University of Auckland. To ensure that complex research projects run on time, on budget, and still achieve breakthrough results, a dedicated project manager is assigned to each company engagement. The project plan, including a detailed resourcing plan, is negotiated and agreed with the company in parallel with the contractual and co-funding discussions. The company's agreement to the detailed project plan sets the framework for negotiations on the company's co-funding commitment and IP

arrangements. Once the project is under way, a joint management committee is set up (made up of two representatives from the company, two from the Materials Accelerator and one from the commercial arm of the managing Research institution), and meet monthly to review progress, formally note the creation of new IP (and who owns it) and deal with issues as they present themselves.

Building this capacity to carry out what often needs to be fundamentally new scientific and engineering transformations requires a global view as well as a strong tie between academe, researchers and industry. Overall, approaches are needed to create more interactions and cross-talk between all members of the Network.

Progress within the past 20 months:

In less than two years MA with its high tech commercial partners has developed platforms in turnkey construction, aerospace, and appliances and devices, which have major commercial impact. For example, Turnkey construction is different from selling bulk construction materials in the commodity market, and provides a total solution (from CAD design through to proprietary production and on-site construction processes) based on a distinctive mix of IP and market knowledge. In the Aerospace platform, the lead company is developing a position based on sustainable lightweight composites for aircraft interiors, in the belief that it will open up a sustainable competitive position for them. The opportunity is at the high end of composite materials, intersecting with creative design. At present MA is engaged with five companies in three platforms and five strong prospects identified as pipeline projects in the coming year.

Acknowledgements

The authors thank the New Zealand Foundation for Science and Technology (FRST) - for funding our activities (Contract No.UOAX 0819) and New Zealand Trade and Enterprise (NZTE) for their valuable inputs.