Tertiary Education Report: Lessons learned from Engineering e2e

Date:	28 March 208	TEC priority:	Low
Security level:	In Confidence	Report no:	B/18/00119
		Minister's office No:	

ACTION SOUGHT

	Action sought	Deadline
Hon Chris Hipkins Minister of Education	Note that this briefing provides you with the additional information on the Engineering e2e initiative that your office requested.	28 March 2018
Enclosure: Yes/~~No~~	**Round Robin: ~~Yes~~/No**	

CONTACT FOR TELEPHONE DISCUSSION (IF REQUIRED)

Name	Position	Telephone		1st contact
Mike Blanchard	DCE, Operations	Section 9(2)(a)		✓
Section 9(2)(a)	Section 9(2)(a)	Section 9(2)(a)		

THE FOLLOWING DEPARTMENTS/AGENCIES HAVE SEEN THIS REPORT

☐ DPMC	☐ MPI	☐ ENZ	☐ ERO	☐ MBIE	☐ MoE	☐ MFAT
☐ MPP	☐ MSD	☐ NZQA	☐ NZTE	☒ TEC	☐ TPK	☐ Treasury

Minister's Office to Complete:

☐ Approved ☐ Declined

☐ Noted ☐ Needs change

☐ Seen ☐ Overtaken by Events
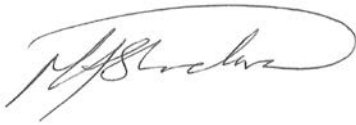
☐ See Minister's Notes ☐ Withdrawn

Comments:

Recommendations

Hon Chris Hipkins, Minister of Education

It is recommended that you:

1. **note** that this briefing provides you with the additional information on the Engineering e2e initiative that your office requested; and

2. **agree** that the TEC release this aide-memoire in full once you have considered it.

Mike Blanchard

Deputy Chief Executive, Operations
Tertiary Education Commission

28 March 2018

Hon Chris Hipkins

Minister of Education

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Purpose

1. This briefing responds to a request from your office (made 26 February 2018) for Engineering e2e evaluation materials, and a briefing covering:

    - background on the initiative

    - our perspective on its success and challenges, and

    - advice on whether and how we might use this approach more widely.

2. The following background materials are enclosed:

    - *Engineering e2e: An Evaluation*

    - *Engineering e2e: Integrating the Systems*

    - *Engineering e2e: Six Key Initiatives.*

Background on the Engineering e2e initiative

3. Engineering e2e (education-to-employment) is a programme designed to increase the number of engineers in New Zealand. It was established in 2014 by the Tertiary Education Commission (TEC) in response to Government concerns about the possible economic impact of a forecasted engineer shortfall, especially for technicians and technologists (NEEP Project Governing Group, 2010). It was established to achieve Government's target to increase the number of engineering graduates by 500 per annum by 2017.

4. Engineering e2e acts as a system integrator for the engineering skills pipeline: It commissions, coordinates, and monitors education-employment activity across primary schooling, secondary schooling, tertiary education, and industry. Engineering e2e has focused particularly on the role and capacity of tertiary education in the pipeline.

5. The *system integrator* role (and term) was introduced by McKinsey in its highly regarded report *Education to Employment: Designing a System that Works*. McKinsey saw a system integrator as a necessary function to align education and employment activities to better prepare learners for the world of work.

Engineering e2e's successes and challenges

6. In late 2017, an evaluation of Engineering e2e was undertaken by New Zealand Council for Educational Research (NZCER) Chief Researcher Karen Vaughan. This was a review of documentation and 16 interviews with Steering Group members and initiative or project leaders asking about the ways that Engineering e2e acted as a system integrator and what can be learned from this.

7. The evaluation confirms that a designated system integrator has an important role to play in supporting the engineering education-to-employment system, and helps identify where the programme has succeeded and the challenges ahead, particularly in terms of Level 6 and 7 qualification uptake.

Positive results from this approach

8. The evaluation identified a number of benefits of the system integrator approach, including:

    - The goal of 500+ engineering graduates was achieved.

- Taking a focused systems-view approach attracted engaged stakeholders and helped counter the accepted idea of competition between providers.

- The establishment and oversight of new relationships and partnership projects led to opportunity-spotting, including trialling new initiatives in curriculum, pedagogy, and education pathways.

- Provision of funding and resources enabled project leaders to work differently and consider possibilities.

- The initiative raised awareness of engineering careers in general, and of specific sub-fields of engineering.

- Liaison and interaction with stakeholders – tertiary educators, employers, professional and advocacy groups and Government agencies – helped provide clarity and flexibility.

Engineering e2e's key challenge is increasing the number of level 6 and 7 graduates

9. The evaluation reemphasised the need for more level 6 and 7 graduates, i.e. New Zealand Diploma in Engineering (NZDE), Bachelor of Engineering Technology (BEngTech). It pointed quite critically to some of the reasons for the current shortfall. Evaluation of Engineering e2e's public awareness campaign showed it was highly successful in raising awareness of engineering, but did not increase enrolments in the NZDE and BEngTech. Public perceptions about the status, role and place of institutes of technology or polytechnics (ITPs) and their qualifications are proving very difficult to change.

10. The evaluation also identifies the need for systemic change within schools and the tertiary sector to ensure students are provided with transparent, appropriate and efficient pathways into their engineering careers.

11. Six key initiatives are planned over the next two years.

Micro-credentials

12. Micro-credentials prioritise the uptake of the NZDE in engineering disciplines that have been underserved, and for those in employment.

A diverse engineering workforce

13. Engineering e2e is funding Te Tapuae o Rēhua to implement a programme that aims to double the number of Maori engineering graduates from Ara Institute of and Otago Polytechnic by 2021.

Degree apprenticeships – a new approach to qualifications delivery

14. The work-based degree apprenticeship is co-designed by employers and ITPs, with employers leading the process with support and guidance from curriculum developers.

Continue work in the compulsory education sector

15. Continued support for six collaborative initiatives between secondary and tertiary institutions to deliver programmes to prepare and pathway students into tertiary engineering study.

Growing the pipeline of work ready engineers

16. Continued support for work to facilitate collaboration between industry and educators to improve the relevance of engineering education.

Engineering education hubs – a new system?

17. Exploration of the establishment of engineering education hubs – collaborative, regionally-based centres for engineering education which involve employers, high schools, universities, ITPs and industry training organisations (ITOs).

Advice on whether and how the TEC might use this type of initiative more widely

18. Engineering e2e is an example of a government-funded system integrator. It coordinates activity across education and industry to grow supply and foster demand for level 6 and 7 engineering graduates.

19. Government stepping in as an active system integrator isn't ideal. Our first preference would always be to establish incentive structures that motivate schools, TEOs, employers and communities to work together to coordinate education to employment activities with minimal government intervention.

A full system integrator model would only be appropriate in areas that meet two criteria

20. A fully-fledged, government-led system integrator model is not the right solution for every situation, but it is a valuable tool in our toolkit. We will look for opportunities to use it in other areas where appropriate opportunities present themselves.

Criterion 1: There must be complex issues that require coordination across multiple sectors or systems

21. A system integration approach is an effective way of dealing with issues that are driven by the interaction of behaviours across multiple sectors, e.g. to address issues of skill development and utilisation in the workplace as well as supply of highly skilled graduates.

22. We have other tools that are more appropriate for addressing issues that are largely contained within the education sector (i.e., supply-side problems). If there is enough evidence of unmet demand from the labour market (such as job vacancies and high remuneration) we can invest more in provision we want to grow and stimulate learner demand by providing targeted career information and guidance. On the other hand, MBIE should take the lead on workforce issues that are primarily driven by industry (i.e., demand-side problems).

Criterion 2: We would need to be confident that the potential benefits warrant the investment

23. Engineering e2e's success will not necessarily translate to other applications of the systems integrator model. Government spent $6.8m on the initiative over 5 years. As the attached evaluation materials show, it was largely successful in achieving its aims, providing a reasonable "return" on this investment. But there were at least two factors that contributed to this success that may not be present in other areas.

24. The [NEEP report](#) established the need to grow the workforce. In other areas, we would need to have a clear idea of the "size of the prize" to justify substantial government investment in further e2e initiatives.

25. There are well-established discipline-focussed professional organisations (e.g. Institution of Fire Engineers and Institute of Public Works Engineering Australasia) that made it relatively easy to work with the industry. This contributed significantly to the initiative's success. In other industries (that are less mature or well-defined) this might not be the case.

Components of the Engineering e2e initiative will improve the way we work more broadly

26. While we would only use a fully-fledged, government-led system integrator model in fairly specific circumstances, we plan to use individual components of it much more widely. Engineering e2e has provided the flexibility and resources to undertake research and test new ways of working. Many of these have provided lessons that will inform and improve the way we work in other areas. For example:

   - Working as a system integrator has improved the way we work with TEOs to establish and support links with schools, and employers.

   - Research into the perceptions of ITPs and vocational education and training (VET) will inform the ITP roadmap 2020 project, and the VET review underway at MOE.

   - We've tested innovations in delivery models that will inform delivery across the sector, including piloting micro-credentials and degree apprenticeships.

   - Lessons from the *Make the World* promotional campaign will inform our efforts to champion learner aspirations through careers information and guidance.

   - We have improved the way we channel employers' voices to guide the system.

We are exploring ways to incorporate system integration into our new 'business-as-usual'

27. We are beginning to change our structure and way of working to integrate our *champion* (career information and guidance) and *invest* (tertiary education funding) functions. A central part of this change is a deliberate move to being a system integrator and broker.

28. As part of this change, we are looking to establish new *Relationship Manager* roles, which will primarily deal with organisations like regional economic development agencies, communities of learning, and TEOs, with an emphasis on system integration and leveraging the work of other players. This approach will require sophisticated brokering, business development and relationship management skills, and if done well would give us significant improvements in reach and outcomes.

The Engineering e2e Steering Group support system integration becoming a business as usual workforce development approach for the TEC

29. The Steering Group agree with the findings of Dr Vaughan's evaluation and support the idea of Engineering e2e becoming a business as usual workforce development approach for the TEC. They see the potential for this approach in the ICT, manufacturing and primary industries.

30. The Group also has a view that the system integration approach could be applied to the various technology R&D initiatives in New Zealand. Members cited a lack of connection between industry and R&D which they believe could be addressed by this approach's inherent flexibility, small trial projects and relationship building methods. The Steering Group also sees the potential this offers to engage with those from the wider community.