Reflections on a collaborative Degree: the Metro experience

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CONTEXT

The Metropolitan Group of Institutes of Technology and Polytechnics (Metro Group), New Zealand developed the Metro Bachelor of Engineering Technology (BEng Tech) programme for first delivery in 2010. The Metro Group consists of the six largest Institutes of Technology and Polytechnics (ITP) in New Zealand.

The goal of the Metro collaboration is to provide standardised engineering education that allows for regional differences across New Zealand. It is envisaged that the sharing of resources and educational best practice would enhance the individual ITP capabilities. An added advantage of the collaboration is the use of flexible delivery techniques to simultaneously teach students courses over a number of ITP in real time. This allows an economy of scale for ITPs while providing a national experience to students. The standardised curriculum allows students the flexibility to move seamlessly around New Zealand when personal circumstances change. It also provides industry with an internationally benchmarked National qualification.

PURPOSE OR GOAL

The BEng Tech has been created and administered as a collaborative programme using a common framework which allows for a degree of regionalized variation. This method of delivery may be unique to New Zealand and is in contrast to a centrally administer national qualification. As the programme has been running now for five years, and is in the process of completing a major review the question can be asked, "How well is this collaborative model working? Is there an advantage to being part of the Metro Group for the delivery of the BEng Tech?"

APPROACH

This qualitative research is based on the personal reflections of Metro Operations Group (MoG) members, meeting minutes, annual programme reviews and the Metro Strategic Review document.

ACTUAL OUTCOMES

The research verified the advantages of the collaboration in creating an enhanced engineering Degree qualification despite facing some initial challenges in the operation of the qualification.

CONCLUSIONS AND RECOMMENDATIONS

The research concluded that the current collaborative structure does enhance the overall outcomes of the qualification for students, tutors and industry. Recommendations include suggested improvements to the overall management of the programme.

KEYWORDS

Collaboration, Engineering, BEng Tech

Introduction

The Metropolitan Group of Institutes of Technology and Polytechnics (Metro Group), New Zealand developed the Metro Bachelor of Engineering Technology (BEng Tech) programme for first delivery in 2010. The Metro Group consists of the six largest Institutes of Technology and Polytechnics (ITPs) in New Zealand, namely Christchurch Polytechnic Institute of Technology (CPIT), Manukau Institute of Technology (MIT), Otago Polytechnic, Unitec, Waikato Institute of Technology (Wintec) and Wellington Institute of Technology (WelTec) as detailed in Metropolitan Group of Institutes of Technology and Polytechnics (Metro Group), (2009).

Prior to the introduction of this Metro BEng Tech, a variety of BEng Tech programmes were offered in New Zealand, namely at CPIT, MIT, Unitec, New Zealand Institute of Highway Technology (NZIHT) and Auckland University of Technology (AUT). However, none of the programmes offered the full suite of civil, electrical and mechanical engineering at one institution. Each programme was unique making it difficult for students to move between institutions if the need arose.

The goal of the Metro collaboration was to provide standardised engineering education that allowed for regional differences across New Zealand while meeting industry needs. A key driver to the collaborative BEng Tech was the Tertiary Education Strategy (TES) 2007 as referenced in Metro Group (2009) which set out the Tertiary Education Commission's requirement for a collaborative and co-operative tertiary system. All signatories to the Metro Group agreement were therefore equal partners with no provision for an external centralized authority.

Anticipated advantages realized by the collaboration would be economies of scale, efficiencies through the sharing of resources and teaching specialists leading to educational best practice with group marketing both nationally and internationally. The standardised curriculum would provide students the flexibility to move seamlessly around New Zealand when personal circumstances changed. It would also provide industry with an internationally benchmarked National BEng Tech qualification.

This collaborative method of delivery may be unique to New Zealand and is in contrast to a centrally administered national qualification. As the programme has been running now for five years, and is in the process of completing a major review the question can be asked, "*How well is this collaborative model working? Is there an advantage to being part of the Metro Group for the delivery of the BEng Tech?*"

Purpose & background

Online Concise Oxford dictionary (2014) defines collaboration as "The action of working with someone to produce something". To the layman the phrase "two heads are better than one" would probably adequately define collaboration. However, the success of collaboration depends on how well the partners work together.

Pearson Education Limited, (2012), as a leading education publishing and assessment service provider, defines four models of collaboration

Model 1: Informal collaboration: Two or more independent partners work together to share information, assignments, staff and physical resources. There is no shared assessment and each has total ownership of quality assurance.

Model 2: Lead Partner Cooperation: One partner has explicit ownership of the programme and content of a qualification. They facilitate one or more other partner to use the programme. The Lead partner retains control of the qualification specification and other partners must request permission to offer the qualification.

Model 3: A Franchise Collaboration: An experienced partner delegates aspects of delivery and assessment to another partners but retains explicit control of all aspects of the programme. The franchised partner must comply with the assessment and quality control of the experienced partner.

Model 4: A Consortium Collaboration: Two or more approved partners are jointly responsible for the delivery, assessment and quality assurance of the qualification. Partners may share assessment and quality assurance. Each partner retains its individual identity but any quality assurance outcomes apply to all the collaborating partners. One partner may act as an Administrative Lead for the consortium, who will be responsible for communicating about the quality assurance arrangements for the qualification and for ensuring that all partners are aware of requirements.

Each partner is an equal partner to the qualification. However, consortium partners may not offer the qualification in isolation of the consortium arrangements, nor may they amend the qualification without the approval of the other consortium partners.

Learners on a consortium qualification are the responsibility of the partner at which they are registered, and will be awarded the qualification under the badge of the individual partner.

The quality assurance of the qualification is the responsibility of each consortium partner, however the Administrative Lead (if allocated) would be responsible for the co-ordination of the overall quality assurance of each partner. This would typically be an annual review of the quality of delivery and/or assessment from each partner. The Administrative Lead would monitor the overall quality assurance and implement an action plan to address quality issues when required.

Others models of collaboration could include;

Model 5: A Joint Venture collaboration: This is where two or more partners team up with for a specific purpose or for a limited period of time only.

Model 6: Joint, Dual/Double or Multiple Award collaboration: University of Warwick (n.d.) defines this type of collaboration as a qualification where the final award bears the name of the various partners, or where more than one award, from multiple partners, is made for the completion of a single qualification.

Model 7: National qualification model: This is where the qualification is owned by a National organization and ITPs apply to offer the qualification according to the Nationally set criteria.

Model 8: Open Source education: The models of collaborative education detailed above are different to open source education. Open source education is usually web based and relies on a collaborative on-line classroom. With the roll-out of ultra-fast broadband well underway in NZ this type of education has the potential to grow rapidly. The integration of video into virtual classrooms has the potential to provide a rich, more flexible and cost efficient online learning experience according to Education Review (n.d.). This mode of delivery then is a collaboration of learners rather than a collaboration of delivery partners.

The idea of a collaborative tertiary education environment (TEE) is not new in NZ as identified by the following authors:

In 2003 the Library Services Sub-group prepared a report for the Tertiary Education Commission (TEC, 2003), NZ on Collaborating for Efficiency in the library environment. The report identified that while NZ TEE libraries had a tradition of collaboration and resource sharing, it was in an ad-hoc manner. The report identified findings from an international literature review which highlighted a number of key principles that underpin effective collaborative arrangements, which are summarised below:
 • *Clear benefits:* Collaboration must be profitable for all partners, with clear benefits for participants;

- *Standardisation:* Partners must accept standardised solutions, rather than cultivate local peculiarities; there may be restrictions on local freedom and competition is not encouraged;
- *Focus on longer-term benefits:* Partners must look at the long-term benefits (as the progress of mutual effort is usually slower than individual activity), though the final benefits are greater and costs lower;
- *Infrastructural change:* Partners must be prepared to change the present mode of operation and accept new arrangements to achieve long-terms benefits;
- *Ownership:* Partners must be equal owners of collaborative programmes and have an equal voice; and,
- *Fostering trust:* All partners must be prepared to work to foster co-operation and mutual trust.

They also identified a range of factors that could be barriers to effective collaboration, which include:

- *Unequal Benefits:* Generally, smaller institutions tend to achieve greater benefits through collaboration than larger institutions. Larger partners may feel they are providing resources and assessments while receiving little in return. This leads to larger partners being less committed to a collaborative arrangement than a smaller partner.
- *Institutional rather than System Perspective:* Institutions by their nature tend to look after their own interests in the first instance. Some institutions may feel concern about loss in autonomy and identity thereby diminishing the effectiveness of their collaborative contributions.
- *Competitive Environment/Culture:* As institutions need to be financially viable a competitive environment or culture can be fostered despite the stated objective of a collaboration agreement.

A recommendation of the Library Services Sub-group (TEC, 2003) was the creation of a *regular national forum* for all participants. The national forum would foster communication and create trust between participants.

A review of literature by Corich (2006), suggested there were still few local examples of national or collaborative qualifications in the ITP environment. The paper identified that while some European countries reported to have national degree structures Corich found little documentation to describe their structure. The paper listed the advantages of collaborative degree delivery as:

- Staff from different ITPs could teach in their specialist areas simultaneously across different ITPs using synchronous communications tools such as video-conferencing,
- Students would benefit from a wider range of staff with differing workplace experiences,
- The larger pool of collaborative staff could help create critical research mass which is a requirement of teaching a degree qualification,
- Students would be able to seamlessly transfer between ITPs should they need to move location for personal reasons,
- Smaller ITPs could offer the first or second year of study in a local environment with the knowledge that students could complete the qualification at a larger ITP,
- Larger ITPs could concentrate on the year three studies and provide niche area qualifications.

The Metro Experience

The structure and operation of the Metro BEng Tech as defined in Metro Group (2009) and developed over the past four years is summarised as;

A Management structure made up of the Chief Executive Officer (CEO) group who are responsible for the strategic direction of the qualification, along with the Metro Management Group (MMG) who share responsibility for the on-going improvement of the BEng Tech to ensure programme outcomes are consistently met; the Metro Operation Group (MoG) are responsible for collaborative operation and administration issues, an independent Metro Co-ordinator responsible for managing all collaborative matters including self-reviews and statistical comparisons of student performance and the Quality Assurance (QA) Management Group, responsible for own and Metro aspects of moderation, accreditation and curriculum matters. This management structure is supported by the Library, Information and Communications Technology (ICT), Marketing groups and advised by a National and local industry advisory groups.

Tutorial staff are supported by a set of Metro course descriptors for each course, containing learning outcomes and broadly defined content together with an assessment schedule. Tutors are encouraged to share resources, assessments and undertake peer review or pre-moderation of assessments using the common Metro moodle site. There are no National exams allowing IPTs to teach and assess to regional variations. Communication between ITP is facilitated by an annual Tutor Forum where tutors are encouraged to present on best practice aspects of their teaching in a mini conference type setting. This forum allows for networking opportunities, workshops, discussions about strategic direction and the creation of trust between tutors from different ITPs. Shared ownership of course resources is encouraged.

Pre and Post moderation of assessments is defined in terms of individual ITP regulations with the added requirement for Metro moderation. All courses are moderated for consistency and best practice over a three year cycle, either Metro or Industry moderated (level 7 courses). An annual tutor forum moderation day assists this Metro moderation function while also providing additional networking opportunities.

Semester student performance statistics and Metro / Industry moderation reports allows the MMG to monitor and benchmark individual ITP progress. Likewise the semester self-reviews completed by MoG members allows ITPs to share challenges experienced during the semester which may direct Metro strategic planning.

Metro Group (2009) clearly defined flexible delivery between ITPs as a preferred method of delivery for small cohorts of students in the final year of the qualification. This was based on the shared belief in the value of pooling delivery resources while modelling desired graduate outcomes of using information and communication technology, remote teamwork and maintaining on-going professional development regardless of time and place constraints. This delivery method would also allow students to complete a desired course where the home ITP would not otherwise be able to offer the course, enhancing the through-put rate. Synchronous delivery either as video-conferencing or Moodle based teaching commenced in 2012 with up to eight courses delivered each year by this method.

Central to the original accreditation document (Metro Group, 2009) was the advantage to students who may need to move regions during their studies for personal reason. A national qualification would allow these students to move seamlessly between Metro ITPs without the concerns of miss-matched transfer of credit arrangements. All courses except the final year project could be transferred from one ITP to another. The only restriction on students is the requirement that a minimum of 75 credits at level 7 including the final year project must be completed at the awarding ITP. Graduates are awarded the qualification under the badge of the individual ITP.

The Metro ITPs have the ability to share research activities, both technical and educational. Collaborative final year student projects can enhance the student learning while role-modelling the real world work environment of working in a global environment.

When the Metro BEng Tech commenced in 2010, CPIT and Weltec applied for accreditation to offer all three majors, although not all the specializations within the civil and electrical majors. Previously CPIT only offered the BEng Tech in the 'electrotechnology' major. MIT and Unitec commenced offering only one major each, electrical and civil respectively and aligned to their previous BEng Tech programmes, while the final two ITPs offered two majors each. The total equivalent full time student (EFTS) numbers across the whole Metro group was just above 300 in 2010.

The Metro BEng Tech five-year review commenced early in 2013.The review has reflected on the performance of the qualification to meet graduate outcomes, ensure best practice, meet collaboration partner requirements and align with the Sydney accord for Technologist education.

Based on the above, the Metro collaboration then is a Consortium Collaboration (Model 4) as defined by Pearson Education Limited (2012).

Reflections on a collaborative degree

Personal reflections from MoG members involved in the writing of this collaborative paper, meeting minutes, annual programme reviews, enrolment statistics and the Metro Strategic Review document form the basis of this reflection section.

The management structure and operation of the Metro BEng Tech, as proposed in the original accreditation document have largely operated as envisaged. The Metro CEO group meet regularly to discuss joint projects, one of which is the BEng Tech. The group is committed to making the BEng Tech collaboration work and have identified the need for more collaboration, in online learning and research in particular. It has been highlighted that sharing ideas is important. It is recognized that Preserving intellectual property is of no economic benefit to an ITP or an individual within the Metro collaboration.

The MMG which has a revolving chair and operates on a collaborative and collegial basis, has also met regularly, sometimes via video conference. The MMG is the caretaker of the programme. In the initial stages of the formation and operation of the BEng Tech this group was the driving force of the collaborative qualification. As the qualification has matured and operational aspects are now running smoothly, the need for this group to meet so regularly has decreased. Many of the operational functions of this group have now been taken over by MoG.

MoG was formed during 2012 and meet every two weeks via video conference to manage operational matters. Again the meetings have a revolving chair and the meetings are open and generally collaborative. The view-points expressed are sometimes widely diverse enough to ensure a meaningful and robust process. These fortnightly meetings significantly enhance the smooth operational running of the Metro collaboration. The MoG members are typically the programme coordinators at their individual ITPs and are well placed to perform this role. However, this role has added another layer of administration and reporting to the already full ITP workload of MoG members which can be considered an identifiable risk to the collaborative process.

To-date the QA group have met regularly, however, once the five-year review is complete, the QA group will only meet for specific projects. An Administration Lead ITP has recently been allocated in this group to ensure continuity.

The Metro Co-ordinator plays a key role in coordinating and supporting these various groups, pulling together the different elements in the programme. The success of the collaborative model to-date has largely been dependent of the efforts of this programme co-ordinator. This role is pivotal to the on-going success of the Metro collaboration. This heavy reliance on one individual is an identifiable risk to the Metro collaboration process.

The Library group has been very successful in achieving their collaborative goals. In contrast, the ITC group has experienced a number of challenges in developing the technical requirements for collaboration and an effective online learning experience. The challenges include differences in technology at each ITP, budgetary constraints and resourcing. This has had a flow on effect of creating barriers and additional challenges in other parts of the Metro collaboration. The marketing group have developed a joint marketing plan although each ITP recruits individually. The Metro National Advisory Group has been disbanded as it was felt their efforts were duplicating Regional Advisory Committees' efforts.

The anticipated advantages realized by the collaboration would be economies of scale and efficiencies through the sharing of resources and teaching specialists (Metro Group, 2009). The collaborative process has allowed some ITPs such as NMIT and Wintec to expand the number of majors offered by the sharing of resources which has significantly shortened the development process. However the anticipated efficiencies through the sharing of resources and teaching specialists have not yet been fully utilised or realized. The collaboration that has occurred has often occurred because of need rather than the desire for collaboration. Some pockets of fully engaged collaboration have occurred, but have mostly been individually led by the Lead Tutor involved. Reasons for this could include:

- Historically the development of the BEng Tech relied heavily on the experience and resources of the two larger ITPs, Unitec and MIT. This may have led to some of the tutorial staff at these ITPs feeling as if there was an *Unequal Benefit* as defined by TEC (2003) resulting in less commitment to the collaboration.
- It was anticipated that efficiencies would be achieved by the sharing of specialist teaching as distance delivery using video conferencing. The success of these initiatives has been mixed, partly dependant on the individual tutor, cohort of students and success of the delivery ICT platform. Reflection has indicated distance delivery requires a great deal more organisation from the delivery ITP than a usual class delivery. At the receiving ITP, in some cases additional support classes have needed to be arranged thereby increasing tutor workload. While distance delivery appears to have decreased rather than increased overall efficiency, it has helped some students complete their qualification where they otherwise could not have, though only a small number of students have made use of this facility.

    Two factors stand out as barriers to effective distance delivery in some classes: tutor inexperience with the new teaching environment and a minimum level of ICT to support the new delivery method. These barriers could be overcome by selective tutor training and a significant investment in ICT to provide each delivery and receiving venue with an adequate level of infrastructure. Overall, participating ITPs have indicated a willingness to continue this mode of delivery for those courses that have worked well. The CEO group have acknowledged these challenges and have indicated that development of good on-line resources would be a better strategy.

- It was anticipated that the stand-alone Metro Moodle site would lead to wide-spread sharing of resources, peer moderation of assessment and peer communication via forums discussions. The reality has been that this expectation has added significantly to tutor workload by doubling the expected Moodle time involvement. Tutors have therefore not engaged much with the Metro Moodle site, preferring to concentrate on their student Moodle interface instead. This barrier could be overcome by using technology to create an integrated Metro Moodle platform where tutors only need to upload their resources in one space. Care would be needed to ensure a clear differentiation between student and tutor space.

    The Metro Moodle site was also expected to facilitate the Metro moderation of courses. Once again this initiative has been subjected to the challenges discussed above.

The total Metro EFTS have more than doubled over the past four years with the biggest increases most noticeable at the smaller ITPs outside of Auckland. This was particularly significant for CPIT as they have increased their breadth and number of graduates into an earthquake ravished community whereby meeting industry needs. The ability for CPIT to offer all three majors has been the key reason for the increase in their student numbers. Weltec has also recorded a good growth in student numbers. However their most significant BEng Tech achievement has been the winning by its first two years of graduates, two IPENZ Ray Meyer Medals for Excellence in Student Design. This award is presented annually to a student or group of students who submit the best final year project with a substantial design component as part of an IPENZ accredited qualification. The shared collective knowledge and wisdom within the Metro Group has benefitted both students and staff resulting in these achievements. Both these winning projects were industry based projects indicating that the Metro BEng Tech is meeting industry needs.

The annual Tutor Teaching and Research Forum has proved to be an effective way to enhance communication between tutors as recommended by TEC, 2003. This is enhanced by the Annual Tutor Forum Moderation Day. This moderation day has provided more consistency to assessments and the focused sharing of course ideas. An analysis of moderation reports, student marks and statistics have indicated there is a consistent standard of delivery across the Metro ITPs. This will be verified when IPENZ accredits the various ITPs over the next year. The creation of a standardised Sydney accord benchmarked qualification will aid the introduction of the new Technologist qualification into the engineering industry.

Only a small number of students have made use of the facility to change ITPs when they moved regions during their studies.

The ITP sector has traditionally been slow to engaging in research, despite it being a NZQA requirement for the teaching of degrees such as the BEng Tech. The CEO group have identified research as a strategic priority. Collaborative educational Metro research is starting to develop, such as the writing of this and other educational papers (Louie et Al (2014)). The creation of a Metro research database open to tutors, final year students and public could encourage and inspire collaborative student projects and technical tutor research. Another initiative could be the creation of an annual synchronous final year student project forum where selected student projects could be showcased around the Metro group. Alternatively an asynchronous delivery model could be used to award the best final year project for the year.

The five-year review documentation is in the process of being finalised by the Lead ITP. ITPs have reached agreement on all changes. The key principles to collaborative arrangements identified by TEC (2003) could have aided the process. The "*Institutional rather than System Perspective"* barrier to collaboration influenced the outcome of the review. This led to the decision to allow more flexibility for local decisions under the revised structure.

Reflections on the effectiveness of this collaborative review process include:
- There was a wide range / disparate of knowledge of education design amongst tutors involved in the process which emphasised the importance of having neutral education designers involved.
- A collaborative process is a slower process than an institutional only process.
- A collaborative process runs the risk of one partner "hi-jacking" the process or allowing minority viewpoints to dominate.
- It is important to keep the process focused on the longer term benefits and the "bigger picture".

- Economies of scale were realized with one or two ITPs implementing the change process on behalf of all ITPs. *This could however lead to a* significant risk of an ITP being left behind during the process or missing key changes.
- Diversity of experience and opinion of tutors within the process made the reviewed qualification stronger and less subject to the vagaries of restructuring, re-staffing, and changes in management within any one particular ITP.

Conclusions and Recommendations

There are some good examples within the Metro ITPs of shared expertise and critical mass to provide enhanced opportunities to students. Only a small number of students have made use of the ability to move easily between ITPs. While flexible delivery has created some challenges it does remain an option to provide teaching to small cohorts of students.

The total Metro EFTS have more than doubled over the past four years since inception. This is in part as a result of ITPs being able to offer all the majors at their ITP. The increased range of graduates has helped one ITP to meet local industry demands. Another ITP has found the shared collective knowledge and wisdom within the Metro Group has supported both their staff and students leading to the winning of IPENZ Excellence awards for two industry based projects. Other ITPs have acknowledged the Metro advantages accrued when expanding their number of majors offered through the shortening of the development process.

Challenges have occurred which have prevented the Metro group from making full use of the opportunities offered through this collaborative process. However, there are still opportunities for sharing of courses or co-teaching across ITPs which have not yet been explored.

It is important to have regular meetings between partners to discuss strategic (CEO group and MMG) as well as operational issues (MoG). The Metro Co-ordinator plays a key role in the effective running of the Metro Collaboration. This heavy reliance on one individual is an identifiable risk to the Metro collaboration process.

Collaborative work requires more up-front time and resources for it to work effectively. The allocation of additional resources such as time and ICT infrastructure could have allowed the collaborative process to have been further developed than it is now. Allocating additional resources to these two important areas will significantly improve the overall collaborative experience for both tutors and students.

The annual Tutor Teaching and Research Forum is an effective method of enhancing communication and sharing between tutors from different ITPs. The Annual Tutor Forum Moderation Day reinforces this concept while fulfilling the duel role of completing a moderation process. The creation of a standardised Sydney accord benchmarked qualification will aid the introduction of the new Technologist qualification into the engineering industry.

The CEO group have identified research as a strategic priority. This could be enhanced by allocating resources to establish a Metro Research database, a final year student project forum or award for the best Metro final year student project.

The five year review has highlighted the BEng Tech Metro qualification is a "true" collaboration with no centralised or collective higher authority to resolve issues. The key principles to collaborative arrangements identified by TEC (2003) must underpin this qualification.

Despite the challenges experienced, reflections from the MoG members have indicated that overall the sum of the collaborative qualification is greater than the individual ITPs, but as with all things there is room for improvement.

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