# Industry-Focused ICT Education: A Case Study

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## Abstract

This paper describes a framework for industry-focused ICT tertiary programmes based on the experience of developing a similar programme. The framework shows that evidence-based course development begins with the needs of both industry and students. The high-quality design of the programme aims to meet these needs and the high-quality provisions ensure that these needs are met. An effective combination of the above is integrated as 'evidence-based course development and delivery' and together lead to high quality learning outcomes for both students and industry. The essential relationship between industry and education affects the development and delivery of tertiary programmes. Successful tertiary programmes incorporate industry-focused components in their delivery and involve industries as key stakeholders. Additionally, this approach has been measured in terms of students' performance, satisfaction, perceived benefit and employability. The Graduate Diploma in IT (GradDipIT) programme at Aspire2 International (a Private training Establishment in New Zealand) has been considered as a case study. Results show that students have performed quite well under the industry-focused model. They were highly satisfied with the amount of knowledge and skills they have gained, especially the industry exposure they were introduced to during the industry project component. The employment outcomes have confirmed the effectiveness of the model, with more than 85% of the graduates being employed within a year.

***Keywords:*** ICT Education, Industry-Focused Education, Tertiary Programme Design, ICT programme Design

## 1. Introduction

ICT industry-focused education programmes go beyond just offering a suite of online courses or traditional learning materials. Industry-focused programmes offer a complete set of learning resources aligned to a predetermined curriculum, with practical activities and assessments, as well as collaboration platforms with the industry and learners' exposure to industry certification (Lucas, Spencer, & Claxton, 2012, Herrera, & Selinger, 2014). Views expressed by Peter Nathan, President of the New Zealand Software Association (NZSA) in 2001, reflect the view of many other employers at the time. Nathan says, "We find that if we take students straight from university it takes so long to make them have any value as employees" (Middlebrook, 2002). This is what ICT industry-focused education aims to bridge.

The Intervention Logic Model enables programme developers and users to clearly see and work within an overall framework within which a programme can be planned, implemented, monitored and evaluated, not only for outputs but also for long term impacts. Its planning begins with the basic question: What is the problem to be addressed? This question is applicable in many different contexts, including business, health, justice, community development and education. The content for each context will vary, but the structure will be consistent. "The logic model provides a means of presenting conditions a programme is intended to address, activities that constitute a programme, short term outcomes resulting from programme activities and long-term impacts" (Julian, Jonnes & Deyo, 1995). Therein lies the power of Intervention Logic. The New Zealand Qualifications Authority (NZQA) has developed a similar model in their External Evaluation and Review (EER) process designed to ensure compliance with statutory requirements and consistency with the initial programme approvals and accreditations. Each EER provides an independent judgement of the educational performance and capability in self-assessment of all non-university tertiary education organisations in New Zealand.

This process involves many, but not all the elements, of an Intervention Logic. It is understandable that with such a diverse range of programme offerings that NZQA is responsible for monitoring, there is a requirement for flexibility than is available in the strict application of Intervention Logic. However, in the context of Information Technology Education and Training, it was decided that the focus provided by an Intervention Logic would be helpful. The specific elements included in the model that go beyond the compliance requirements of an EER include:

1. Identification and definition of 'the problem' through a needs and strengths analysis: Employers are facing a long term 'skill shortage' and are seeking employees with appropriate skills and experience, including self-management, communication and employment related skills. Students are seeking an opportunity to prove themselves as skilled professionals.

2. Long term impacts, beyond the short-term outcomes: While measurement of employment outcomes one year after completion is a requirement for compliance, the Intervention Logic model identifies additional outcomes for employers and students:
- Outcome for employers: Access to work-ready graduates
- Outcome for students: Self-managing with personal and employment skills, and ready for career development.

The other domains included in the Intervention Logic model, namely High-Quality Course Design and High-Quality Provision, are consistent with the requirements of an EER and thus, mutually reinforcing. The development and use of this Intervention Logic model also contribute to evidence required by NZQA of the organisation's 'capability in self-assessment'. A programme logic or theory is an explicit theory or model of how an intervention, such as a project, a programme, a strategy or a policy, contributes to a chain of intermediate results and finally, to the intended outcomes (Funnell & Rogers, 2011, Kneale, Thomas, & Harris, 2015). When programme theory and logic is performed well, they can develop agreement between diverse stakeholders about what they are trying to achieve. A well-designed programme logic can assist stakeholders, highlight gaps and opportunities for collaboration; it helps to set realistic objectives. When considering the development of an intervention theory to address the skills shortage of IT graduates in New Zealand, a complex theory design was utilised. The complexity of design pertained to the changing and evolving industry needs, the everchanging landscape called Information Technology and the economic and political setting of

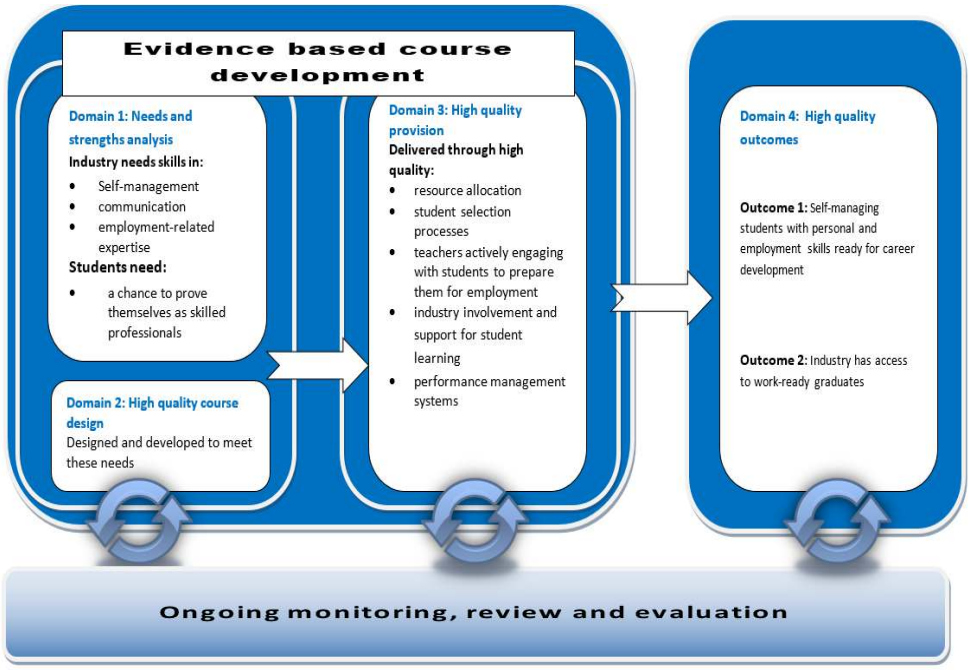
international education in New Zealand. The development of a needs-based responsive curriculum required the design of an Intervention Logic that acknowledged the complexity of the problem.

The rest of this paper is organised as follows. Section 2 describes a framework for ICT industry-focused education, while Section 3 presents the GradDipIT programme as a case study programme developed using the industry-focused framework. The methodology used to conduct this research is described in section 4, and section 5 discusses the results of implementing GradDipIT using the industry-focused framework. The conclusion is presented in section 6.

## 2. A Framework for Industry-focused ICT Education

Figure 1 shows a framework for industry-focused education that has been used to develop the GradDipIT programme.

**Figure 1:** ICT Industry Focused Education Framework




## 3. A Case Study Programme

The Graduate Diploma in Information Technology (GradDipIT), currently being delivered by Aspire2 International, was first offered in 2002 by Information Technology Institute Ltd. (ITI), a PTE created for the specific purpose of delivering this programme in response to the stated needs of the industry. In 2000, there were a limited number of Graduate Diplomas in IT offered by New Zealand universities. These were usually structured as a one year (120 credit) programme comprising papers from a selection of stage three (level 7) undergraduate papers and available to those with a degree in areas other than IT. GradDipIT at ITI, approved in 2001 by the New Zealand Qualifications Authority (NZQA) and the newly created Tertiary

Education Commission (TEC), was the first graduate diploma specifically designed to address industry needs at that time (Middlebrook, 2002).

The programme operated at ITI Campuses in Auckland, Wellington and Christchurch for two years from 2002 to 2003. ITI closed at the beginning of 2004, because despite strong support from stakeholders, the business model was unsustainable. The intellectual property associated with the programme was purchased by Axcel Institute Ltd. and the business model changed to enable Axcel Institute to offer the programme to other providers under a licence agreement, which it did from 2004. Since 2015, the programme has been provided by Aspire2 International (formerly Ntec Tertiary Group) to international students under an exclusive license agreement with Axcel Institute. With more than 17 years history, much has been learned in the process. Major learnings from the operation of the programme since 2002 are:

***1. Applied learning from Day 1***
Students need in-class projects to apply their learning of project management and systems development for the duration of the programme prior to their final project for an industry partner. Early attempts to have students move straight from classroom learning to industry projects proved problematic, delaying the success of the industry project and requiring a structure to apply a Systems Development Integration (SDI) set of courses across all three terms (SDI I, SDI II and SDI III).

***2. Entrepreneurs work best***
The initial expectation for some students was that they would undertake their project with a large multinational software and systems development company. However, the best projects are undertaken for start-ups and entrepreneurs. Senior managers in large companies are 'time poor' and have funds available to undertake approved projects. Start-ups and entrepreneurs are 'cash poor' and open to using and providing appropriate supervision for talent. Some projects being provided in 2017 are for entrepreneurs who started their involvement with the GradDipIT with ITI in 2002.

***3. Short feedback loop***
Projects tend to be non-mission critical. Entrepreneurs are looking to try out new areas for future development. These future-focused projects provide academic supervisors and teachers with immediate feedback on what technical skills employers are looking for, which can then be incorporated back into the programme curriculum.

***4. Finger on the pulse of industry***
Related to the short feedback loop is the ability to engage the industry advisory group, who agree that all involved in the GradDipIT are open to their input and do not need to be persuaded to take note of their advice. This mutual respect leads to a virtuous cycle that further improves the relationship between all stakeholders.

The GradDipIT implemented by Aspre2 International has not only continued to focus on the original industry needs but also the learning gained over the past 17 years. This paper focuses on the outcomes for stakeholders of the GradDipIT, with specific reference to delivery at Aspire2 International since July 2015. The GradDipIT programme has been designed with three strands as follows:

- GradDipIT without specialisation: Candidates have degrees or equivalent in areas other than IT, but want to transfer to an IT career without going back to square one.

- Internet Development and Digital Media specialisation: Candidates have degrees or equivalent in IT and/or experience and want to build a career in this area.
- Mobile and Pervasive Technologies specialisation: Candidates have degrees or equivalent in IT and/or experience and want to build a career in this area.

The structure of every strand is based on the model described above. Table 1 shows the general structure of these strands. The core courses are system development integration courses that help students gain real experience by focusing on 'practice and integration', as students apply what they have learned in other courses as part of the project. These courses are also preparing the students for the industry project in the final term. In the final term, students work in teams on real projects provided by IT industry partners. For students, the industry project gives them an opportunity to gain real IT-related experience while gaining their qualification; whereas for employers, it enables them to access IT-skilled students to undertake projects and to 'try before they buy', if they wish to employ students beyond the duration of the project.

**Table 1:** GradDipIT Structure

| **Term 1** |
|---|
| Strand-related course 1 |
| Strand-related course 2 |
| System Development Integration 1 |
| **Term 2** |
| Strand-related course 3 |
| Strand-related course 4 |
| System Development Integration 2 |
| **Term 3** |
| Industry Project |
| System Development Integration 3 |

### *3.1 Acceptability of the programme*

Support for the GradDipIT programme has been demonstrated by the feedback received from academics and industry experts, as summarised in Table 2 and Table 3 (below).

**Table 2:** GradDipIT Academic Reviews

| **Reviewer** | **Designation** | **Excerpts from response** |
|---|---|---|
| Academic1, PhD | Head of School,<br>Science and Technology<br>of a New Zealand Institute of Technology and Polytechnic (ITP) | *"The strength of the programme is the Industry Project which I believe will help and train the students to ease themselves into a real working environment."* |
| Academic2, PhD | Head of Information Technology Programmes of a Private Training Establishment (PTE) in New Zealand | *" Employers find the industry project component of this type of programme useful and it helps the students find employment"* |
| Academic3, PhD | Associate Professor at Faculty of Engineering and Information Technology at a university in Sydney, Australia | *"There is certainly a market in Australasia for graduates from this programme.*<br>*I am pleased to see optional papers included that will bring some attention to bear on aspects of contemporary user interface design, such as Web and Mobile Human Computer Interaction."* |

**Table 3:** GradDipIT Industry Reviews

| Reviewer | Designation | Excerpts from response |
|---|---|---|
| Industry expert 1 | CIO at a leading software development firm with offices in NZ, Australia and UK | *"...I think extending the options from just traditional IT to include Internet and Mobile specialisations makes a lot of sense, and would appeal to industry..."* *"We struggle to hire web developers who have the requisite programming skills, so I think graduates from this course would have real appeal."* |
| Industry expert 2 | Senior manager at a leading recruitment firm in NZ | *"...the main development shortfalls we have in NZ are being covered. We have a need for a lot of niche development skills especially in javascript..."* |

## 4. Methodology

Education research can be carried out in several ways, depending on the purpose of the research. Keeping in mind the aim of our research and that GradDipIT is an ongoing programme, we found action research to be the most suitable methodology for this study. Action research is widely used in educational research where the aim, as in our study, is to formulate a solution or guideline (Winch, Oancea, & Orchard, 2015). The aim of this study is to critically evaluate and reflect on the impact of GradDipIT programme on students. Hence, we used action research as it allows academics to reflect on their practices and evaluate the programme (Norton, 2018). To measure our programme's effectiveness the following surveys were conducted:

1. Students' performance in the programme
2. The students' feedback regarding the course
3. Industry partners' feedback
4. Current students' perceived benefits of the course
5. Graduate employment survey

Surveys 1, 2 and 3 were conducted on students in the year 2016, thus they encompassed students in four of our terms. Survey 4 was conducted on the students from 2016 and the ones who completed in the first term of 2017. Survey 5 was conducted on our 2016 graduates.

## 5. Results and Discussion

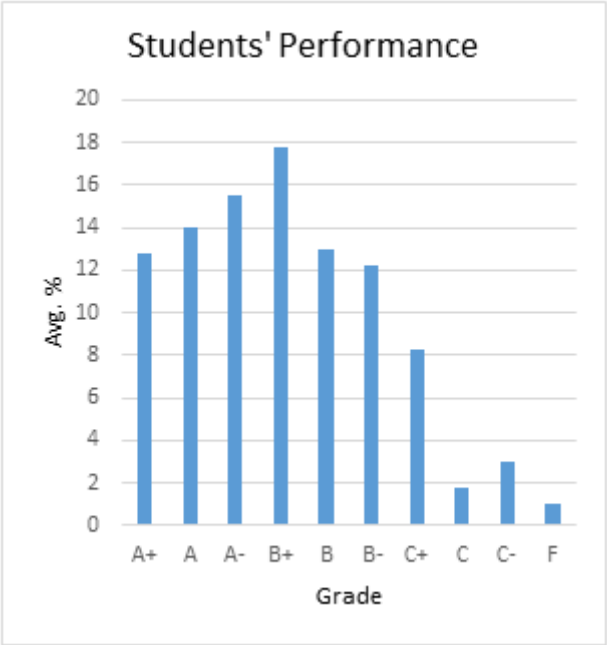
To show the effectiveness of the industry-focused learning approach adopted in developing and running the GradDipIT programme, data have been continuously and consistently collected about different aspects related to the programme. The data collection tracks issues in four main categories which are the students' performance, the learners' and industry partners' feedback, perceived learners' benefits and employability data.

### *5.1 Students' performance*

Figure 2 shows the students' performance over the year 2016, these results are for 40 courses with 522 learners enrolled in these courses. The majority of the students' results were above

the average, with about 80% gaining As and Bs. This is a clear indication that students have performed very well in their studies.

**Figure 2:** Students' Performance

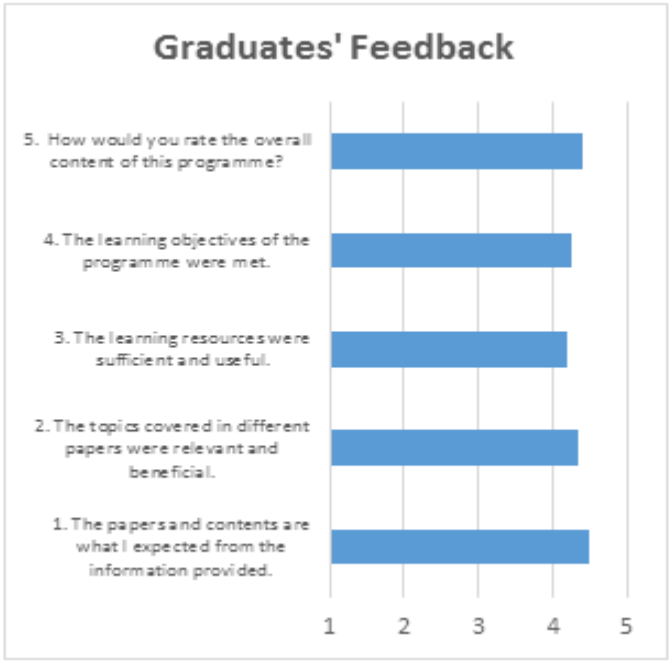



Other achievements that demonstrate students' excellent performance over the year 2016 were that 20 students gained a variety of industry certifications such as Microsoft Technology Associate and Android Developer Certificate, 35 students participated in the Microsoft Student Accelerator programme and one student gained the inaugural Aspire2 Succeed Award. This award includes a significant cash prize and is granted to only one student among all Aspire2International graduates. This award is given to a student who has shown not only a high academic performance but also a clear contribution to the learning environment by going above and beyond what is needed. Additionally, one GradDipIT student was selected among 20 successful applicants from all New Zealand PTEs for the Bootcamp programme.

### *5.2 Learners and Industry Partners satisfaction*

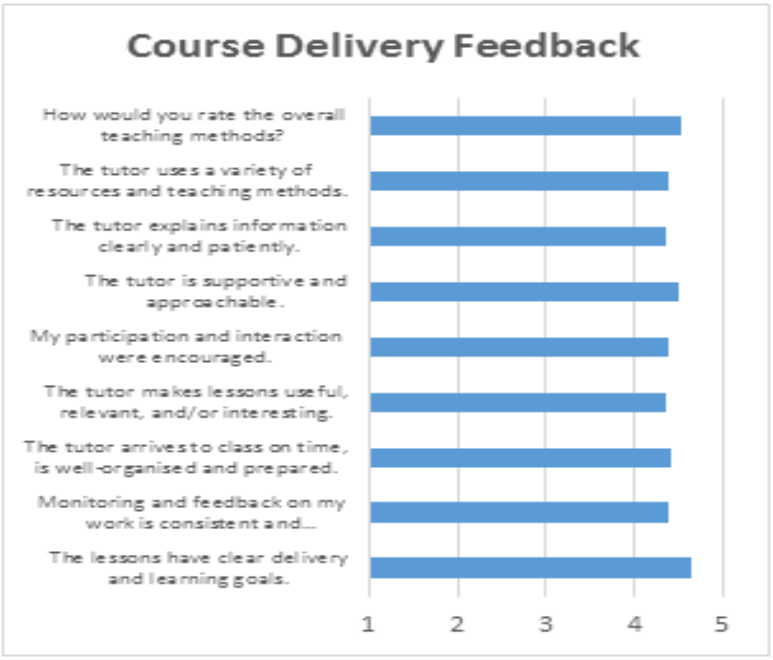
Gathering learners' and graduates' feedback is an essential and continuous process. Figure 3 shows the feedback gathered from 45 graduates. The graduates were asked to rate their satisfaction with the programme on a scale of 1 to 5. One being not at all satisfied and 5 being extremely satisfied.

**Figure 3:** GradDipIT Graduate Feedback




The feedback shows a high satisfaction of graduates about the programme with the overall rating of the content of the programme being 4.4 out of 5. The graduates were asked to rate their satisfaction about course delivery on a scale of 1 to 5. One being not at all satisfied and 5 being extremely satisfied. Feedback from the learners about the course delivery also shows a high satisfaction of the learners about the teaching and delivery methods used in the programme. Figure 4 shows that the ratings for all survey questions are above 4 on a 5-point scale.

**Figure 4:** Course Delivery Feedback



GradDipIT students have worked on a number of projects for different NZ companies. The feedback received from the industry partners shows that they are highly satisfied with project outcomes and very confident that GradDipIT graduates are work-ready. New companies are approaching every term to provide new projects for GradDipIT students to work on. Five students have been offered full-time employment directly with our industry partners after completing their industry project with them. Other students have got references from our industry partners that help them to secure a job. Table 4 summarises the feedback from three industry partners.

**Table 4:** Industry Partners Feedback

| Industry Partner / Observer | Feedback |
|---|---|
| Industry Partner 1<br>Founder of IT company (Web Development and Data Mining) | *Our company has had an ongoing working relationship with NTEC for the past 2 years. As the projects have progressed during the semester, the students have all grown in confidence and ability producing very good work.*<br>*I highly recommend these types of industry projects with the team at NTEC and it is also a great way to recruit new employees via the student projects.* |
| Industry Partner/Observer 2<br>Founder of a Building Management System (BMS) company | *We have done several industry projects with NTEC over the past 12 months and are very pleased with what has been achieved. Over the past 10 years we have done maybe 60 student projects across various PTEs and the mainstream Auckland universities and Polytechnics, from Level 7 course projects right through to PhDs so have a very good feel for the likely outcomes and success rates. The results that we have seen from these NTEC projects is definitely in the top tier for us.* |
| Industry Observer 1<br>Manager of UI/UX company | *I have to say I was very impressed with the quality of the work that the students produced and having been in the academic world for a number of years, I can comfortably say that they were among the best I have ever seen.* |

### *5.3 Perceived Learners' Benefit (PLB)*

The aim of this survey was to understand how our current students perceive the course they are undergoing. Mainly the aim was to answer the question: Do the students think GradDipIT will help them in their ICT career? To answer this question, we formulated questions PLB1 to PLB11 described in Table 5. Additionally, we added another question PLB12 which deals with further education. Questions PLB1 to PLB11 look into a students' self-assessment of the course with respect to two main points: industry exposure and job readiness (Culkin & Mallick, 2011, Finch, Peacock, Levallet, & Foster, 2016). The aim of the GradDipIT is to provide students with industry exposure while they are still studying. For this purpose, the students undergo a 14-week industry project. As for the further education pathways, several NZ universities like Waikato University and Massey University invite applications from GradDipIT graduates directly into their Master programmes, confirming the academic quality in addition to employer commitment. PLB12 indicates that student satisfaction with these further education pathways is high.

**Table 5:** Perceived Learners' Benefits Survey Question

| Question Code | Question |
|---|---|
| PLB1 | I believe that the Graduate Diploma in IT programme makes me IT industry ready |
| PLB2 | I believe that the Graduate Diploma in IT programme provides me with the relevant technical skills that make me IT industry ready |
| PLB3 | I believe that the Graduate Diploma in IT programme provides me with opportunities to improve my communication skills |
| PLB4 | I believe that the Graduate Diploma in IT programme provides me with opportunities to learn and exercise team management |
| PLB5 | I believe that the Graduate Diploma in IT programme provides me with opportunities for self-learning |
| PLB6 | I believe that the Graduate Diploma in IT programme provides me with opportunities for research |
| PLB7 | I believe that the Industry Project in Graduate Diploma in IT provides me with an opportunity to work on real world IT problems |
| PLB8 | I am satisfied with the opportunity provided in the Industry Project to work with real clients |
| PLB9 | I am confident that the Industry Project will help me improve my client interaction skills |
| PLB10 | I am confident that the experience gathered in the Industry Project will help me at an actual workplace |
| PLB11 | I believe that having an Industry Project as part of the course with real clients will increase my possibility of getting an actual IT job |
| PLB12 | I am satisfied with the further education pathways available after the completion of my programme |

**Figure 5:** Perceived Learners' Benefits

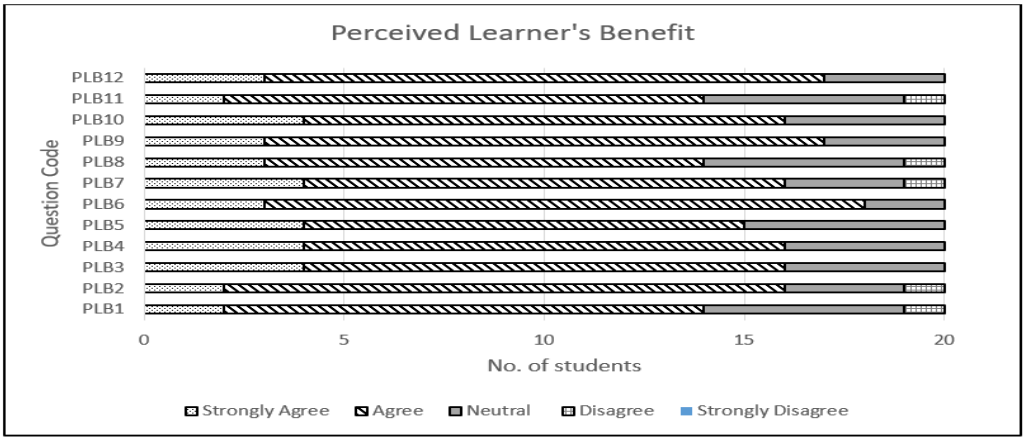



Figure 5 shows that the vast majority of students agree or strongly agree with the benefits of the programme. However, some students gave a neutral reply to some answers and one student gave a negative answer. We will investigate these neutral and negative answers and see what and where our programme is lacking, and we will then formulate a course of action to fill those gaps.

The results of the survey shown in Figure 5 also indicate a positive response from the students and indicate that a majority of them feel that they get adequate industry exposure while still studying. Additionally, questions PLB1 to PLB11 also measure job readiness. This is another of GradDipIT's objectives to equip students with the best possible ICT education so that they are confident enough to hit the ground running as they enter the ICT industry. The results in figure 5 indicate that a majority of GradDipIT students feel job ready.

### *5.4. Employability*

Table 6 describes the employment rate of graduates one year after completing the programme.

**Table 6:** GradDipIT Graduates' Employability

| Term | No. of Graduates | Employed | Employed within the first 3 months | Employed within 3 to 6 months | Employed within 6 to 12 months |
|---|---|---|---|---|---|
| T1 2016 | 11 | 10 | 4 | 5 | 1 |
| T2 2016 | 22 | 19 | 4 | 7 | 8 |
| T3 2016 | 35 | 29 | 6 | 12 | 11 |
| T4 2016 | 10 | 9 | 4 | 3 | 2 |

The data gathered from GradDipIT graduates show that the employment rate of students within one year after graduation was an average of 87% (90%, 86%, 82% and 90% for T1, T2, T3 and T4 2016 respectively). The employment outcomes have confirmed that the industry-focused framework was very helpful to the students providing them with essential knowledge and skills necessary for securing their IT-relevant jobs in New Zealand.

## 6. Conclusion

This study has a unique significance in the New Zealand context. The structure of the programme shortens the feedback loop between employers and Aspire2International as provider of the programme. Employers' requests for project deliverables reflect the current and immediate future trends that are important for their future needs. The project requests are future-focused rather than 'mission critical' which provides a more supportive environment for students to learn. Industry feedback is invariably very positive.

The results of this study have confirmed that students performed very well, always above average and they were highly satisfied with the knowledge and skills they gained. The employment data collected over a year showed that 88% of GradDipIT graduates have been employed within a year after completion.

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**Chris Mitchell,** Director, Axcel Institute Ltd is the licensor for the Graduate Diploma in IT (GradDipIT) currently offered under an exclusive license agreement with Aspire2 International. Chris has a Postgraduate Diploma in Business and Administration (Finance) and has a strong interest in work-integrated learning and cooperative education. He was a member of the executive committee of the New Zealand Association of Cooperative Education (NZACE) in its formative years in the 1980s. He has worked in the education, government and private business sectors and continues to support delivery of the GradDipIT programme that was first developed and approved in 2001.