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Opinion

The trifecta for curriculum sustainability in Australian universities

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Abstract: Commercialization and internationalization of tertiary education has opened a new way for universities to grow and make more profit. This in turn has supported sustainable growth of the higher education sector for the last three decades in developed countries. Curricula offered by accredited tertiary institutions must meet the quality standards set by both the governmental agencies and the professional accreditation bodies. These programs must also provide graduates with employment opportunities. Hence, quality and employment opportunities are the two key factors for sustainability of any degree program offered by tertiary institutions. However, changes in regulations and policies by the national government sometimes play a vital role in creating new programs, and maintaining or disestablishing some existing programs offered by institutions in the nation. These changes are not controlled by individual institutions, which has become the third unpredictable factor in curriculum creation and/or sustainability. Using the journey of a new master's program in information technology (IT) in an Australian university as a case study, we explore how this third factor impacted on the initialization, creation, and short life of this program primarily targeting international students in the mid-2000s. We then extend our discussion to the implications of the recent changes to tertiary tuitions from 2021 by the Australian Government on the sustainable future of the Australian tertiary education sector on a broad scale.

Keywords: curriculum quality, employment opportunities, government regulations and policy, curriculum sustainability, international education, tertiary education

1. Introduction

Two prominent changes have reshaped the tertiary education sector in Australia in the last three decades. The first change is the commercialization of higher education that opened the door for almost the entire population to have access to university education in various ways. Young students and adults who passed the formal entrance examinations can choose to study at universities with government loan support schemes. Those students who are not qualified for taking government supported places can still have university education by paying full tuition fees at some universities and are classified as domestic full-fee-paying students.

Commercialization of higher education in Australia also resulted in another even more profound impact on the Australian tertiary education sector: internationalization. Overseas students who pay an even higher tuition fee have increased from a few percent in the 1980s to nowadays more than 50% of the student enrolments in many Australian universities [1-4]. These overseas students are predominantly from Asian countries, such as India, China, Korea, Japan, Singapore, Malaysia, and other Middle East countries [1, 5].

During the same period, education internationalization has also been promoted at almost all universities in USA, Canada, UK, and other European countries, with all aiming at sharing the international student market [3, 6-9]. Geographically, Australia is within the broad region specifically denoted as Australasia and its immigration policy favors young graduates with an Australian tertiary degree. This has made Australia the top choice for many Asian students [10, 11]. To attract more overseas students to undertake onshore degree studies, many Australian universities have expended efforts in creating new programs to facilitate international student recruitment whilst also meeting the needs of domestic students.

Any degree curriculum offered by an accredited university must meet the quality standards set by the corresponding professional governance body. For example, the Australian Computer Society (ACS) periodically accredits all tertiary degree programs in information and communication technology (ICT) offered by Australian tertiary institutions. Institutions, students, governments, communities, and industries also agree that good programs should provide the graduates with employment opportunities in the relevant profession. Hence, curriculum quality and future employment opportunity for the graduates are the two key factors influencing the survival and viability of tertiary degree programs. The recent efforts in many universities have seen that most programs have incorporated these two factors into the design and quality assurance of curricula through redefining graduate attributes of a program and embedding work-integrated learning (WIL) into the programs [12-17]. Good design and effective implementation of a curriculum often leads to the creation of a quality degree program, which needs further enhancement through good teaching delivery by experienced teachers and learning feedback from students who undertook the study of the program. However, a quality degree program delivered by experienced teachers does not guarantee a definite future for the program because external factors, some predictable whereas others unpredictable, may have a greater influence on the lifespan of a quality program. For example, changes in industry demands for graduates from a professional field, particularly any ICT discipline, are progressive, hence largely predictable. On the other hand, the COVID-19 pandemic that emerged from early 2020 is an unprecedented event, or an unpredictable factor, has caused catastrophic consequences and disruption across the whole world, including the educational sector.

Many postgraduate degree programs by coursework in ICT disciplines in Australian universities are primarily designed for attracting overseas onshore students. A large proportion of international students enrolled in such postgraduate coursework programs, mostly at a master's level, aim at gaining Australian permanent residency after successfully completing their onshore study in Australia. If an award of an accredited master's degree issued by an Australian university is included in the skilled occupation list (SOL) released by the Commonwealth Government of Australia, the awardee would be eligible for applying for Australian permanent residency. The Australian government uses the SOL as a strategy to direct skilled immigrants to professions which the nation requires now and in the near future, or to geographic regions where the economy needs boosting with more skilled people.

The government regularly reviews and updates the SOL to ensure that genuine skill needs are met across Australia. Some of the updates to the occupation list may well be oriented with the shortage of skilled workforce nationwide, which is relatively predictable for institutions to consider creating new degree programs in a relevant discipline for international students. However, sudden removal of some occupations from the SOL often happens in new updates, imposed on the uncertainty of the frequency of updating. Such unpredictability has a profound impact on creating new degree programs for international students in Australia. In Australia, it typically takes a university 1.5-2 years to create a quality degree program from its conception, feasibility study, final proposal, education committee approval, and finally academic board approval to ensure compliance with the requirements of the Australian Qualifications Framework (AQF) and the Tertiary Education Quality and Standards Agency (TEQSA) for any new degree program registered on the Commonwealth Register of Institutions and Courses for Overseas Students (CRICOS). Professional accreditation of a new program is normally conducted after the program has been officially launched. Hence if an occupation appeared in the SOL for only a few years, or is suddenly removed from the SOL, any associated degree program at an institution would quickly become unviable by dramatic reduction in international enrolments. Therefore, changes in government regulation and policy are another vital and unpredictable factor in creating degree programs in Australian universities.

In this study, we present a case study on the process of conceptualization, design, official approval, and struggle of a master's program in information technology (IT) at an Australian metropolitan university in the mid-2000s. It is a good lesson to share with other educators in this ever-changing world of education internationalization.

The rest of this paper is organized as follows. Section 2 outlines the initial ideas and rationale on creating such a specialized master's IT program. Section 3 details the design logic, curriculum structure and the quality assurance process of this new program during 2003-2004. Section 4 describes the journey for survival of this new program impacted by a sequence of changes in government regulations and policies during 2005-2006. Section 5 reflects upon the implications of governmental changes in regulations and policies on both new curriculum design and sustainability of existing and new programs in Australian universities, with our opinion on how such unpredictable impact should be rationalized in the future.

2. Conceptualization and rationale for Master of Networking and Distributed Systems

The 1990s IT boom saw IT graduates in high demand in Australia and new IT graduates were not of sufficient number to satisfy job vacancy demands. Therefore, all IT specializations were on the SOL

at the time. International students who completed either a bachelor or master's program in IT disciplines accredited by ACS in an Australian university would be rated highly with extra points in their applications for Australian permanent residency. It normally takes three years of full-time study for a student to complete a bachelor's degree whereas a master's degree by coursework only took one and a half years to complete until the mid-2000s. Hence, more overseas students who already completed a bachelor's degree in a credited foreign university would prefer to undertake a master's study at an Australian university in the late 1990s to the mid-2000s. This led to such coursework master's programs in IT being very popular at the time.

Like other Australian universities during this period, the metropolitan university, that forms the focal point for this case study, had already offered multiple master's programs to students, such as Master of Information Technology (MIT), Master of Computer Science, Master of Computer Security, and Master of Software Engineering. All these master's programs could be completed in 1.5 years (or three semesters) of full-time study. In the early 2000s, network technology was a popular specialty for IT professionals who were dealing with more practical matters in computer networking and communications networks. However, no specialized mater's program in network technology was available, even though a few units (equivalent to courses in the US) in networking and network technology were offered as electives at this university. There was a strong desire from many students to undertake a master's program specialized in network technology. However, the skill levels and knowledge body in network technology alone at that time could not make up the quality standard required for a master's degree.

In the meantime, distributed systems and development emerged as a highly integrated IT specialty during the early 2000s across the world. The specialty of distributed systems is built on skills and knowledge in computer science, information technology, networking, and software engineering for the design and development of secure, open, scalable, concurrent, and consistent networked IT systems, which met the quality standard required for a master's degree. Two postgraduate units in distributed systems were already included in the existing MIT. Many students enrolled in the MIT wanted to complete further study in distributed systems after completing the two available introductory distributed systems units, particularly in the areas of distributed system design and development.

Combining networking and distributed systems together to create a new master's degree was a logical decision to meet both the demand of current and future students and the quality standard for master's degrees. A small team comprised of academic staff from both networking and computer science disciplines came together to conceptualize and propose a new master's program specialized in both network technology and distributed systems – Master of Networking and Distributed Systems (MNDS). Such a master's program would be the first of its kind in Australia at the time.

3. Design, structure, and approval of the new master's program

Although some training programs in network technology were offered by other institutions, the proposed MNDS was an advanced and specialized master's program in networked communication systems that was built on a platform combining the International Standards Organization (ISO) Open Systems Interconnection (OSI) Reference Model and the Internet Communication Model [18, 19].

3.1. The ISO Open Systems Interconnection (OSI) Reference Model

To regulate network communication standards, the International Standards Organization proposed a communication protocol named as the Open Systems Interconnection Reference Model, or ISO Communication Model. It consists of seven layers, from bottom to top, Physical, Data Link, Network, Transport, Session, Presentation, and Application, respectively (Fig. 1). This layered protocol provides standard rules that govern the format, contents, and meanings of messages sent and received in networked systems.

Each of the seven layers deals with one specific aspect in networked communication. The physical layer defines how individual bits are formatted and then transmitted through the network. The data link layer deals with message delineation, error control and network medium access control. The network layer is responsible for making routing decisions. The transport layer deals with end-to-end issues such as segmenting the message for network transport and maintaining the logical connections between sender and receiver. The session layer is responsible for initiating, maintaining, and terminating each logical session between sender and receiver. The presentation layer formats data for presentation to the user, and provides data interfaces, data compression and translation between different data formats. The application layer is the user's connection to the network and includes the application software and other supporting software packages used to connect the application to the network.

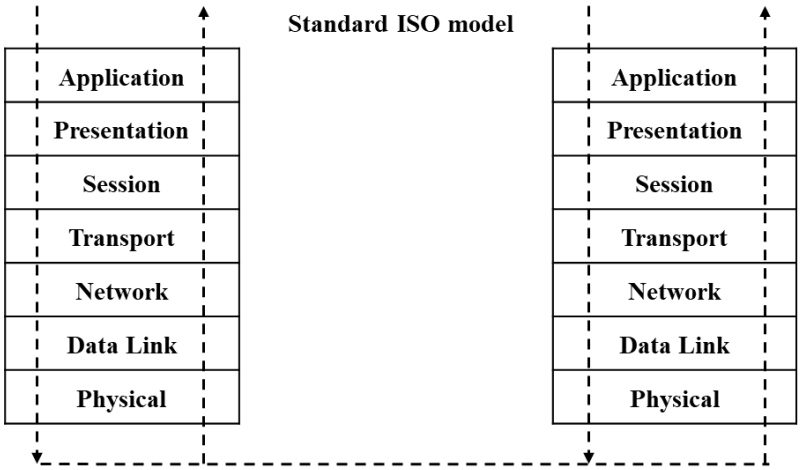

Figure 1. The standard ISO Communication Model.

This seven-layered ISO communication protocol clearly defines the functionalities of each layer, particularly for the top three layers of Session, Presentation, and Application. In practice, a distributed software package often includes all the required operations for the users to interact with the system through the interface provided. The users do not need to distinguish the internal sections of functionalities contained in different layers. Rather, with demand on availability of a common platform that can support quick development of compatible distributed applications for a developer who is likely good at using a particular programming language, a modified ISO Communication Model was later proposed with six layers by replacing both Session and Presentation layers with a Middleware layer

(Fig. 2). This middleware layer contains both the general-purpose protocols that are shared by many applications, and the collection of libraries that can be used by developers to create new distributed applications.

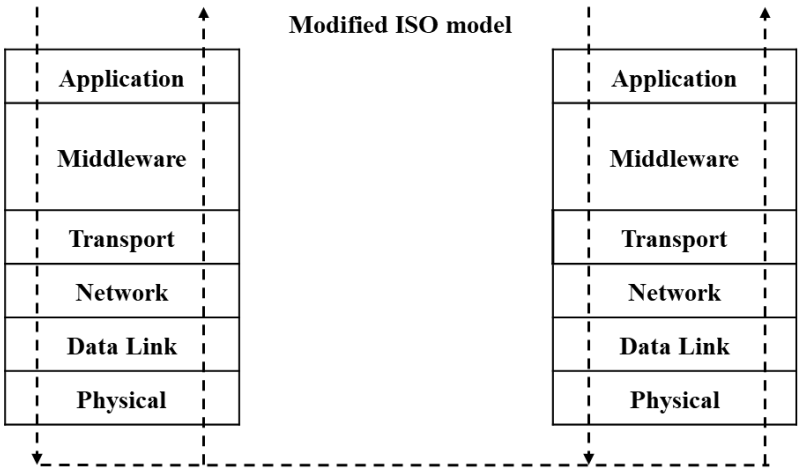

Figure 2. The modified ISO Communication Model.

3.2. The Internet Communication Model

The original ISO communication protocol has never been fully implemented because it was proposed after the wide acceptance of the de facto Internet Communication Model that consists of only four layers of, from bottom to top, Hardware, Network, Transport, and Application (Fig. 3). Hardware combines the ISO Physical and Data Link layers together whereas Application covers the functions of the ISO Session, Presentation, and Application layers together. The two middle layers are identical to their ISO counterparts.

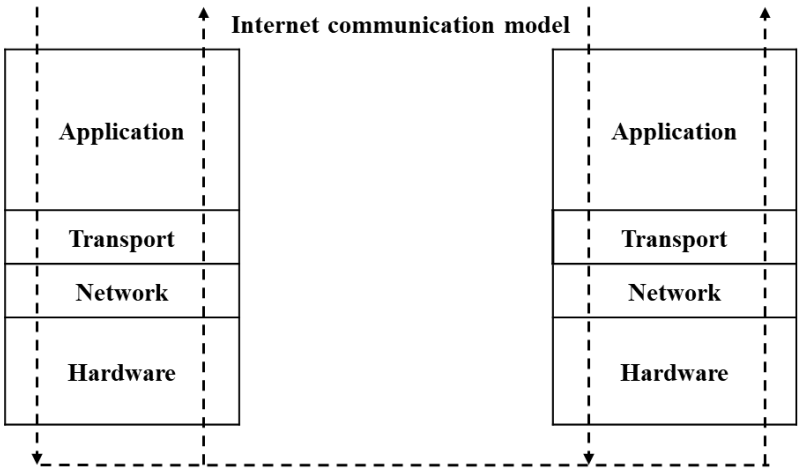

Figure 3. The Internet Communication Model.

Although the four-layered Internet Communication Model has been the dominant protocol used in networked communication systems for its historical reasons, the lack of well-defined rules to regulate communications in large-scale heterogeneous networked systems has often caused problems in compatibility and interoperability in communication. Developers have to add extra pieces of software between the Transport and Application layers to facilitate interoperability. Since the Internet Communication Model has no dedicated layer to host these pieces of 'supporting agents', it can result in making the Application 'bloated'.

For cohesive development of distributed systems in the future, it seems that the modified six-layered ISO Communication Model is a reasonable choice for networked communication systems, where the middleware layer not only holds all those 'supporting agents' shared by many applications, but also provides a platform for developers to create new distributed applications.

3.3. Structure of MNDS

The structure of MNDS was aligned to both the modified ISO and Internet Communication Models and comprised of nine units over three semesters of full-time study (Fig. 4). The six core units in the first two semesters should cover both the general and specific aspects associated with individual layers and the overall system. After completion of these core units, students could choose either a coursework stream or a project stream to complete the program in the final semester. If choosing the coursework stream, a student could select three units from a pool of six units available in the existing Master of Computer Security. If choosing the project stream, a student would complete an applied project on a special topic in either networking or distributed applications agreed on by the student and the project supervisors in the final semester (Table 1).

<table>
<tr><th>Standard ISO model</th><th>Modified ISO model</th><th>Internet model</th><th>MNDS core units</th></tr>
<tr><td>Application</td><td>Application</td><td rowspan="3">Application</td><td rowspan="3">PDSD, APL & PDS</td></tr>
<tr><td>Presentation</td><td rowspan="2">Middleware</td></tr>
<tr><td>Session</td></tr>
<tr><td>Transport</td><td>Transport</td><td>Transport</td><td rowspan="2">NT2 & NT3</td></tr>
<tr><td>Network</td><td>Network</td><td>Network</td></tr>
<tr><td>Data Link</td><td>Data Link</td><td rowspan="2">Hardware</td><td rowspan="2">NT1</td></tr>
<tr><td>Physical</td><td>Physical</td></tr>
</table>

Figure 4. Networked communication models in relation to the design of MNDS.

The design logic of this curriculum is illustrated in Figure 5. The inner circle as the core was vertically halved and each half consisted of three core units. The three units of Network Technology 1 – 3 (NT1, NT2 and NT3) in the network half covered the Hardware, Network, and Transport layers correspondingly. Three other units in the other half, Principles of Distributed Systems Design (PDSD), Administration and Programming in Linux (APL), and Programming for Distributed Systems (PDS), were linked to Middleware and Application in the modified ISO Communication Model (Fig. 4). These

three units would guide students progressively towards mastering the process of analysis, design, implementation, testing, and deployment of distributed applications in a networked environment. The outer circle was horizontally halved, and the two halves correlated to the project stream and the security-oriented coursework stream, respectively. Each half would be built on the knowledge and skills gained from the core units.

Table 1. Initial program structure for the MNDS.

Core units in first and second semesters	
Network Technology	Distributed Systems
Network Technology 1 (NT1)	Principles of Distributed Systems Design (PDSD)
Network Technology 2 (NT2)	Administration and Programming in Linux (APL)
Network Technology 3 (NT3)	Programming for Distributed Systems (PDS)
Third semester	
Either	Project Preparation
	Project 1
	Project 2
or three units from	Computer Security
	Information Security
	Network Security
	Wireless and Mobile Computing Security
	Internet Security 1
	Internet Security 2

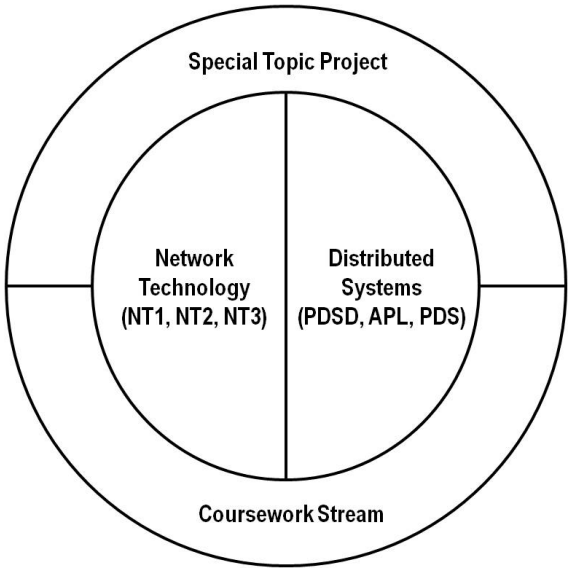

Figure 5. Logical structure of MNDS

3.4. Knowledge flow of the core units

NT1 was primarily concerned with the devices and technologies of the Hardware layer in the

Internet Communication Model that combines both the Physical and Data Link layers in the ISO communication Model. Topics would include the provision of high-bandwidth connectivity and the design, configuration and management of both switching and multi-layer switching technologies. Access policies to control user access and traffic would also be addressed in this unit.

NT2 was primarily concerned with devices and technologies of the Network layer in both communication models. Topics would include the design, configuration and management of scalable networks. All the major interior and exterior gateway routing protocols would be covered in this unit.

NT3 was primarily concerned with devices and technologies of Wide Area Network (WAN). Topics would include the design, configuration and management of remote access networks using a variety of contemporary WAN protocols. The major circuit switched and packet switched technologies would be addressed in this unit.

After completing these three core units, students could take a special project on design, implementation, testing, and evaluation of a network system, or choose the security-oriented coursework to complete the program.

PDSD was designed to provide an overview on fundamentals of distributed systems. Systematically discussed were principles for system design, requirements for system development, and problems that emerge with applications for distributed systems. Mechanisms of communication, processes, naming, synchronization, replication, fault tolerance and security in distributed client-server systems were given particular attention.

The Linux operating system was chosen for facilitating practices in distributed systems development for this program. This open source platform would allow students to set up a networked system at home for exploring/managing network activities in their own rights. The resources for supporting distributed applications were readily available in Linux, which would provide students with a real environment for developing, testing, and deploying new distributed applications.

APL was designed to familiarize students with programming and administration in Linux. The emphasis was on the Linux operating system and network administration and programming using Linux software development packages so that students could examine and experience both practical and theoretical issues associated with programming for distributed systems. On completion of this unit, students should be able to research Linux system specification and administration, examine Linux administration in the context of distributed computing, and create simple programs for a distributed computing environment in Linux.

Both PDSD and APL were the prerequisites for PDS. PDS was designed to articulate the theory of distributed systems that students learnt in PDSD with practice on distributed application development using existing development tools in Linux. Some advanced distributed computing paradigms were analyzed to compliment the practical activities. Students were required to do all the practices in the Linux environment already exposed in APL. On completion of this unit students should be able to implement simple distributed object-based applications.

By completing these three core units, students could take a special project on the development of real distributed applications, or the security-oriented coursework to complete the program.

3.5. Market analysis

Feasibility of this proposed program was justified by the following three major factors. Firstly,

since the mid-1990s most IT systems have been enabled by distributed applications over digital communication networks. This fast-growing trend in system development had been sensed by IT professionals who were the main source of domestic full-fee-paying students enrolled in master's programs. Many of these students had expressed their desire to take such a specialized program to enhance and/or expand their knowledge and skills in this specialty. Secondly, a large portion of international students had worked in the IT industry for some years. These students wanted to complete a master's program not only for gaining an advantage for their immigration applications, but also obtaining new knowledge and skills in networking and distributed systems. The last factor was that no such specialized master's program had been offered in other universities, and thus the program was expected to attract more interested students to the university.

These factors were confirmed by the market study from marketing experts. The number of new full-time students in this proposed master's program was roughly forecasted by a linear model as around 80 in 2005, 100 in 2006, and 125 in 2007. These annual numbers would be the sum of the two new intakes in both the first and second semesters in the same year with a split of 55% to 45% for the first and second semesters, respectively.

3.6. Proposal and approval

The formal proposal was submitted to the governing university bodies in the middle of 2004 for approval. During this period, the federal government announced a new policy that any international student must study full-time for at least two years in an Australian university to be eligible for applying for Australian permanent residency through the skilled occupation scheme, in addition to completion of a degree program in Australia. Hence, completion of a three-semester master's program in an Australian institution would not be enough for the graduate to apply for Australian permanent residency. Considering this new policy and other academic matters, the governing bodies approved the proposal for this new master's program subject to 1) changing to a more conscious title – Master of Network Technology (MNT); 2) creating a one-semester program of graduate certificate related to networking or network technology. This was to offer students articulation from the 1.5-year master's program to a duration of 2-year full-time study for those international students who would apply for Australian permanent residency.

Consequently, a Graduate Certificate in Network Technology (GCNT) was proposed. GCNT was developed as an award for people with little or no exposure to IT who wanted an entry-level qualification into the IT industry. Both GCNT and MNT were officially approved in late 2004 for the first intake in 2005.

4. Struggle for survival (2005 – 2006)

MNT was officially launched in the first semester of 2005. To provide students with the maximum flexibility in settling in the most appropriate program for individuals, new students could enroll in any available master's IT program in their initial semester. Upon successfully completing the units in the initial semester, students could then choose to continue progressing in the current program or transferring to another program in the next semester. Hence, the actual number of enrolments in a master's program would vary from semester to semester until the completion of the first two semesters of the three-semester program at the time. As an indirect indicator, we could use the enrollment number

in the first-year core unit PDSD for MNT to trace the trend of new student numbers involved in the MNT in 2005 and 2006.

In the first semester of 2005 when the program was officially launched, there were 39 students enrolled in PDSD (Fig. 6), which was about 90% of the forecasted number of enrolments for MNT in that semester. Towards the end of the first semester, the government announced new changes to the immigration policy, which gave overseas students extra points in their immigration application if they completed an eligible degree at a regional campus of a metropolitan university or at any Australian university located outside of the major capital cities in Australia. A considerable portion of new international students would have chosen other regional universities for their study in order to earn the bonus points for their immigration application. Since this program was only delivered on a metropolitan campus, students studying there were ineligible for the extra points. This policy change must have had an immediate negative impact on this program because there were only 28 new students enrolled in PDSD in the second semester of 2005, about 78% of the forecasted number of enrolments for MNT in that semester. Despite this, the program was still financially viable.

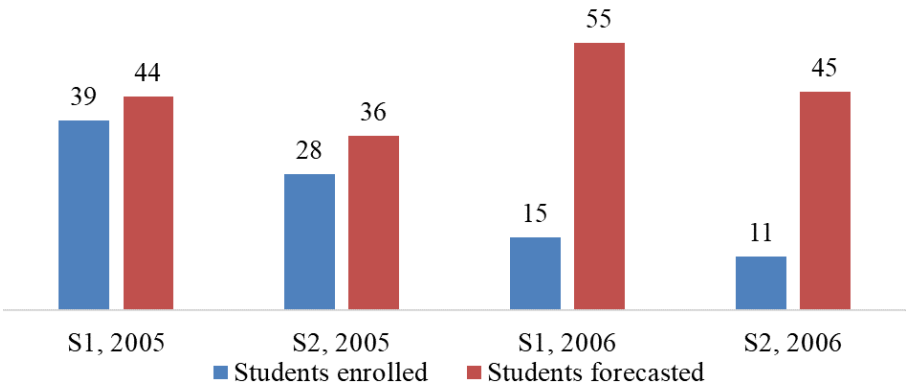

Figure 6. Actual enrolments in PDSD (blue) and forecasted enrollments for MNT in 2005-2006

By the end of the second semester in 2005, new changes to the immigration policy were announced again, which saw the removal of most specializations in the IT profession due to the updated SOL, including networking. However, computer security remained in the updated SOL. These updates drove international students to other specialized master's programs still included in the updated SOL. The immediate impact of this policy change on the MNT was two-fold: most existing students enrolled in MNT in 2005 were switched to the Master of Computer Security in 2006; most new international students who planned to study MNT in 2006 were forced to take the Master of Computer Security. As a result, there were only 15 new students enrolled in PDSD in the first semester of 2006, only 27% of the forecasted enrollments for MNT in that semester and 62% less than the number in the first semester of 2005 (Fig. 6). The student enrollment number in PDSD went down even further in the second semester of 2006 with only 11 new students enrolled.

The government made such changes because by 2005 the effect of the IT bubble collapse had a severe impact on the Australian IT industry, which was indicated by the sudden shrinking of domestic full-fee-paying students from IT companies. It was inevitable that the reduced student enrolment numbers in the MNT became unsustainable for the program to survive from 2006. In such a chaotic situation, the low enrolment in almost all of the master's IT programs, except for the Master of

Computer Security, left university management with the decision to not only withdraw the resources allocated to fully implement the proposed new units for MNT, but also cut about 40% of its IT academic workforce by the end of 2006.

Soon after, the federal government changed the regulations for the composition of master's degrees in Australian institutions, which required all coursework master's programs to be completed in 2-years of full-time study. This was the final blow that knocked MNT from offering viability. Although the MNT was still listed in the university's program handbook in 2007-2008, it did not admit any new students from 2007. Those students who started the MNT in 2006 were transferred to other master's programs in 2007.

One may argue that the teaching quality for the units in the MNT might be a factor leading to the unsustainability of this new program. Student's teaching evaluation data for individual units in the MNT during 2005-2006 were private to individual instructors and hence not publicly available, however, student's teaching evaluation data for PDSD in 2005-2006 were available (Table 2). From the feedback of more than 60% of the students who participated in the teaching evaluation in each of the four semesters from 2005-2006, student's satisfaction of the teacher's teaching performance was above 80% in all semesters and averaged higher than 90% over the four semesters. There might be very few students who were not satisfied due to various reasons [20, 21], but for this case, it was unlikely that the teaching quality was a key factor leading to the unsustainability of the MNT.

Table 2. Teaching evaluation for PDSD during 2005-2006.

Semester	Students enrolled	Students returned feedback (rate)	Teaching satisfaction (%)
S1/2005	39	25 (64%)	89
S2/2005	28	22 (79%)	81
S1/2006	15	12 (80%)	100
S2/2006	11	9 (82%)	92

5. Discussion and conclusion

Commercialization and internationalization of tertiary education has provided universities with a new way to grow and make more profit, which in turn supports the sustainable growth of the sector. Australian universities have been very successful in recruiting international students, particularly Asian students. The high proportion of international students in many Australian universities has irreversibly changed the landscape of Australian tertiary education [3]. Since the late 2000s, education has become one of the top five exports in Australia [22]. Postgraduate programs have made a significant contribution to this achievement.

After a rapid expansion of student intake in the last three decades in all Australian universities, particularly the rapid growth of international students, many Australian institutions have been operating with a significant income exposure to international students, with some institutions being more dependent on international revenue than government funding. The quick expansion in tertiary education in Australia during the 1990s saw the number of universities almost double compared to the 1980s, even not counting the private tertiary education providers. However, maintaining sustainable operations with the already inflated size for many institutions has become an immensely challenging

task. With the shrinking of the domestic student market in the past several years, even not taking the influence of the COVID-19 pandemic into account, holding and increasing the market share of international students is ever more vital for the sustainability of many Australian universities [3, 23].

Australian universities have several great advantages in recruiting Asian students. These include an attractive immigration policy, close geographical connections, relatively low costs in living and tuition, and most importantly, the good reputation of Australian universities as recognized worldwide. Commercialization and internationalization along with an attractive immigration policy increased international student enrolments in all Australian universities in the last three decades, but the fundamental factor behind such dramatic development is the good reputation and high-quality curricula that are worth investing for good return for many Asian students [1]. Without quality curricula and good reputation, international students would not come to Australia only for the sake of gaining a certification of tertiary education with a lower cost. There is a growing trend that more Asian students who graduated from Australian universities have returned to their origin to seek more opportunities as a result of the rapid economic development in their home country since the late 2000s [24-26]. Therefore, it is vital for universities to maintain and create high quality programs for a sustainable future during a time of intense competition in the recruitment of international students, particularly Asian students [3, 7, 8, 10, 23].

However, creating high quality curricula with prospective employment opportunities may be negatively impacted by uncontrollable external factors. For example, the COVID-19 pandemic that occurred since early 2020 is an unprecedented world-wide event that has dramatically impacted many aspects of modern human life. The education sector has not been spared from the pandemic. This unpredictable external factor has led to cuts in the academic workforce and/or the closure of many degree programs offered by some Australian universities since the middle of 2020 [27-29]. The key reason behind the closure is not due to the quality of those affected programs. Instead, it is a business decision, by senior university executives, because of the significant impact of the reduction of student enrollments in these programs, which made the affected programs financially unviable. However, we must note that the COVID-19 pandemic has impacted almost universally on all education programs, not only on some selected ones.

The unpredictable changes in regulations or policies the government makes for the tertiary education sector may have a profound impact on the sustainability of quality curricula offered in Australian universities. These changes may sometimes have serious negative effects at micro scales for some specializations within a profession, for example the journal of MNT presented in this article, or at macro scales for some professions as a whole. An example of such macro-scale impact is the recent changes in tuitions and funds for domestic students entering bachelor's degree programs at Australian universities from 2021. The federal government wishes to use these changes to direct more students to certain fields where more job opportunities are available, for example, STEM, health, architecture, environment, agriculture, teaching, nursing, clinical psychology, English and languages. Student tuition in these fields will be reduced by 18-59% compared with the cost in 2020. However, the tuition to study humanities, law, economics, commerce, communications or visual arts will be increased by 17-113% compared with the cost in 2020. The argument is that there are still employment opportunities in these professions, neither booming, nor diminishing [30, 31]. For some small and regional universities where many students are from low socio-economic regions, these changes may force more students out of the fields of humanities, economics, commerce, communications or arts,

which in turn may make some programs in these fields at regional universities unsustainable, regardless of the quality of these programs.

Therefore, sustainability of a degree program is not always determined by the quality and associated employment prospective. Sometimes, changes in regulations and policies by the government may drive some quality programs to terminate prematurely, instead of promoting and sustaining quality curricula.

It is timely to consider the long-term sustainability of the Australian tertiary education system. The rapid expansion in student enrolment has occurred but maintaining a healthy status in such an inflated sector requires even greater effort. Undoubtedly, the Australian immigration policy has contributed to this rapid expansion in the last three decades and will continue to influence the planning and operations of Australian universities for many years to come. However, similar to the growth and collapse of the IT bubble in the 1990s-2000s, the Australian higher education sector has kept inflating for two decades and such rapid expansion is not sustainable in the long-term. To avoid disastrous consequences from the collapse of the higher education bubble in the future, collective wisdom is required in advance to deal with the potential risks. We do not know what the strategy should be, but one thing that is certain is that quality curricula always play a key role in the tertiary education sector.

It might be time to consider separating the provision of quality higher education to international students from applications for Australian permanent residency, as has been long argued by journalists and politicians. Government regulations and policies should set a strategic vision for the long-term prosperity and sustainability of the nation, rather than closely controlling the direction of academic education programs offered in tertiary institutions. Let universities focus on developing quality curricula linking to prospective professional careers that attract both domestic and international students aiming to experience a worthy higher education, and not be distracted by the unpredictable external factors.

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