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Enhancing Graduate Skills through Bootcamps

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ENHANCING GRADUATE SKILLS THROUGH BOOTCAMPS

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Abstract:

Universities are facing challenges to prepare industry-ready graduates with knowledge and skills in demand for the workforce. One of the ways to overcome these challenges is through a University-industry collaboration for innovations in teaching. This paper presents the experience of such collaboration in the form of a bootcamp by industry partner Microsoft at the University of Canberra to deliver intensive theory and practical knowledge sessions for the students. The purpose of the bootcamp is to extend graduate skills and prepare students for industry certification, which in turn has the potential to increase their employability. Experienced practitioners from Microsoft and Akkodis presented sessions during two bootcamps over three weeks each, in the most sought-after areas of Artificial Intelligence, Cloud-computing, Cyber Security, Machine Learning, and Data Science. More than 150 undergraduate and post graduate students participated in these bootcamps to gain job-ready skills and knowledge. These bootcamps have been received well by students as indicated in their encouraging responses. The initial response to these bootcamps indicates that such bootcamps will be valuable in the future.

Keywords: Bootcamp, graduate skills, University-industry collaboration, industry certification.

I. INTRODUCTION

In recent years technology has undergone rapid advancements, reshaping various aspects of our lives and industry. Higher education institutions are facing challenges due to rapid technological advancements, increasing global competition, and the gap between graduate skills and industry expectations (Howells et al., 2014; Mukerjee, 2014). In Australia, the Australian Computer Society (ACS) accreditation process assures the quality of IT/IS programs whilst the Australian Qualifications Framework (AQF) assures levels of graduate capability. There is lot of constructive collaboration between the ACS and AQF accreditation expectations for institutions towards constructive alignment of course design and delivery. ACS and government accreditation processes and associated conversations have become drivers for program architectures that align curriculum and industry needs. The ACS requires institutions to prepare graduates for Skills for the Information Age (SFIA) roles. For example, SFIA 8, released by the SFIA foundation on 28 September 2021, has an additional 21 skills and is restructured to highlight the need for deeper

skills in areas like security, data and analytics, and computational science. Despite the detailed process of institutional course quality assurance and longer accreditation cycles, the level of complexity of curriculum design reflects rapidly changing technologies, the nature of service across a diversity of business domains, and the need for soft skills to apply technical knowledge successfully (Topi, 2019). In addition, the Higher Education Support Act 2003 (The Federal Register of Legislation, 2023) suggests engagement with industry as one of the ways to enable graduates to thrive in the workforce. To add on, it is imperative for higher education institutions to ensure that education meets industry expectations. One of the ways to meet such expectations is to increase University-industry collaboration that augments the theoretical foundation gained through formal education and adds value by reflecting current technology competency (Randall and Zirkle, 2005). Such initiatives can include industry-based capstone projects, industry placements and certifications.

University-industry collaboration has become inevitable for resources, research, and reach. Recently, University-industry collaboration for education has increased to a wider extent because the curriculum should mirror the training needs of the industry (Bean and Dawkins, 2021). Traditionally, curriculum development processes involve course advisory groups involving academics, accreditation bodies, students, as well as industry partners. Academics and industry partners work together in many initiatives, typically through an agreement, towards rendering students with investigatory skills to solve practice-based problems. They work together towards helping to keep the curriculum relevant to industry expectations, provide guest lecturers to share their professional expertise, mentor and guide students in work-integrated learning activities, as well as evaluate curriculum as part of the advisory committee. While teaching facilitates knowledge and capabilities development of future professionals, this knowledge can be further enhanced with exposure to additional learning and skilling activities that are integrated with industry. Industry-focused professional development opportunities then become an avenue for incorporating the needs of employers and complex demands of the workforce (Lang, 2023). Embedding industry certification in the curriculum and promoting students towards industry certifications is a new transforming way that academics work with industry on as they prepare students to be job-ready. Thus, while graduating with their bachelor's degree qualifications, students will also gain industry provider certifications in their area of interest. This paper presents a descriptive case study of a series of successful University-industry collaborative bootcamps at the University of Canberra (UC) to prepare students towards their certification.

II. LITERATURE REVIEW

As earlier studies highlight, the benefits of University-industry collaborations include contribution to education and training skill development, acquisition of knowledge through innovation and technological knowledge transfer, increase labor mobility between private and public sector organisations, and present opportunities to start a career path with the firms involved in the collaboration (Wang et al., 2016). Engagement or industry involvement through University-industry collaboration is part of the third mission for Universities that aim to incorporate industrial innovation into the primary activities or missions that include teaching and research. Based on a study of 61 Universities from 2009 to 2013 on the relationship between University-industry collaboration and teaching performance, Wang et al. (2016) assert that University-industry collaboration has a positive impact on teaching.

The continuous changes brought about by automation, globalisation, and changes in technology have led to task change (changes in the amount of time spent on existing tasks and the addition of new tasks), which in turn has led to considerable growth in demand for data and digital skills (National Skills Commission, 2021). The state of Australia's skills in 2021 identified computer and electronics skills as one of the fastest growing skills cluster families. In addition, the 2022 Skills Priority List released by the National Skills Commission (National Skills Commission, 2022) shows many Information and Communications Technology (ICT) jobs having a fill rate lower than 50%. This indicates a growing shortage of ICT skills that need to be filled. However, occupations in high demand are more likely to be specialised and require higher level skills and formal qualifications

(National Skills Commission, 2021). Recent graduates enter the workforce for the first time with a basic set of skills and the ability to learn. The degree to get a job is only the starting point, however, learning must continue for a lifetime through continuous upskilling (Christensen, 2020). In addition, the Australian aging population means that there are fewer people to do jobs, and those who are looking for jobs may not necessarily possess the skills. Further, the pace of business and technology change continuously creates demand for depth in skills not programmed into the current University curriculum (e.g., current demand for Artificial Intelligence (AI) skills was not programmed into most University degrees developed/updated in the last 6 months). Collaboration and partnership with employers and industry technology providers are a win-win endeavor for all as the linkages created are a source of ready talent for employers and inform Universities' course design decisions by helping to identify the skillsets industry may be looking for at any given point in time.

Researchers have proposed several models to improve the effectiveness of collaborations. These models primarily aim to encourage University-industry Collaboration (UIC) and offer guidance for establishing effective UICs. Philbin (2008) proposed a process model that can be utilised by academics and industry practitioners to develop and effectively manage research collaborations. The model is based on the findings of a literature review and an empirical study involving 32 stakeholder interviews. The main components of the model are a central linear process and enabling features such as social capital, knowledge factors, and collaboration agent. Schubert and Fisher (2009) proposed a generic model for Collaborative Basic Research (CBR) model for collaborative empirical research with the primary aim of increasing the relevance and rigor of research. The model is based on real-world experience derived from a case study of a specific collaboration over a period of eight years in Switzerland. The model considers four basic aspects of funding, topic, cooperation, and interpretation. Perkmann and Salter (2012) presented four models of collaboration based on findings from action research projects in which the author of the model engaged in surveys of collaborating industries and academics, interviews with company executives, entrepreneurs, and academic scientists, and secondary material identified through a literature review. Among the four models, deep exploration is a model in which a company creates long-term relationships with Universities to tackle fundamental business challenges, gain access to new areas of expertise, gain access to an array of discoveries by University researchers and hire talented graduates.

The Cambridge-MIT Institute (CMI) formulated a Knowledge Integration Community (KIC) model (Acworth, 2008) for the UK as a more effective approach to knowledge sharing and enhancing the effectiveness of University-industry linkages. Its objective is to increase competitiveness, enhance productivity, and encourage entrepreneurship. Sandberg et al. (2011) proposed a collaboration model for setting up collaborative practice research projects that bring together practitioners and reflecting researchers. The Sponsored Research Interaction Process (SRIP) model (Burnside and Witkin, 2008) is designed to help Universities and businesses handle the complexity of negotiations related to IP contracts. The model is based on collaborative efforts between UC Berkeley and industry. These representative University-industry collaboration models focus primarily on the research aspect. In addition to the various models for specific types of University-industry collaborations described so far, there are some proposed conceptual frameworks that aim to improve understanding of University-industry collaborations in general (Alexander et al., 2018; Ankrah and Omar, 2015; Galan-Muros and Davey, 2017). Further, we identified a framework (Awasthy et al., 2020) to improve the effectiveness of University-industry Collaboration (UIC). This work offers insights regarding concrete steps to be taken for effective collaboration between Universities and industries. The UIC Framework (Awasthy et al., 2020) identified a comprehensive list of factors operating in a broad and wide context within the collaboration system as described in Table 1.

Table 1. University-Industry Collaboration (UIC) Framework

Factors of UIC Framework	Description
1. Understand the variety of interactions	As a starting point, we need to understand the importance of the diverse UICs, which have different extents of involvement, varied duration, and specific associated benefits. An

	understanding of such details about UICs enables the stakeholders to make an informed decision about selecting a partnership suitable to the context.
2. Identify the stakeholders	Assess the stakeholders to ensure that the selected partners have genuine interest and commitment, adequate resources to support the intended outcomes of the collaboration (Barnes et al., 2002), relevance of the problem to the stakeholders, complementary nature of resources, and established capacity of the firm in the area of interest. Prior experience with stakeholders is also a consideration as earlier short-term successful partnerships can lead to long-term strategic partnerships.
3. Identify the motivation of UIC	UIC offers several benefits, which will motivate stakeholders to collaborate. It is important to identify motivations and common areas before collaborating as it will lead to increased commitment.
4. Appoint suitable people, and involve leadership	Motivated individuals play an important role in establishing collaborations and determining their outcomes. Appointing the right and capable people is important for the success of a UIC. Universities and industry should identify and appoint staff and faculty who are suitable for UIC. UIC partners should ensure leadership involvement. The success of a collaboration is influenced by leadership involvement through encouraging engagement, creating a conducive environment, and demonstrating commitment.
5. Ensure basic partnership characteristics	UIC partners must consider everyone's perspective and ensure fair contributions. There should be clear articulation of the amount of active contribution expected from the partners at the beginning of the UIC.
6. Establish effective communication	Communication among participants is critical in order to coordinate work and manage UIC effectively. Stakeholders should adopt measures to improve communication between them, such as regular contact to meet and talk, encouraging bidirectional flow of information, and using virtual meeting tools.
7. Strengthen the dissemination strategy	Universities must work towards strengthening their dissemination strategy and using elements of marketing for sharing collaboration results, and their relevance in order to attract new partners. They should use a variety of channels to enhance the dissemination of results.
8. Address IP concerns	Intellectual property rights are an important factor in many UICs. The process of identifying possible IP, decisions to protect it, and patent portfolio management is challenging. All UIC stakeholders must develop a common understanding around Intellectual Property (IP).
9. Adopt policies and strategies to encourage collaboration	Policies are important in sustaining collaboration. Long-term development of industrially relevant academic R&D resources, communication, reduction of the financial/material costs of interaction, the resolution of organisational conflicts, and filling roles, which can facilitate collaborations at the University-

	industry interface have been identified as key policy areas for Universities to overcome barriers to UIC.
10. Focus on social capital resources	Social capital resources include trust, mutual obligations, common understanding, access to information and opportunities. Each collaborator should focus on these aspects.
11. Rewards and incentives	A new system of incentives should be created in Universities to recognize the efforts of the academics participating in partnerships with industry.
12. Management of collaboration	It is important to manage UICs to ensure success. Adopting a framework to manage the collaboration process will help in monitoring, course-correction during the collaboration process, and achieving the set goals.
13. Alumni association	Universities should maintain a connection with their graduates working in industry. Through these connections Universities can discuss industry problems and understand ways of working together to solve them. In addition, these alumni can become mentors for the present cohort of students, which will influence the future workforce.

We find this UIC Framework applicable in mapping the steps involved in hosting bootcamps – in our case – hosting a bootcamp at the University of Canberra in collaboration with our industry partner Microsoft which will be presented next. This study will be one of the first attempts to present bootcamps using the UIC Framework.

III. BOOTCAMP – A CASE STUDY

A bootcamp is a learning program where content is aggregated or bundled into short, intensive, and rigorous learning program. It is an accelerated learning strategy that compresses material that would normally be covered over an extended period (e.g., a semester or more into 2 days to 3 weeks of intensive learning). The term bootcamp itself is borrowed from the 1800s American military basic training where strict discipline, rigorous physical training, and unquestioning obedience are emphasized (MacKenzie and Gover, 2014). It has now, however, come to mean as focused intensive curriculum delivery and assessment. This innovation is meant to take someone from having little to no understanding to becoming a fully trained person in a fraction of the time (Anita Maharani, 2022).

In this section, we elaborate on our experience of running a bootcamp at the University of Canberra and reflect on the student experience as they attend the bootcamp as a case study. To present our experience in hosting a series of bootcamps – both in November 2022 and July 2023, we apply the University-Industry Collaboration (UIC) Framework proposed by Awasthy et al. (2020) to describe the steps involved in hosting bootcamps.

1. Understand the Variety of Interactions: University-industry collaboration commences with a series of interactions and agreements. The 'Microsoft Learn for Educators' program gives an overview and the steps towards organizing a bootcamp or embedding Microsoft curriculum in courses. Considering the extent of involvement and the available time, we selected bootcamp, which is an intensive short-term UIC to facilitate skills development. Bootcamp is akin to block mode of teaching where a study unit is condensed into a short time. It is intense but encourages students to focus. While the bootcamp lasts for 2 weeks, the variety of interactions between the University and industry is a continuous process starting from planning, agreeing to the terms and conditions, marketing, enrolling before the bootcamp starts, feedback and reflections, organizing

certifications exams, and recruitment of students for job opportunities – an interaction that follows the bootcamp.

2. Stakeholder Identification: We identified Microsoft corporation as our collaborative industry partner as it is an established leading provider of in-demand technologies such as Cloud Computing, Cybersecurity, and Artificial Intelligence. Having an established industry partner ensured the capability and resources required for the bootcamp. In addition, the resources within the University and industry are complimentary for the bootcamp, which include industry experts, academics, content, and computer labs. This is critical for the success of the initiative as the higher complementarity of capabilities between partners is believed to increase the level of trust and mutual commitment (Chartered Accountants Australia and New Zealand and RMIT, 2017; Das and Teng, 2000).

In addition to Microsoft, other partners included the Akkodis Academy, one of Akkodis' four specialised divisions which closes essential skill gaps by delivering cutting-edge upskilling and reskilling solutions in IT and Engineering to progress transformation, future-proof organisations' talent, and drive performance in the ever-evolving smart world. With a global reach and academies in 10 countries, Akkodis provides hands-on and expert training content. One of its most defining features is the integration of practical knowledge with theoretical learning. Backed by two decades of experience and a wealth of cross industry expertise, Akkodis Academy is uniquely positioned to bridge the skills gap hindering transformation in modern organisations. It achieves this through a practitioner-led training curriculum that is not only dynamic but also consistently updated to reflect emerging trends and technological demands. In doing so, the Academy provides its participants with both hands-on and expert training content. In terms of recruitment outcomes, Akkodis Academy is working with Akkodis Consulting, a world leader in IT and Engineering services. This affiliation allows the Academy to integrate industry interactions into its program design, ensuring a smooth transition from education to employment opportunities. By establishing early engagements with Universities and forging partnerships for experiential learning, the Academy creates a continuous pipeline of young professionals who are primed for immediate effectiveness and long-term career satisfaction. In close partnership with Microsoft, Akkodis Academy has developed the certification bootcamp program and served as the facilitator, connecting the University and Microsoft Corporation.

3. Identify Motivation: The identified industry partner, Microsoft Corporation, along with the Akkodis Academy, had motivations similar to our University – improving graduate skills. The bootcamp is aimed at providing students with an opportunity to easily access industry certification. It is to extend and consolidate what students learn during the semester to a certification level. It is designed to provide students with comprehensive resources and guidance to enhance their skills and gain valuable certifications. Thus, the bootcamp is a quick way to certification. At the end of the bootcamp, students should be ready to sit and pass the certification exam compared to less than 4 weeks taken by majority who sit the fundamentals exam (Heintzkill, 2022). Certification fills the graduates' skill gap by providing tailor made learning programs that equip participants with in-depth skills and tool sets to deliver the outcomes required by the employers. These certifications (micro credentials) which enable learning in small chunks can be delivered in a variety of ways, including online courses, apprenticeships, or bootcamp training (Christensen, 2020).

Bootcamp is the delivery of choice towards rendering a fast-paced certification for students. The micro credentials are very attractive to learners as they provide a clear career pathway. In this case, the opportunity of certification at the end of the bootcamp creates motivation for the students (Ghapanchi, 2022). For instance, in 2021, an Atlassian company survey found that 86 per cent of Atlassian certified workers reported that certification “increased their professional credibility”, while 73 per cent said it lifted “their job prospects”, 57 per cent reported it raised “their earning potential”, and 52 per cent “had grown their professional network” (Collins, 2023).

With certification in mind, we had to decide on the focus areas that need to be considered towards enhancing graduate skills for our students. Therefore, the following certification opportunities were offered in the bootcamps with Microsoft:

1. **AZ-900: Microsoft Azure Fundamentals:** Designed for individuals who are new to cloud computing and Microsoft Azure and want to demonstrate foundational knowledge of cloud concepts and Azure services. It covers basic cloud computing concepts such as the benefits of cloud services, different cloud deployment models, and cloud service models. It also covers core Azure services, pricing and service level agreements, and governance and compliance. This will be particularly useful for students taking Enterprise and Cloud Computing (9281).
2. **SC-900: Microsoft Security, Compliance, and Identity Fundamentals:** Designed for individuals who are new to security and compliance concepts in Microsoft's cloud services, particularly in Azure. It covers fundamental topics related to security, compliance, and identity within the Microsoft ecosystem. This certification will be useful for students taking Introduction to Cyber Security (11906).
3. **DP-900: Microsoft Azure Data Fundamentals:** Designed for individuals who are new to data-related concepts in Microsoft Azure and want to demonstrate their foundational knowledge in data services and data storage solutions within the Azure cloud ecosystem. It covers fundamental data concepts including data types, data storage, and data analytics. It includes Azure SQL database and other relational data services including provisioning, querying, and managing relational databases. One of the relevant units to this certification offered at our University is Database Systems PG (6681).
4. **AI-900: Microsoft Azure AI Fundamentals:** Designed for individuals who want to demonstrate their foundational knowledge of Artificial Intelligence (AI) and Machine Learning (ML) concepts and their application within the Microsoft Azure ecosystem. It covers AI concepts such as common AI workloads, ethical and responsible AI practices, and considerations for AI solutions. It also includes machine learning concepts such as Azure Machine Learning, data preparation, training models, and evaluating model performance. Image and video analysis, text mining, and natural language processing are exclusively covered. This certification will be relevant to students taking Artificial Intelligence Techniques PG (6685) unit at our University.
5. **PL-900: Microsoft Power Platform Fundamentals:** This certification includes Power BI, Power Apps, Power Automate, and Power Virtual Agents. The content is designed for understanding the components of Power platform and its importance in solving business problems.

Following the completion of the semester, most of our University students have a semester break from their studies. Involving them in additional learning towards their career is very attractive to them and gives them the opportunity to intentionally learn or enhance skills they may have missed or not delved deep into during their study. Since the bootcamp is a compressed learning delivery mode, it fits well within the time students have during the semester break. It provides highly interactive, customised, activity-based fast paced learning with a clear target of certification at the end of the exercise. This fosters focus, engagement, and intentionality for these students. It makes learning organic, collaborative and hands-on, which in turn positively impacts information retention and increases learning satisfaction, making the participants more likely to engage in further learning (Wu et al., 2015).

With these certifications in mind, our University organized bootcamps with industry partner Microsoft, facilitated by Akkodis Academy, to deliver intensive theory and practical knowledge sessions for the students. The University sponsored the first 100 students who enrolled in the bootcamp to promote participation and ensure that students who need funding can take this opportunity to be included in the bootcamp for free. Students were offered vouchers to attend the bootcamp and to do the certification exam. The total value proposition was \$49 AUD. In addition, the bootcamp compressed the certification study period from an average of 3 months to 14 days. This worked out very well for students who were on semester break and could spare that time before going off to engage in other activities. The bootcamp was spaced out over two weeks which

allowed plenty of time for students to work through the learning materials, practice new-found skills, and complete the certification exam. Coupling this with experts who were available at various points in time created a supportive and engaging environment that enabled students to make the connections between the theoretical concepts and real-world applications, which is a foundation to significant learning.

4. Identify and Appoint Suitable People and Involve Leadership: As a step towards progressing with the bootcamp, we identified the academic program advisor to take up the leadership role in organizing the bootcamp. Figure 1 shows the initial communication with the appointed program advisor and steps towards initiation of the collaboration. The program advisor works with Akkodis and Microsoft to engage in Faculty onboarding and training events and opportunities, and plan towards using shared resources, bootcamp dates, marketing materials, content, and agreements. The program advisor must agree to the business terms on behalf of the Institution.

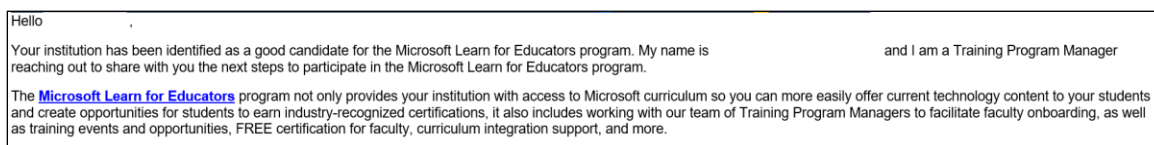


Figure 1. Initial Email Correspondence After Identifying and Appointing a Program Advisor

The academic program advisor works with the management, communications and marketing team, IT labs technical team, academics expert in the respective certifications, as well as students, to make sure that the bootcamp is organized effectively.

5. Ensure Basic Partnership Characteristics: The amount of active contribution expected from the industry partners at the beginning of the bootcamp was clearly articulated which helped in the successful organisation of the bootcamps. As we established the partnership, we enrolled in the bootcamp by filling in the form and ensured that we mutually agreed to the terms and conditions. The basic commitments of different stakeholder groups are listed below in Table 2.

Table 2: Commitments of Stakeholders in the UIC Towards Hosting Bootcamps

Stakeholder	Commitment
Student	Enrolment into bootcamp (49 AUD per student)
	Completion of curated Microsoft Learn online learning path/s and practice tests
	Synchronous engagement with bootcamp facilitators & Microsoft experts
	Completion of online certification exam(s)
University – Program Advisors	University marketing plan & activation to promote bootcamp to target student audience
	Provision of University brand guidelines and assets to bootcamp delivery partner (Akkodis) to enable creation of the white-labelled bootcamp experience
	Educator engagement in live events
	Entering of bootcamp courses into MSLE CRM
Industry Partner – Microsoft	Create University branded landing page and bootcamp learning experience

	Collaborate with University and bootcamp delivery partner (Akkodis)
	Create the industry relevant content
	Oversee the management of bootcamp
Industry Delivery Partner – Akkodis	Create University branded landing page and bootcamp learning experience
	Connect students to career opportunities (WIL, Internships, contract, part time and full-time work)
	Project management of bootcamp experience

6. Establish Efficient Communication: Efficient and planned communication is a key element in successful collaboration. From an academic perspective, Akkodis rendered a very planned communication and delivery pattern for the University and Microsoft to effectively communicate during the bootcamp and organise it systematically. Figure 2 illustrates the planned communication and delivery organised by Akkodis and Microsoft.

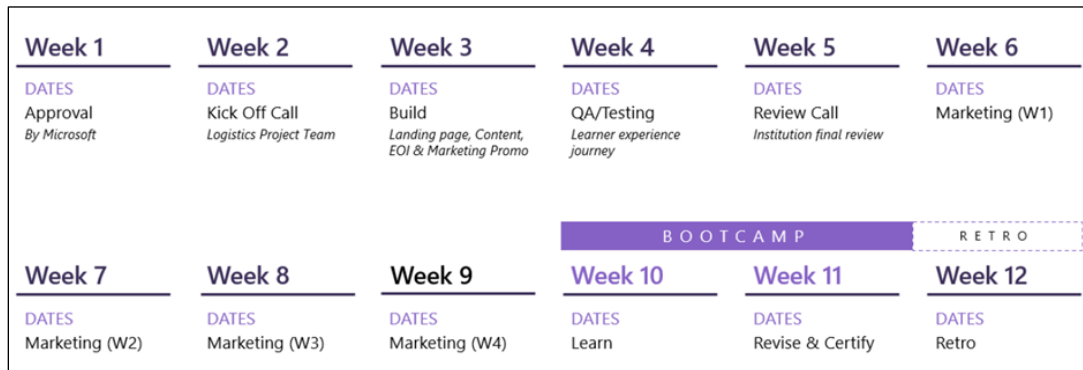


Figure 2. Bootcamp Project Timeline

7. Strengthen the Dissemination Strategy: University strengthened the dissemination strategy by sharing the bootcamp website as planned to reach students not only in the School of Information Technology and Systems, but to the University as a whole. We used Instagram, Facebook, LinkedIn, University mailing lists, Canvas, and students’ portal to advertise and spread the message to interested students as illustrated in Figure 3.

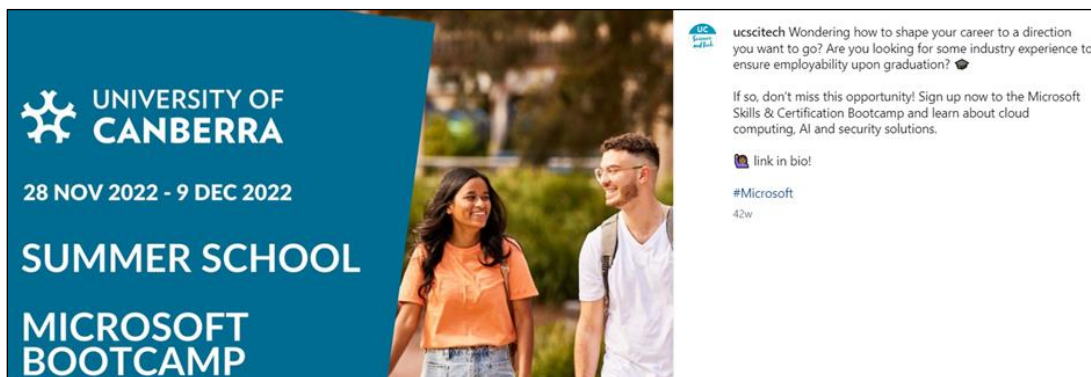


Figure 3. Dissemination Strategy for Marketing Bootcamp in Instagram

The marketing and promotion of bootcamp resulted in a total of 159 students participating in the bootcamps hosted in November 2022 and July 2023 as listed in Table 3.

Table 3: Participation Count in the Bootcamp

Bootcamp Certifications Offered	Number of students participated
Microsoft Azure AI Fundamentals (AI-900)	40
Microsoft Azure Data Fundamentals (DP-900)	26
Microsoft Azure Fundamentals (AZ-900)	56
Microsoft Power Platform Fundamentals (PL-900)	13
Microsoft Security, Compliance, and Identify Fundamentals (SC-900)	24
Total	159

The second dissemination strategy followed for the University-industry collaboration was to promote students to share their success stories in their social media network. They shared their posts with hashtags such as #go1, #microsoft, #proudtobecertified, #akkidostechacademy, and #MSBootcamp etc. They also tagged the program advisor and industry advisors whom they met during their bootcamp and who guided them towards their certifications (Figure 4).



Figure 4. Dissemination Strategy for Sharing Student Success Stories in LinkedIn

The remaining six factors of the UIC framework are focused on continuous medium- and long-term University-industry collaboration. Adopting policies and strategies to encourage/facilitate collaboration should be the first step that needs to be taken by a University so that hosting bootcamps and embedding industry curriculum in the courses will be much easier. Focusing on social capital resources with the establishment of the existence of mutual trust is an important factor, leading to effective knowledge sharing between various stakeholders and contributing to the success of the collaborative venture. Setting up rewards and incentives are expected to influence the motivations and level of engagement of individuals, leading to more effective collaborations. Hence, a University needs to plan towards systematic ways in which such initiatives can be recognised as future collaborations continue. Effective management of future collaborations by adopting a framework to manage the collaboration process in a similar manner will help in monitoring and course correction during the collaboration process and achieving the set goals. The

main aspects of management are related to objectives, roles and responsibilities, planning and execution, risk management, and progress monitoring. Finally, forming an alumni association to maintain connection with the students who experienced certification process and received employment opportunities and who can become mentors for present cohort of students. It is through the development of 'long-term relationships with the University, graduates help the University to re-learn' (Leung, 2017).

IV. BOOTCAMP BENEFITS

The bootcamps form of University-industry collaboration is believed to lead to many benefits and positive outcomes to the stakeholders involved as will be outlined next.

Benefits for Students: These 2- or 3-week accelerated bootcamps are designed to skill up and certify students, offering industry-recognized certification opportunities in a short period of time. Bootcamps offer students a pathway to future employment opportunities that will help accelerate the start of their career, both at a domestic as well as at a global level. Bootcamps also lead to other benefits including staying up-to-date with current technologies, a chance to learn with other peers who are also undertaking the bootcamp, and improved commitment to the certification process. Bootcamps offer students an avenue to access apprenticeship and mentorship but also a chance to network with other peers, practitioners from the industry, and future employers. The dissemination strategy adopted for the bootcamp results in a positive impact on the students' profile.

Benefits for Educators: For educators at the higher education institute involved in the bootcamp such as academic staff, the collaboration and hosting of bootcamps can be a rewarding experience. Bootcamps provide an opportunity for academics to network with industry partners who could potentially become partners in future research, inspire ideas for other collaborations, and who can potentially come as guest speakers in relevant units, adding value to the student's experience. For academics who are also involved in the organisation and facilitation of the bootcamp, this experience contributes towards their professional development and can be grounds to demonstrate collaboration and leadership. Material from the courses can contribute to continuous curriculum improvement by incorporating certification content into University units to enhance their relevance to practice. Demonstrating many of these efforts can potentially improve the likelihood of academic promotions for the educators.

Benefits for the University: Through industry connections, bootcamps provided students with palpable insight into their future jobs (Azzone and Soncin, 2020). For a University to extend its teaching activities to incorporate bootcamps, this can lead to an enhanced reputation for being responsive to industry requirements and better connected and affiliated with industry partners and renowned multi-national leading IT organisations. This form of engagement further contributes to the growth of the institution's third mission activities in addition to teaching and research, and its overall reputation and global ranking. A University-industry collaboration where students gain access to experts in a renowned IT organisation enhances the perceived and real value of the units offered, hence the University's reputation (Valentín, 2000). Some of the drivers of students' choice of University and course of study include the reputation of the University and future job prospects of those who attend those Universities (Azzone and Soncin, 2020).

Benefits for Industry: For industry partners, the collaboration creates access to some of the smartest and most talented potential employees/customers. In fact, the bootcamp gives the industry partners an opportunity to evaluate the potential effectiveness of some of their approaches to solving problems. In these instances, this opportunity was in the technology, in the delivery methods used by the delivery partners, and in the students' responses. With further collaboration and development, these opportunities can be developed into new products or services.

Benefits for Employers: Certifications are indicative of improved technical skills. Therefore, for employers, one of the key benefits of bootcamps is gaining access to graduates who are job-ready

and who possess technical skills in the most demanded IT areas. This accelerates the volume of available technical talent in the market.

Benefits for Delivery Partner: For bootcamp delivery partners such as the Akkodis Academy, facilitating the delivery of the certification course presents more opportunities to bring in revenue to the academy and improve its reputation and marketability within the higher education industry.

V. DISCUSSION

The Australian Government Department of Industry, Science and Resources has listed Artificial Intelligence and Advanced Information and Communication Technology among the critical technologies that can impact Australia's national interest (Australian Government, 2023). This recognises the arrival of the fourth industrial revolution in which the physical, digital, and biological worlds blur with the application of technologies like AI, Machine Learning, Security and Cloud Computing (Microsoft Corporation, 2017). In addition, numerous surveys of the private sector indicated that the skills deficits in these areas is a significant challenge to economic growth (Australian Information Industry Association, 2023). Thus, bootcamps resulted in clearly defined outcomes with the students gaining intensive learning experience with Microsoft and taking certifications along with them. Such experience and certifications open possibilities for students' career.

We identified some challenges to overcome in future bootcamps. We observed that the number of students enrolled in the second bootcamp is less than those in the first bootcamp. We can attribute this lower participation to the cost and timing of the bootcamp. In the first bootcamp, the University offered to pay for the students' registration which was not the case in the second bootcamp. The second bootcamp was organised during the middle of the semester break during which most of the students might have traveled back home. In future, we would like to experiment with organising the bootcamp immediately after the end of the semester or during the orientation week early in the semester. Further, not all the participants took the certification exam. Therefore, we would further like to explore the possibility of embedding participation in the certification exam in the unit to encourage a larger number of students to get certified. Finally, given that not all participants took the certification exam, and as part of our future plan, we would like to establish a system to collate various data about the cohort of participants as to the reasons why some students pursue the certification exam and others do not, their success in the workplace, and other performance indicators for measuring the effectiveness and success of the bootcamp, which ultimately, would result in students getting the certification and formalise knowledge and skill acquisition.

VI. CONCLUSION

In this paper, we presented the experience of organising a bootcamp in our University – University of Canberra – in collaboration with an industry partner, Microsoft Corporation, with the aim to improve graduate skills. The bootcamp strongly emphasises the value of intensive content delivery and practical training in preparing graduates for industry certifications that have the potential to increase their employability. The increased employability is attributed to the value of industry certification and the focus on skills that are in demand. Such bootcamps create a win-win situation for all the stakeholders, students, academics, the University, and industry alike. Students gain skills required for the workforce, and academics gain support in enhancing students' learning experience and employability while demonstrating leadership and collaboration initiatives. Industry plays its role in developing industry-relevant content aimed at creating an industry-ready workforce that helps in addressing the demand for a skilled workforce. In addition, the networking during these bootcamps has the potential to create future collaborative opportunities. Our bootcamp experience confirms and extends earlier works that establish the value of University-industry collaboration in education. It presents an effective experience that can be adopted by other higher education academics and institutions. Moving forward, we will continue to work closely with our industry partners to explore and deepen our collaboration for improving graduate skills.

VII. REFERENCES

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