EMERGING TECHNOLOGIES AND ENTREPRENEURSHIP PROGRAM IN AUSTRALIAN PRIVATE HIGHER EDUCATION: A CASE STUDY SHOWING INTEGRATION OF ANALYTICS AND GAMING INTO A BACHELOR'S DEGREE PROGRAM

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ABSTRACT

Emerging digital technologies have been rapidly reshaping the world by threatening to bring creative destruction to the existing norms of an industry or a crucial part of it. Reports have revealed a projected growth of 20% in the business analytics profession by 2024 and more than 23% growth in the gaming industry in Australia. Governments, businesses, and institutions of higher education are fast becoming aware that new business graduates must master the knowledge and skills to deal with these rapid changes to fit in the evolving business environment and try to address the issue, albeit in different ways. This paper presents a case study of a private tertiary education provider (PTEP) in Sydney, Australia, based on a search analysis of the response to the higher education sector transitioning to technology-sensitive business education in general and entrepreneurship in particular. It attempts to evaluate to what extent A PTEP's Bachelor of Entrepreneurship and Innovation (BEI) program reflects the current emerging digital technologies-focused practices reported in the literature, other similar courses or units at other academic institutions and responses to in-depth interviews. The study reveals that higher education institutions have recognised the importance of including a variety of technologies in their programs to enrich students' knowledge base and adaptability of technological skills. Analysis of the case stresses the importance of uplifting students' careers into technology-savvy entrepreneurs by integrating technology into existing programs. The research also reveals that some of Australia's leading business schools have only recently introduced undergraduate degree programs in entrepreneurship and business with new and emerging technologies as the focus of study.

Keywords: Emerging Technology, Entrepreneurship, Analytics, Game Design, Higher Education/University

INTRODUCTION

Emerging digital technologies such as the Internet of Things (IoT), smartphone, cloud, virtual game, analytics and the like enable entrepreneurs to build their firms and provide services differently than before (Berger et al., 2021; Ghosh et al., 2021; Nambisan, 2017; Rippa and Secundo, 2019; von Briel et al., 2021). It has resulted in the transformation of entrepreneurship

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activities/processes (e.g. prototyping, scaling), funding outcomes (e.g. business models) and contexts (e.g. networks/communities and ecosystems) (von Briel et al., 2021). For instance, resource acquisition through online crowd funding campaigns has rapidly changed a start-up's technology innovation management process (Giones and Miralles, 2015). Since the combination of technology and entrepreneurship has resulted in different types and levels of information acquisition, process, and management capabilities in the entrepreneurial team (Andre, 2018; Machuka, 2020), the study of entrepreneurship and innovation calls for revision and further advancement (Herrity, 2020; Rippa and Secundo, 2019).

Extant research suggests that digital technologies can be essential in shaping entrepreneurship study within higher education institutions (Secundo et al., 2020). Michael Crouch Innovation Centre (MCIC), UNSW Sydney, introduced a 3D printing program for future entrepreneurs (MCIC, n.d.). 3D printing, also known as "additive manufacturing" or "rapid prototyping", is the printing of solid, physical 3D objects (3Dprinting.com, n.d.) to increase the development of entrepreneurial competencies. With the availability of low-cost 3D printing technologies, there is an enormous opportunity for the students' entrepreneurs to bring ideas, products and solutions to life which would not have been possible with the traditional ways of ideating, designing, prototyping, testing and manufacturing. With the hope of achieving the European Commission's "Entrepreneurship Action plan 2020 (European Commission, n.d.), the University of Patras, Greece, introduced the Games Design and virtual reality educational environment that promotes game-based learning activities on real challenges in the real business world (Grivokostopoulou et al., 2019). Universities offering entrepreneurship education programs often use traditional methods such as lectures, guest speaker sessions, and case study presentations. While these pedagogical approaches allow students to grasp the theories, concepts, and practices to help understand the roles, responsibilities and characteristics of entrepreneurial activities in a limited fashion (Hytti and O'Gorman, 2004), they lack in assisting students in tracing the impact or the consequences of actions in real-time. Game-based learning in a 3D virtual reality educational environment has the potential to design and analyse activities on real challenges with the simulated business environments (Fox et al., 2018). Further, game-based learning activities develop future entrepreneurs' mindsets, risk tolerance, creativity, passion, and leadership characteristics (Andre, 2018; Fox et al., 2018). Several research studies pointed out that gamification or game-based learning can engage and motivate learners in activities and training contexts to formulate new–venture creation and can positively impact the entrepreneurial intent, mentality, capabilities and skills of the students (Bellotti et al., 2014).

Grivokostopoulou, Kova and Perikos (2019) conducted an experimental study in a public university in Europe to explore the potentialities of the game-based learning environment and the gamified learning activities and evaluate the impact on students' learning experiences. Eighty-six (86) students - 52% male and 48% female - participating in the pilot study discussed their pre- and post-knowledge levels of entrepreneurial activities and how their attitudes and intentions toward entrepreneurship increased after participation in game-based learning activities. The results highlight that gamified learning activities increase students' perception of successful entrepreneurs, motivate them to take risks and challenges, utilise opportunities, and assist in formulating entrepreneurship competencies (Grivokostopoulou et al., 20

Keeping all these in view, the objective of this study is twofold. The first objective is to identify the role of emerging digital technologies within entrepreneurship study at the higher

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education level. The second is to integrate selected technologies of study within the Bachelor of Entrepreneurship and Innovation (BEI) Program offered by a PTEP.

Research Design

Research has been conducted in a rapid literature review of the role of emerging digital technologies in entrepreneurship study and gathered experts' opinions about best practices and future demand of entrepreneurship and innovation study both globally and locally.

Rapid Review

Rapid reviews are a form of evidence synthesis within a short period of time (less than five [5] weeks) when the policy-makers are keen to learn new or emerging issues and critical topics and to assess existing procedures or practices (Hamel et al., 2021; O'Leary et al., 2017; Temple University, 2022). The study systematically queried the four databases, namely Google Scholar, ACM Digital Library, Springer Link, and ProQuest, for published academic journal articles in English. It also checked conference proceedings, reports, white papers, blogs, and organisational web pages published within the last five (5) years to understand emerging technologies' role in entrepreneurship learning and teaching or digital entrepreneurship at the higher education level.

To know the best practices, the researchers visited online resources or information via:

a. Official webpages of Australian universities, Australian private higher education/institutions, and international universities.

b. program or course structure of Bachelor of Entrepreneurship/Innovation Program/course, Bachelor of Business/commerce program/course with majors in accounting, finance, HRM, marketing, business analytics, Hospitality and tourism management, supply chain management.

As the study focuses on the evolution of the literature from an education perspective, the researchers further limited search results to the area of the curriculum content (learning), methods of teaching (education) and students' active participation or engagement (students' experiences), and how they correlate with the real-world needs.

Researchers used the following keywords while exploring each database so that the search result includes those articles that contain the word 'emerging technology' along with "entrepreneurship", depending on the search engine functions each database offers. They used the following logical query to search the full text of the journal articles and conference proceedings, where query intelligence is able to manage variations on words such as emerging technology and emerging technologies, entrepreneurship, and entrepreneurs.

As the study focuses on the evolution of the literature from a higher education perspective, the search results were further limited to the area of "education." The query explicitly uses the term emerging digital technology as the intention was to set the central theme first and then narrow it further for entrepreneurship AND/OR entrepreneurship education. As seen in Table 1, the search query returned a total of 845,370 articles on emerging technology but ultimately returned 1,222 articles on emerging technology and entrepreneurship that discuss education.

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Table 1
SEARCHING SUMMARY

Search Time: 10.10.2022, 01:00 PM - 2:30 PM [AEST]			Number of total Articles Founds –**Repeated [2017-2022]**			
Database	**Field and Access**	**Document Type**	**Emerging technology (ies)**	**Entrepreneurship**	Emerging technology (ies) (AND, OR)	
ProQuest	All Fields	Journals	1,76,567		Entrepreneurship	Entrepreneurship education
Google Scholar	All Fields	All	28,000	19,210	1056	76
ACM Digital	All Fields	Journals	5,64,273	3,12,000	25,012	548
Library				2,838	1352	209
Springer Link	All Fields	Journals	76,530	1,03,958	986	
Total			8,45,370	20,09,006	28,406	389

Of the 1,222 articles, the researchers manually selected relevant papers from the initial list and excluded the irrelevant papers by studying the article's titles, keywords, abstracts, and full text. Articles removed from the list had one of the following exclusion criteria:

- absence of focus on analytics, game design and development, education/study at academic institutions;
- were duplicates;
- appeared irrelevant to the inclusion criteria;
- no empirical evidence;
- written in languages other than English; and
- Not available for inspection.

In the extracting stage, the researchers considered essential details to obtain the paper. They considered several inclusion and exclusion criteria, such as deleting duplicate papers, year of publication, theory applied to adoption, application area, geographical location, type of communication, outcome measures, and results (Borg et al., 2015; Chaudhry et al., 2006).

The process yielded a total of twenty three (23) relevant articles for in-depth study. However, the study included other websites or reports pertinent to the researchers' needs which were not considered in this screening process. Figure: 1 show the exclusion steps are 1 show the exclusion steps.

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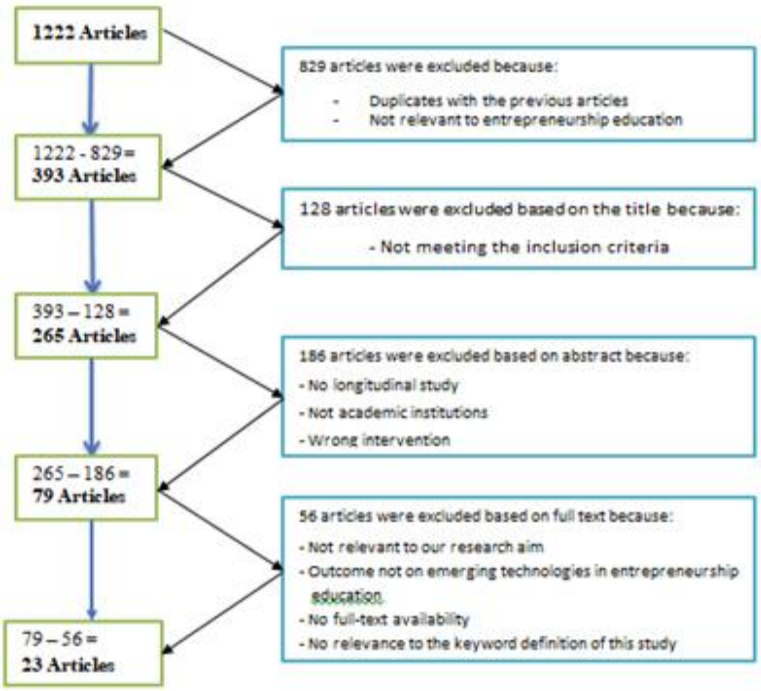

Figure 1
THE EXCLUSION STEPS

Expert interview

Using expert interviews *to gather information about or explore a specific field of action* is a popular qualitative data collection technique (Döringer, 2021). The approach taps into the wisdom or expertise of an individual or group of knowledgeable people having a commendable understanding of a particular subject area (Kaiser, 2014). The researchers interviewed fourteen (14) experts and students of the A PTEP's BEI program (see Table 2). Each interview lasted up

Table 2
INTERVIEW PARTICIPANTS

Respondent type	Number	Note
Students	8	Final-year students
Graduate alumni	2	
Academic staff	2	Two (2) fulltime faculties
Senior Academic (Professor)	1	Academic Board Member
Industry representative	2	Working at the innovation division of the Australian Government.
		ACS ICT fellow with experience in course accreditation;

Setting the context: *A PTEP's Bachelor of Entrepreneurship and Innovation (BEI) Program*

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A PTEP has been offering a 3-year AQF level 7 Bachelor of Entrepreneurship and Innovation (BEI) program since Semester 1 (March) 2019. The participants of this program are predominantly international students. Their motivation to enrol in this specific higher education program is derived from the hope that successful completion of this program will help them settle in Australia since the program is included in the Government's Skilled Occupation List (SOL). In addition, the onset of COVID-19 and students' tendency to switch institutions with a low-fee structured program aligned to SOL list (e.g. Bachelor of IT or Bachelor of Accounting) impacted the overall retention of the BEI program. Of the 425 students, 38% reported a lack of academic progress, financial circumstance, and change of mind (see Table 3).

Table 3
STUDENT'S ENROLMENT STATUS

Semester	Enrolled	Semester	Enrolled
S1-2019	9	Summer 2020	31
S2-2019	39	S1-2021	81
Summer 2019	6	S2-2021	64
S1-2020	53	Summer 2021	12
S2-2020	68	S1-2022	62
Total 425			

Entrepreneurship study is evolving, and there are no prescribed guidelines for "what" should be taught in the program or "how" to teach (Ismail et al., 2018; Jones, 2018). However, there is consensus and devoted attention to conducting an ongoing review of the learning needs of future entrepreneurs by carefully analysing the contemporary tools and techniques and market demand (Secundo et al., 2020; Strachan, 2018). So, the Course Coordinator examined the PTEP's BEI program structure, unit content and market trends compared to other similar academic institutions under the direction of the senior academic staff.

FINDINGS

This section presents the study's findings into two major themes of emerging technologies choice of study, i.e., analytics and game development. The findings were documented based on the relevant literature and information extracted from the expert interviews.

Analytics for entrepreneurs

The contemporary world is built on the ultimate amount of data with the blessings of Web 2.0 technologies (Geelan, 2021). Today, digital technologies have made it easier than ever before to navigate complex business data. While access to data is no longer difficult, the insights derived from data and who can analyse the best is the winner (Entrepreneur, 2022). From start-ups to large companies like Facebook and Amazon, everyone is rushing to find effective ways of incorporating data into their decision-making. For instance, Climate Corporation (Micro, 2022), a start-up in the USA, provides data-driven decisions to farmers for the cultivation of crops based on publicly available agricultural and weather forecasting data. Further, digital technologies such

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as the Internet of Things, business analytics, mobile apps, and cloud/social media platforms provide entrepreneurs with an alternative way or tool to capture-operate-analyse data.

Historically, people have viewed entrepreneurs as innovators and high risk-takers, not the analytics gig! They develop creative ideas, prepare business plans, and seek funds to develop new products or render new services for the business. They love to explore things and have a common mindset: Build it and see what happens; if anything goes wrong, start again. With the immense potential of generating value for a business, data analytics provides tools and techniques to be effective in entrepreneurs' exploration journey. It is vital to understand how and when analytics is vital to entrepreneurs.

Analytics becomes a critical success factor for entrepreneurs on many occasions and in many situations. These include identifying opportunities to develop new products and services, customer prediction, investigating customer preference, launching new campaigns (Kehal and El Alfy, 2021), assessing and predicting risks and others. For start-ups or new ventures, analytics could track funds and provide several options to spend money (cash). With the help of analytics, social media reputation, and customers feedbacks for the minimum viable product (MVP) will direct the entrepreneurs to improve their interpretation of the product/market, potential and actual customers so that the final product/market drives acquisition efforts to go in salient ways (MJV, 2020). Thus, hiring an external market researcher or consultant saves the cost.

Further, analytics can help entrepreneurs pinpoint where to innovate by capturing and analysing sales data to discover customers buying behaviour and offer relevant promotions. Knowing where to innovate will encourage product management/engineering to modify or develop a new product (Wassin, 2019). According to one participant,

"Analytics may also be useful when deciding where to innovate. I strongly support outcome-driven innovation. It is a structured innovation paradigm, and in this context, analysing survey data might be valuable in determining where to allocate limited technical resources."

The advent of crowdsourcing and crowd funding IT platforms taps into a crowded talent to get many entrepreneurial business ideas/projects and divide them into small blocks of tasks for implementation (Prüfer and Prüfer, 2020). From seed funding to equity share, crowd funding IT smart platforms enable individuals or groups to contribute financially, predict the performance of the fund and conduct sentiment analysis of the textual comments by the participants. Three types of data (i.e. proposed idea/content/product, entrepreneurs' experience and attitudes, and comments on the heterogeneous group of individuals on a project) obtained from a large crowd funding portal for entrepreneurs, namely Kick starter, were analysed and measured to conclude the effectiveness of the entrepreneurial project (Courtney et al., 2017).

Another analytics tool entrepreneurs can benefit from is the smart contract. This block chain application generates self-enforcing and digitally distributed contacts among stakeholders, i.e. suppliers, financial institutions, distributors and customers (Flynn, Shannon, 2022). A smart contract is built on trust and uses an open distributed agreement into Block chain code by a network of computers (Wolfgang Rückerl, 2022). With special permission, all the parties within the network could see the complete process of an agreement fulfilment based on the conditions set by them. Start-up companies constantly struggle to build business relationships with established suppliers, financial institutions, and distributors because of their newness in the

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market and lack of business track record. The smart contract provides 'comfort' for them by preventing alterations of the agreements or actions at any point of the execution.

At the early stage of block chain development, someone had to render Block chain developer services to develop code which was an expensive exercise (Rahman, 2022). At a later stage, small businesses and freelancers have developed some pre-defined applications that enable start-up companies to create a smart contract without hiring the block chain developers' service (Kot, Ivan, 2022).

Historically, any new technological development witnessed new avenues of potentially malicious activity (CSRC, 2022). Despite all potential benefits, no block chain applications are 100% secured and non-vulnerable (Khan et al., 2021). In 2018, researchers from Singapore and UK discovered poorly coded smart contracts and security breaches for more than thirty-four thousand applications of block chain technology (Sedkaoui, 2018) (Technology HQ, 2022). Further, many countries are yet to accept the smart contract as a legislative exercise. Hence there is still time to go, and experts believe that a proper cyber security strategy ready to deal with the new issues could be brought by future smart contracts (Technology HQ, 2022).

Academics are concerned by this phenomenon which is also changing learning needs and require a reorientation toward developing new approaches and advancing their entrepreneurship program (Sedkaoui, 2018). Courses like predictive analytics and decision support systems prepare future entrepreneurs (students) to extract value from (un)structured data and enhance their professional capabilities. According to one of the participants:

"….in the early phases of a new business endeavour, business analytics is useless to the entrepreneur. Unless, of course, your new firm involves selling products or services related to business analytics. Analytics are useful in a variety of situations. Naturally, finance comes first; where is the money going, and can it be used better elsewhere? Opportunities for increasing sales are some of the most intriguing topics for analytics in new businesses. How to set a price on innovation is among its most challenging features. There is a need for a price manual for new goods and services. The Bachelor of Entrepreneurship and Innovation specialisation in business analytics might help with this".

Another participant expressed her views, as shown below.

"The substantial misalignment between higher education learning practices in relation to entrepreneurship education models and technology is creating a shortage of skills essential for the new realities of the dynamic global business context. Higher education providers are slow in providing or articulating a program that captures the synergies fuelled by the integration of entrepreneurship and technology. The stringency and dysfunctional nature of a plethora of educational programs and practices create an impediment to change. However, higher education can learn from few institutions that have abandoned the narrow orientation of management/ entrepreneurship studies towards technical or innovative entrepreneurship education."

In general, institutions of higher learning have been slow in responding to the new realities of technical entrepreneurship education founded on web-based information technology in a global business context. To our knowledge, few universities or entrepreneurship centres

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integrated 'analytics' under the Bachelor of Entrepreneurship or Innovation program (see Figure 2). Babson College, USA, combines entrepreneurship and analytics in a newly developed Master of Science in Business Analytics program and defines capable entrepreneurs by the ability to transform information into innovation. Eastern Washington University, USA, offers a Major in entrepreneurial analytics to apply data analytical skills and develop and lead new products or services for entrepreneurial companies at their initial growth stage.

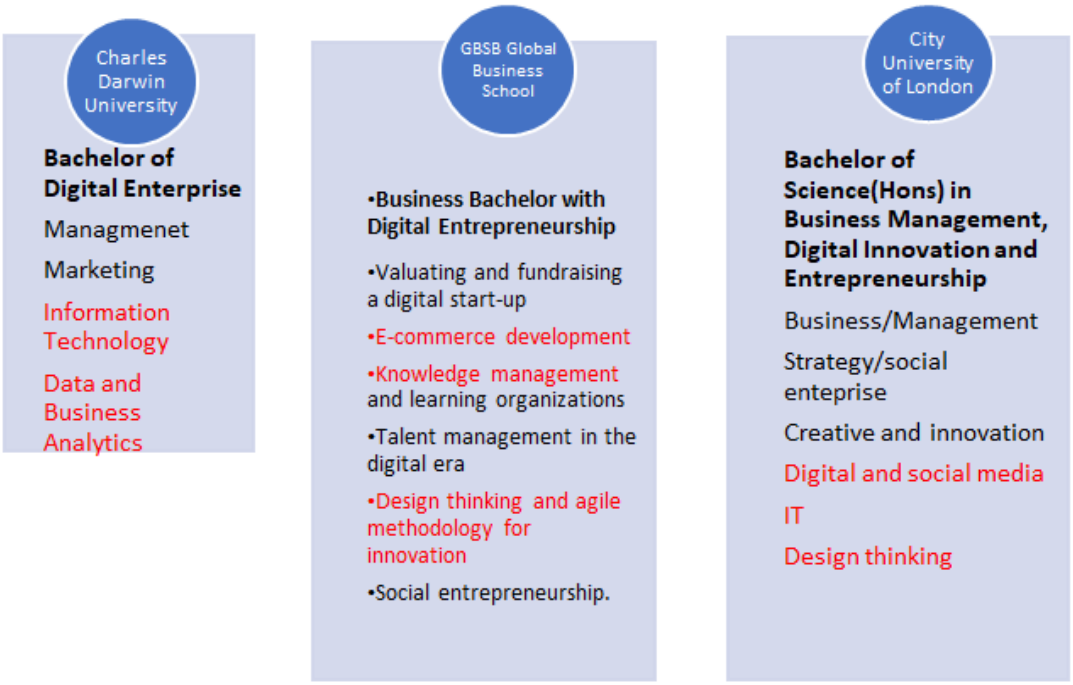

Figure 2

STAND-ALONE BACHELOR PROGRAM WITH EMERGING TECHNOLOGIES/ANALYTICS

There is no shortage of analytics degree programs in business or computing schools in Australia, but few attempts to combine analytics and entrepreneurship. Table 4 below presents a list of participating universities/institutions in Australia which adopted analytics within the Bachelor of Business or Management program.

Table 4
AUSTRALIAN UNIVERSITIES/INSTITUTIONS THAT ADOPTED ANALYTICS WITHIN THE BACHELOR OF BUSINESS OR MANAGEMENT PROGRAM.

	Participating Universities/institutions in Australia
Bachelor of Business/Management with Entrepreneurship, Business Analytics major or minor	Torrens University Australia; Deakin University, RMIT, Swinburn University of Technology, Canberra University, UniSA, Murdoch University, the University of Queensland, Newcastle, and Canterbury Institute of Management.

The inclusion of technology into academic programmes of specific disciplines dealing with entrepreneurship creation, creativity and innovation has been implemented in some higher

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education providers' programs. One of the most prominent providers that offer a unique program is the Swinburn University of Technology.

The Swinburn University of Technology offers a technology-based Business degree. In this degree, students study both technical and business languages. They will learn how to identify potential operational and environmental issues before developing and putting into practice creative solutions that have the potential to transform business through technology. Swinburn University offers a double degree in business with a major in business analytics and design. The degree offers a major area of specialisation combined with core- business studies that aims to equip students with knowledge and skills essential for becoming entrepreneurial thinkers and business innovators. This model supports open and complete collaboration between business, industry, the professional community, and technology-based business incubators. Swinburne's Bachelor of Business challenges students to become innovative while having a positive social impact. One of the business double degree options is data analytics and analysis. The total 300 credit points include 100 points for eight (8) core subjects in business, 100 points for eight (8) subjects in the major business analytics and analysis, and 100 points for eight (8) subjects in other study areas that include the work integrated learning and other major subjects and electives. Students can opt for a particular area of specialisation and combine it with core business studies articulated to create entrepreneurial thinkers and business innovators. Business analytics and analysis bridge the gap between management and technology. This structure equips students with management and tech skills essential in today's business environment. Upon graduation, students will be able to apply creative solutions that can transform business through technology. More so, it equips students with the ability to navigate the business and tech contexts. The approach enables students to identify potential opportunities and challenges and devise and apply creative solutions that can transform the business through technology. Additionally, the degree offers real industry experience during the course of study through the Work Integrated Learning programs, which can include placements, internships or industry-linked projects. The principal subjects in business analytics and analysis are:

- Foundations of Data Management and Analytics
- Big Data Management
- Digital Business Analysis and Design
- Cloud Approaches for Enterprise Systems
- Business Intelligence and Data Visualisation
- Agile Methods for Business Analysis
- Knowledge Management and Analytics
- Business Analytics and Artificial Intelligence

Upon completing the Bachelor of Business, students will be equipped with the skills and mindset to start their journey. At the same time, those that seek employment can tap into a range of career pathways such as consulting, management, accounting and business analytics. The Swinburn University of Technology program described above reflects the conviction that 21st-century universities can become crucial technological development and economic growth engines.

A PTEP will consider Swinburn's approach as a model and apply some modifications that fit into its current Bachelor of entrepreneurship. While there is no specific focus on gaming, the course does prepare students for a business world replete with advanced technologies that need

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to be understood and managed. A PTEP aims to bridge some of the existing and evolving gaps between entrepreneurship and technology education programs, thus providing the groundwork for a better, more vigorous fit between learners' and market needs.

RMIT distributes entrepreneurial, creative, and innovative material across various majors and minors. The Business Analytics course at RMIT, for instance, teaches students how to analyse data, produce data visualisations, and precisely predict business decisions. Understanding how technological advancements may enhance decision-making, customer service, marketing, resource management, and other activities is crucial to the Business and Technology degree. Modern business techniques relating to business analytics, artificial intelligence (AI), technological innovation, and cybersecurity issues are emphasised in the units' and lessons' subjects.

Many universities across Australia offer degrees in information technology; however, only a few are now recognising the importance of business technology study. The University of South Australia has begun its Bachelor of Digital Business this year. It aims to provide students with a complete understanding of digital technologies' role in the evolving business environment, focusing on online existence in all its forms, from marketing to deep data analysis. It prepares the next generation of business leaders likely to operate in a totally online networked business ecosystem.

Game Design and Development for Entrepreneurs

Australia is home to cutting-edge games studios led by bright, dynamic, and multicultural entrepreneurs.

--Senator the Hon. Don Farrell, Minister for Trade and Tourism

People play video games on consoles, PCs, smartphones, and virtual reality devices. With graphics/3D design and animation skills, young Australian entrepreneurs are now contributing to the international marketplace more than before. According to one participant,

"Gaming is one of the world's largest and fastest-growing entertainment sectors. The field's growth will likely see its inclusion in the Olympic Games in the not-too-distant future; discussions are ongoing. Regular international competitions are held between teams and individuals where there is no delineation between the sexes".

Australia is experiencing a steady growth (23% increase over last year) of its gaming industry with an approx. $226.5 million in the 2020/21 financial year (AusTrade, 2022). Therefore, it is pertinent that entrepreneurs develop the necessary skills and get access to support, including financial (i.e., tax rebate, seed grant) and non-financial (insurance, patent, copyright). The gaming landscape continues to progress with many more products on the market covering different entrepreneurial contexts and technological advancements, such as virtual reality and artificial intelligence, offering many opportunities for technological and learning sophistication improvements.

Researchers characterised video gaming as a source of excitement-driven innovation for entrepreneurs (Del Bosco et al., 2020). It leads to interaction amongst users, innovators, and entrepreneurs, from opportunity identification to establishing a start-up company. According to one participant,

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"Creating innovative pedagogies and innovative entrepreneurship programs that incorporate different types and levels of information acquisition, process, and management capabilities require a reflective approach and further advancement. As a result, each higher education institution has a great chance to provide students with the option of specialising in "Game Development and Designing." That will transform students' love of playing video games into an in-depth understanding of science and the art of problem-solving. In addition, the program will address the students' need for practical experience that can be gained through partnerships with successful entrepreneurs, business owners, and technical business incubators. Students should use digital tools or emerging technologies to learn entrepreneurial skills such as business feasibility and market research as well as designing their own business plans."

Western Sydney University provides an Entrepreneurship programme focusing on game design and simulation to prepare its students to become project managers, app developers and gaming entrepreneurs. Every semester of the programme includes a workshop when students are placed in entrepreneurial settings (incubators, technology parks, innovation centres) and supported through all stages of a concept's creativity and sustainable development into a lean start-up. Game design is not limited to entertainment; it increasingly finds application in scenario processes in government and business, specifically in the military, economics, marketing, urban planning, transport and other areas.

How could emerging technologies (analytics and game design and development) be integrated into existing A PTEP's BEI Program?

The discussion on the need for analytics and game design and development for entrepreneurship study notwithstanding, decision-makers need additional knowledge and competency areas, i.e., technology and process for integrating into the existing A PTEP's BEI curriculum. An innovative step is the inclusion of gaming as a potential business analysis tool—building on game theory and experimental business/economics concepts.

A PTEP’s BEI program combines conventional business/management-related competencies such as knowledge, skills, and attitudes. Standard entrepreneurial competency includes opportunity recognition, assessment, risk management, creative problem solving, value creation and building, and using networks. The researchers believe that entrepreneurs with business/management and an understanding of advanced technology and application will comprehend the opportunities that will exist by the decade’s end.

The contemporary issue of technology's extraordinary growth in dimension and concepts within technology and process knowledge or competency areas (see Figure 3) needs to be

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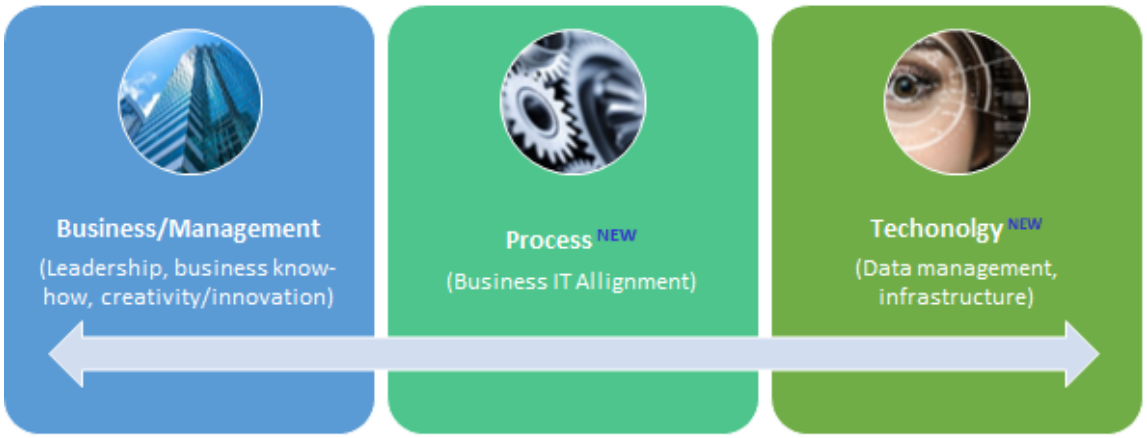

Figure 3

ALIGNMENT OF EMERGING TECHNOLOGIES KNOWLEDGE AND COMPETENCY AREAS WITH THE EXISTING BEI PROGRAM.

Addressed at this point. For instance, Met averse and Quantum Computing will likely change human direction; these have immense potential. To date, there has been plenty of discussion about the role and impact of Artificial Intelligence, AI. Met averse and Quantum computing will be the next step; combined, they will change every gaming aspect. Some widely used aspects include cyber security, crypto currency, military strategy, national security, town planning, business analytics, experimental economics, human and animal phycology, climate change modelling, industrial design, and financial modelling.

The attitude, risk tolerance, creativity, enthusiasm, big thinking, team development, and leadership skills that are the essential traits of high-impact entrepreneurs will be developed via the Bachelor of Entrepreneurship and Innovation degree. Students will gain knowledge and skills for opportunity discovery; impact analysis; customer analysis; strategic team building; leadership; the psychology and ethics of the start-up; funding modelling and financial analysis; growth and exit strategies; and other topics in an entrepreneurial ecosystem. As a result, each higher-education institution has a great chance to provide students with the option of specialising in "Game Development and Designing." Through the creation and use of game creation and development, the Games Development and Design specialisation will transform students' love of playing video games into an in-depth understanding of science and the art of problem-solving. Gamification, game design, game-based learning, gaming psychology, serious games, gaming entrepreneurship, and more general modelling and simulation are all possible topics of study in this field. After completing the course, students may have developed an entrepreneurial mindset that they can apply to various problems using simulation and game-based approaches.

Proposed changes to the A PTEP BEI Program

Changes should motivate students to use digital tools or emerging technologies to learn entrepreneurial skills such as business feasibility and market research and design their own business plans. Against this backdrop, analytics as a 'major' (i.e., specialisation) would provide data retrieval, cleansing, structure, and interoperability skills needed to implement and oversee

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data-driven business decisions. It is worth mentioning that analytics major units will cater for the theoretical and practical knowledge needed to become an Australian Computer Society-accredited or recognised ICT Business Analyst (ANZESCO Code 261111). The Australian Government Labour Market Insights Portal highlighted the business analytics profession as in high demand, with over 20% projected job growth by 2024.

Further, analysts have been on ACT Government Critical Skills List since July 11 2022 (Australian Government, 2022)

At present, BEI embedded business/marketing plans, strategies, and processes of different aspects of innovation and creativity by offering a new or existing product/service into a new or global marketplace; the integration of Business Analytics into the program would provide benefits in the following ways:

1. The integration of Business Analytics constitutes one of the most important opportunities for the students to learn theory and tools to foster transformation into the core BEI learning and skill sets or practices using information technology. As part of the Business Analytics study, A PTEP graduates will meet the prerequisites for their eligibility to apply for membership of professional bodies in their area, such as the Australian Computer Society.
2. Business Analytics-driven business processes stimulate knowledge access and sharing and support companies' in developing analytical skills, thus increasing our existing students' strategic potential for entrepreneurship.
3. By adopting and implementing Business Analytics, organisations can create better value through effective decision-making, gain operational effectiveness, and achieve better business performance (Ciampi et al., 2021). Therefore, adopting Business analytics into the program can also significantly improve A PTEP students' entrepreneurial performance based on the quality of the decisions made.
4. Business Analyst has been identified as being in high demand in Australia according to the World Economic Forum's The Future of Jobs Report 2020 (Word Economic Forum, 2020). "Business Analytics" help identify the gap between producing analytics and their practical application within existing businesses.
5. Matching Business Analytics contents with its present form of BEI and ANZESC code 261111 ICT Business Analyst for skilled migration to Australia is crucial for attracting international students. The participants of this program are predominantly international students motivated in enrolling specific higher education programs in Australia based on the Government's Skilled Occupation List (SOL) with the hope that they would live and settle in Australia after their studies.

With a game design and development major or specialisation, students can prepare themselves for qualified multimedia specialists (ANZESCO Code 261211), listed under the Medium- and Long-Term Strategic Skills List (MLTSSL). According to Labour Market Insights (Australian Government, n.d.), *"Game and Multimedia Developers create and manipulate computer animation, audio, video and graphic image files into multimedia programs to produce data and content for CD-ROMs, information kiosks, multimedia presentations, websites, mobile telephone resources, electronic gaming environments, e-commerce and e-security solutions, and entertainment and education products."*

The authors propose incorporating two specialisations (analytics and game design and development) which would require some changes within the current BEI course structure. For example, A PTEP will need to add two (2) core units and ten (10) new electives units (five for each specialisation). In addition, some contents from two existing core units require modification as per the need. Table 5 below presents the new structure of the BEI program with specialisations.

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Table 5
THE NEW STRUCTURE OF THE BEI PROGRAM WITH SPECIALISATIONS.

Level 1
• Business Communication • Management Principles* [emphasis on digitalisation of organisational activities or digital transformation. Some aspects of the 'information systems' study would be embedded into those units.] • Accounting Practice • Introduction to Entrepreneurship and Innovation • Economics* [essential foundation of statistics contents will be integrated] • Entrepreneurial Marketing • Business Ethics • Programming Fundamental [provides foundational knowledge of logic building, structuring, and coding to solve critical entrepreneurial problems within the digital organisation.]
Level 2
• Disruptive Innovation • Organisational Behaviour • Thinking: Process and Implementation • Corporate Entrepreneurship and Innovation • Small Business Management • Commercial Law for Entrepreneurs • Elective 1 • Elective 2

Table 5 (Contd.)
THE NEW STRUCTURE OF THE BEI PROGRAM WITH SPECIALISATIONS.

Level 3
• Leadership and Change Management
• Finance for Entrepreneurs
• Intellectual Property and Commercialisation
• Entrepreneurship Project
• Elective 3
• Elective 4
• Elective 5
<u>Electives for Analytics specialisation (any five)</u>
a) Introduction to analytics
b) Applications Modelling and Development
c) Requirements Analysis
d) Decision-making and support systems
e) Introduction to Enterprise Artificial Intelligence
f) Predictive Modelling
g) Business Intelligence and Data Visualisation
h) Social Media Analytics

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Electives for Game design and development specialisation (any five)
a) Graphic design
b) Interactive web-design
c) Introduction to video games
d) Applications Modelling and Development
e) Game Development
f) Virtual Reality and Advanced Game Development

The proposed BEI specialisation with Analytics will apply for Australian Computer Society accreditation against the knowledge areas of ICT in general and ICT Business Analyst (ANZESCO Code 261111) in particular. According to the Australian Bureau of Statistics (2009), an ICT business analyst identifies and communicates with users to formulate and produce a requirements specification to create system and software solutions. It is the expert opinion of the participants that the proposed BEI specialisation with Analytics meets the knowledge required to perform the core duties of an 'analytics' professional as mentioned by the Australian Bureau of Statistics 1220.0 - ANZSCO - Australian and New Zealand Standard Classification of Occupations, First Edition, Revision 1 (ABS, 2009).

Appendix A presents the mapping of the proposed BEI (specialisation in Analytics) units with Australian Computer Society (ACS) Knowledge area and core duties of Analytics professionals. Appendix B and Appendix C depicts how Analytics and Game design and development Major/Specialisation are benchmarked.

Concluding remarks, challenges, and future work

The digital transformation in entrepreneurship education is a new approach and a fundamental challenge in education to prepare students for the face of technological change. Building a technology-based entrepreneurship education curriculum is warranted, whereby the digitalisation process can expand student partnerships and networks with their peers across countries, entrepreneurial educators, and business communities. Students should use digital tools to learn entrepreneurial skills such as business feasibility and market research and design their business plans. This research demands a change in the present structure of the program at A PTEP. The proposed structure of BEI introduced two streams that merit inclusion in the new curriculum - Analytics and Game design and development. The rapid digitalisation of business and managerial processes in various industries highlights the importance of learning about analytics. Gaming design and development is expected to nurture an entrepreneurial mindset ready to tackle various real-world problems through 'game' and simulation-based solutions. The new streams will also align well with the Australian Skilled Occupation migration scheme, making it attractive for international students. As such, more student enrolment, as well as retention, can be expected. Overall, this restructuring of the EandI module is potentially going to be beneficial for the A PTEP.

The proposed restructuring of the BEI program combines the synergies between entrepreneurship and technology. It is structured to implement the need for analytics and game

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design and development for entrepreneurship study by adding additional knowledge and competency areas, i.e., technology and process for integrating into the existing A PTEP's BEI curriculum. This step is integral for A PTEP to keep up with market demand and become one of the leaders that capture this opportunity and pass it on to potential students. This structure provides an alternative a more flexible approach that integrates management/entrepreneurship studies with technology. It is delivered in a way that captures the synergies of business, technology, analytics and the love of gaming to equip students with the skills and attitude they need to compete and contribute to a turbulent environment. This gives both students and the higher education institution a competitive dimension that addresses the need to respond to environmental uncertainty and change. However, cross-disciplinary skills appear to be essential to capitalise on this flexibility.

Given the results and the characteristics of the participants, the limitations of the A PTEP case study need to be pointed out. The authors acknowledge them in the following points:

- Game development specialisation may not be enough to claim a multimedia specialist (ANZESCO Code 261211) professional; further structural change on the course is required to meet the professional code standards.
- The proposed BEI units have been mapped across other institutions to claim that future students can become qualified ICT business analysts; however, this is subject to other factors such as work experiences and ACS assessment's outcome policy and procedures.
- The proposed BEI structure is mapped across other institutions with a proposition that future students can become qualified ICT business analysts. It is an educational qualification that students could gain to be ICT professionals. Another important aspect, i.e., practical experience, which is assessed by the Australian Computer Society (ACS), is beyond the scope of this research.
- The rapid review was conducted within a few weeks, and the process might have ignored or left out factors that could prove to be valuable. Additionally, only a handful of participants were interviewed; the results may not be generalised to a particular extent.
- The nature of the sourced dataset limits the results, and further research should reflect on additional factors in order to address these shortcomings.

Addressing these challenges may also point out the potential of a higher perimeter to the advantages of this new entrepreneurship program, as the case is with many other customised management/ entrepreneurship programs. While they may increase entrepreneurial skills, we can state a perceivable impact on student skills and venture performance.

Based on the literature, review of other institutional curricula, and interview of relevant experts, this research concludes that entrepreneurship study is now moving fast with technology integration at all phases. An effective Bachelor of Entrepreneurship and innovation degree is not only expected to provide a fundamental education in business, management, innovation/creativity and market development principles. Most industry sectors crave for skilled graduates to create and translate their analytics data into transformative business change. With the foundational knowledge of entrepreneurship and innovation, graduates will quickly become successful entrepreneurs equipped with modern digital tools and knowledge of emerging technologies for best practices in the highly competitive world marketplace.

It is hard to think of an industry sector that is not actively seeking skilled graduates to create and translate their analytics data into transformative business change. To cope with the

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present trend, which is the adoption of emerging technologies in the business world, change in the present structure of the program at A PTEP is essential. With this change, A PTEP's BEI graduates will be in demand and highly employable in business or data analytics work environments. They will have had integrated work experience/projects throughout their studies, including acquiring professional workplace behaviours and competencies. With the foundational knowledge of entrepreneurship and innovation, graduates will quickly become successful entrepreneurs, confident to navigate through a fast-changing world where the old rules no longer apply. The proposed BEI structure is designed to provide a broad-based knowledge of the functional aspects of a company and their interconnection with technology- disruption-analysis-community/society. At the same time, allowing for specialisation in a particular area and enhancing their communication, reasoning, business analysis and decision-making skills.

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Received: 01-Feb-2023, Manuscript No. IJE-23-13234; **Editor assigned:** 03-Feb-2023, PreQC No. IJE-23-13234(PQ); **Reviewed:** 17-Feb-2023, QC No. IJE-23-13234; **Revised:** 20-Feb-2023, Manuscript No. IJE-23-13234(R); **Published:** 27-Feb-2023

Citation Information: Ashraf, M., Razzaqu, M., Lawrence, L., & Shamayleh, M., (2023). Emerging technologies and entrepreneurship program in Australian private higher education: a case study showing integration of analytics and gaming into a Bachelor's Degree program, *International Journal of Entrepreneurship,* 27(S3),1-20