QUT submission to the Inquiry into innovation and creativity: workforce for the new economy

QUT welcomes the opportunity to add to its first submission to the Inquiry, dated 10 March 2016. That submission is included again here in Addendum 1, with minor additions to bring the submission up to date.

QUT is pleased to be able to address the new term of reference:

4. Opportunities for generating increased economic activity, including further investment and jobs, through greater synergies among publicly funded research agencies, universities and other Australian research institutions with businesses and industry; including but not limited to: co-location, cluster formation and development of precincts between universities and industry.

Since its inception as a university in 1989 QUT has placed high value and emphasis on linking our research with industry. Over the years we have developed a wide range of projects and partnerships with end users.

While we will continue to see ongoing development emerge from the network of contacts and relationships that exist across QUT's researchers and our various partners, our intention is to move to an advanced level of engagement and integration with industry and other end users. In 2016, QUT reappraised its strategic direction and developed a refreshed overarching strategic plan, the QUT Blueprint 5, and a supporting Research and Innovation Strategy. These documents outline how we seek to differentiate our research.

Being a university for the real world, QUT's research is aligned to the human capital and innovation needs of the economy. This means we look at research through the lens of the academic disciplines as well as from the perspective of the economic sectors where innovations are being underpinned by automation, big data, and extreme customisation. It is in these areas where QUT's deep technological strengths mean we have built internationally leading research critical mass, and in selected sectors we see considerable potential for building on emergent precinct development.

Innovation precincts can arise where there is a combination of deep industry domain knowledge and technological capability in particular sectors of the economy where there are regional strengths, together with enabling factors such as professional services firms and entrepreneurial education. While Silicon Valley is the dominant example, the linkage of strong universities and areas of specialty can also be seen in the financial technology cluster in London and the agricultural technology cluster in Israel. For Brisbane, QUT sees particular potential in the health and medical sector, as well as agriculture and mining technology, and creative industries.

Significant scale of activity is already evident in Brisbane in the health and medical fields, as it is in a number of other emerging innovative cities. With a strong nearby base in university research from The University of Queensland and QUT working with adjacent hospitals and health services agencies there is an emerging precinct from Kelvin Grove (QUT campus and QUT Institute for Health and Biomedical Innovation), to Herston (UQ Medical School, QIMR Berghofer, Royal Brisbane and Women's Hospital (RBWH)), and Woolloongabba (Princess Alexandra Hospital, Translational Research

Institute (TRI) with the co-located Patheon bio-pharmaceutical manufacturing facility with fermentation capacity). Activity spans a wide range of clinical areas and academic disciplines and can be strengthened by new technological developments in areas such as robotics, big data and 3D printing. For example, QUT has recently announced a partnership with Metro North Hospital and Health Services and RBWH to launch a Biofabrication Institute at Herston; and our researchers at TRI are working with big data in genomics to develop new and more personalised treatments in association with Janssen Biotech Inc., one of the Janssen Pharmaceutical Companies of Johnson & Johnson.

Similarly, given that Queensland has depth of domain knowledge and executive talent in the resources and agricultural sectors, it makes sense for QUT to prioritise research and innovation at the intersection of technology and the agriculture and the Mining Equipment, Technology and Services (METS) sectors. QUT already has a strong base in these fields: we host the METS Industry Growth Centre, and are in the process of appointing a Chair in Mining Automation through Mining3 (the CRC for Mining); we have partnered with the State Government in farming automation; and we are a key player in a bid for a CRC in Food Agility (incorporating digital agriculture).

The creative industries innovation spurred by QUT Creative Enterprise Australia (CEA) also provides a base for a wider range of possibilities for linking technological capacity, academic expertise, entrepreneurial environments and industry needs. CEA is part of the Creative Industries Precinct at QUT's Kelvin Grove campus. The Precinct was established more than twelve years ago to foster connections and collaborations with partners from government and industry to create new work, develop new ideas and grow the creative industries sector in Queensland and Australia. Through a partnership between the Queensland Government and QUT, the Precinct combines inner urban development (being part of the Kelvin Grove Urban Village) with innovation in commercial development in the creative industries, academic programs and performances. In 2016 an $80 million expansion of the Precinct was completed to provide new state of the art facilities.

An innovation precinct can only be successful if there is a thriving culture of innovation and entrepreneurship. QUT is actively fostering such a culture in Brisbane in a variety of ways:

- QUT was selected to host the MIT Global Entrepreneurship Bootcamp at Gardens Point campus in Brisbane in March, 2017, through a collaboration with the Queensland Government. The highly-selective camp condenses a one year MIT course into a week-long, action-based learning experience for budding entrepreneurs picked from across the world;
- In June 2016, the Johnson & Johnson Innovation (JJI) Partnering Office was opened at QUT, supporting the relationship between government, academia and industry to advance the life sciences industry in Queensland and throughout Australia through networking, education, mentoring and access to commercialisation skills and the JJI global network. This is an initiative by Johnson & Johnson Innovation in an affiliation with Janssen ANZ (Janssen-Cilag Pty Ltd), the Queensland Government and QUT;
- QUT is the lead and partner in a 14 member consortium of pharmaceutical companies, venture capitalists and universities selected by the MTPConnect Industry Growth Centre to deliver The

Bridge Program which aims to transfer practical skills on the commercialisation of pharmaceutical research through a training program that targets researchers and entrepreneurs.

- QUT has established a $3 million early stage development fund (QUT Founders Fund) to build the next generation of Founders from QUT's staff, students, alumni and technology. Important long-term outcomes are to attract and produce entrepreneurial graduates and to attract and develop early career staff. The initiative is not necessarily about commercialisation outcomes, but is primarily about encouraging entrepreneurship;
- In a similar vein, QUT's Blueprint 5 includes a corporate KPI based on the number of staff and students who found a new business venture. The Founders Fund and the allocation of spaces to house start-ups on campus, where a program of activities and events, alongside entrepreneurship research and formal business curriculum, will support entrepreneurial behaviour in the QUT community;
- QUT's commercialisation arm, qutbluebox, provides support, advice, space and programs to translate student, staff and alumni innovations into entrepreneurial outcomes. With a portfolio of QUT technologies, a start-up accelerator program and a $250,000 Innovation Challenge, qutbluebox's team of experienced professionals with industry-relevant technical backgrounds and a broad range of management, legal, patent and finance skills enable QUT IP to be transferred and realise commercial potential. Most recently for example, qutbluebox has worked closely with new commercially successful firms such as ClipChamp (founded by a QUT staff member) and Vald Performance's NordBord Hamstring Testing System Performance (founded by a QUT graduate); and
- QUT CEA, the commercial arm of QUT's award winning Creative Industries Precinct, was established by QUT to support entrepreneurial activity and business growth in the creative industries, in particular to foster start-up incubation and industry engagement. It is a unique and multi-faceted creative industries accelerator in Australia, incorporating incubation, acceleration, coworking, and mentoring to start-ups. Since 2008, over 4,000 entrepreneurs have engaged with CEA services, supporting over 500 creative industries businesses on site, established over 50 start-ups and raising over $60M capital. Currently 94 creative industries businesses are located on sites in specialised markets including wearable tech, fashion, design, screen, games and interactive media.

Issues of location are also central to the idea of precincts. QUT is a university with two CBD campuses and a significantly smaller campus to the north of Brisbane at Caboolture. We have developed a number of "distributed" research activities across Queensland, including the Mackay Renewable Biocommodities Pilot Plant (which receives NCRIS funding to encourage use and has been engaged in research programs with significant multinational companies such as Asahi) and the Crop Development Facility at Redlands which provides space for plant biotechnology and agricultural robotics as well as trialling by industry of new products and services. However the creation of economically valuable broadly based innovation at significant scale will require locations that are attractive to the building of critical mass in culture and knowledge. Scholars such as Richard Florida and Paul Krugman have emphasised the importance of geographical place and local culture in sparking the exchange of ideas and leading to "knowledge spillovers". QUT sees the Brisbane CBD and its immediate surrounds as having great potential to develop as a series of inter-related precincts. In particular, Kelvin Grove has a well-established cultural precinct; proximity to the CBD and major sites of research; established track

record of success with new ventures in the Creative Industries via CEA; easy access to Brisbane Airport; and, importantly, the available space to offer an ideal opportunity to serve as a key focal point for a Brisbane innovation precinct.

The attraction of the MIT Bootcamp supports QUT's goal to create confident, capable and competent entrepreneurs who see innovation and start-ups as viable career choices. Universities play a key role in any start-up ecosystem: through building talent; by exposing students to the concept and practice of entrepreneurship; by encouraging entrepreneurial behaviour and practice as a graduate destination; and by developing and sharing intellectual expertise and cutting edge research across multiple discipline areas. As the world changes and the need for creativity, innovation and problem solving skills grows, QUT seeks to enable choice for our graduates so they may make entrepreneurship their graduate destination.

If we aim to create a Boston-style ecosystem in Brisbane where we all need to differentiate ourselves, we might see The University of Queensland as a Harvard Medical School in the health space; Griffith University like Boston or Northeastern University – a large comprehensive university. We note that whilst MIT is a big player in health, it is not a comprehensive player. It is a technology-driven player, using robotics, big data and technology. This is where we see QUT's role - as the technology hub for research and innovation in a precinct environment.

As an example, QUT is the main trainer of radiographers in Queensland. Our challenge is to promote research and innovation in an important area of health by introducing capabilities in machine learning and data visualisation so that imaging technologies can transform medicine. We are working with the Translational Research Institute (TRI) in a partnership with Siemens and the Queensland Government to establish an Innovation and Translation Centre to bring one of the world's leading PET-MRIs to the Princess Alexandra Hospital, and QUT is introducing a PhD scholarship program in Medical Radiography. This approach is a serious response to the studies on the effects of automation on the jobs of the future. We are interested in preparing the professions for technological disruption, with students and researchers who are ahead of the curve - radiographers with computer science skills as well as radiography skills, developing software to drive innovation in medical practice. We are doing this in collaboration with research partners, industry partners and government in an emerging precinct environment.

Submission prepared by:
Division of Research and Commercialisation, QUT
Contact: dvc.resacom@qut.edu.au

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ADDENDUM 1

QUT Submission to the Inquiry into Innovation and Creativity

March 2016

a university for the real world®

Introduction

Queensland University of Technology (QUT) supports the recommendations included in the *Universities Australia Submission to the Inquiry into Innovation and Creativity*. It succinctly addresses the pivotal themes in relation to the role of the Australian higher education system in the context of the nation's innovation and creativity agenda.

QUT's submission provides some additional information regarding the key issues relevant to ensuring that innovation and creativity capabilities are developed in all students and that it is represented in our research and industry partnerships, particularly as QUT continues to proactively enact its brand promise, as a *University for the Real World*. QUT is a young, ambitious, world-class university with a history of strong industry links and has a significant leading presence in fields including science, technology, engineering, mathematics (STEM), health, business, and creative industries.

QUT appreciates the opportunity to provide the following feedback to the *Inquiry* and offers the following information and suggestions.

1. The extent to which students are graduating with the skills needed for the jobs of today and of the future.

QUT acknowledges that its graduates must be highly skilled, digitally literate, creative, networked, and resilient in order to work effectively throughout their life. To facilitate these aims, QUT invested in undertaking institutional research that highlighted that strengthening employability and enabling employment in a discipline of choice are key criteria for graduates assessing the value of their higher education. As well as responding to market expectations for work-ready graduates, QUT provides opportunities to enhance the student experience, foster the aptitudes and mindsets of students to handle a dynamic labour market, and create employment through innovation, entrepreneurial thinking, and peer assisted learning and programs. It is envisaged that the development of peer-to-peer models and associated employment platforms are likely to experience rapid growth. Enhancing the employability of higher education students is an essential QUT strategy for improving graduate outcomes, as well as contributing to the high reputation and viability of the institution.

As highlighted by Grattan Institute research[1], the financial value of an Australian bachelor degree holder over a school education is as high as approximately $900,000 for males and $700,000 for females over a lifetime of employment. Further, the Australian Bureau of Statistics figures continue to show that higher degree holders have much better employment and participation rates than the broader Australian population. While recent graduate outcomes data reports improvements to the overall national employment rate for domestic bachelor graduates, the current context of sustained and low employment rates has highlighted that graduates are vulnerable to external market forces. QUT has adopted a number of strategies focused on building students' employability as a continuous process during and beyond their university studies. In partnership with Faculties, the University has implemented a holistic approach to employability initiatives, as well as contributing to the development of strategies to address the national issues that relate to the recent trends in employment outcomes.

QUT has actively looked at ways to provide educative and reflective services and programs that will assist students to manage employment expectations and advance work readiness and skills

[1] Norton, A., & Cherastidtham, I. (2014). "Mapping Australian higher education", 2014-15, Grattan Institute.

capabilities. Our *Real World Learning 2020 Vision*[2] specifically articulates the graduate capabilities and learning experiences required for 21st century employability. This *Vision* is a university-wide, ambitious statement, which includes a set of enabling strategies. The *QUT Digital Roadmap* forms part of the Real World Framework, and underpins QUT's plans for real world research, learning, and engagement. It sets the agenda for digital transformation (and literacy) over the mid- to long-term future in the core areas of students, learning, and teaching; research and innovation; and people, culture, and sustainability. Furthermore, the *QUT Digital Roadmap* supports the realisation of *Blueprint 4* and strengthens QUT's role as a university of technology. Some other factors that are key to QUT's more immediate success include:

- Reflecting on course offerings and learners' development, and how this impacts and contributes to society in the future;
- Monitoring student satisfaction, progress, and engagement through learning analytic studies, and developing early intervention strategies, as required;
- Embedding career development education within the curriculum, as well as offering it as extra-curricular activities;
- Offering studies in design/creative thinking and problem solving skills that complement students' deep content knowledge and are required for their professions;
- Offering skills in communication, team work, analysis, and entrepreneurship across all QUT courses (see term 4);
- Supporting work integrated learning through placement opportunities, guidance, and mentorship services, which in turn, promote long-term relationships and innovative collaboration between the University and industries;
- Integrating work readiness and 21st century skills into each QUT student's experience;
- Improving students' ability and capacity to articulate their capabilities to future employers;
- Responding to the need to offer education and skills to alumni entrepreneurs to enable them to start their own small businesses;
- Developing new strategies for working with industries to ensure course outcomes address employer expectations; and
- Using data more effectively and using analytical expertise, necessary to develop informed strategies and future goals.

Recently, QUT has examined the needs of its research students more closely as many graduates are seeking employment in the non-academic workforce and collaborating outside the academic sphere. By developing formal mechanisms for providing students with an understanding of research impact and developing their skills and contributions to society as graduate researchers, students will be better prepared for both future academic and non-academic careers. QUT manages the e-Grad School (Australia) (eGSA)—a virtual graduate school operating from Australia for the global research community—which is a unique joint collaboration of the Australian Technology Network (ATN) of universities[3]. eGSA's mission is to "raise the bar in research training" by focusing on the development of non-discipline specific generic skills, and creating further employment opportunities for research sector professionals. The short, flexible courses are delivered online and are developed and taught by experienced experts from industry and research sectors (see term 2).

Given QUT has significantly invested in health and clinical education and research, the University strongly supports Universities Australia's commentary and recommendations in relation to clinical placements in real-life settings and developing capable and proficient health professionals of the future. Health related issues, along with an ageing population, will impact on the demographic structure of Australia's future workforce. High growth rates in employment are projected for health

[2] "Real World Learning 2020 Vision". https://www.qut.edu.au/about/strategic-ambitions/real-world-learning-2020-vision.
[3] "e-Grad School". http://www.egradschool.edu.au/.

professionals, driven by population growth and ageing. Consultation on the potential development of a coordinated whole-of-Government approach to clinical placements is welcomed (see term 2).

Megatrends such as globalisation, digitalisation, and automation continue to reshape the job market at an accelerating rate and generate a shift from a knowledge-based to creativity-driven and emotionally intelligent economy, changing the attributes and skills required of graduates. In this context, universities need to remain contemporary and flexible in their capacity to educate in ways that ensure graduates are agile, resilient, and able to find and create meaningful work. By applying the research of Frey and Osborne[4], QUT identified that 80 per cent of its courses are in occupations and industries at risk of being automated in the next 20 years. To address this concern, QUT is seeking to strengthen the innovation, entrepreneurial, creative, and design-thinking skills and attributes among graduates through targeted programs and modular offerings. This will contribute to delivering a new generation of self-actualised and agile learners. Furthermore, QUT continues to focus on digital learning initiatives and strengthening skills, capabilities, and engagement of our staff and students.

The employability and employment strategies at QUT align and complement the activities of its controlled entities, qutbluebox and Creative Enterprise Australia (CEA) as subsidiaries of QUT Enterprise Holdings (QEH), which focus on building the commercialisation and an increasing number of the entrepreneurial aspects developed by QUT students. For example, the proof-of-concept (POC) programs they have developed have the potential to lead to start-up companies and/or commercial licences. Furthermore, the controlled entities' investment funds that provide financial support to ventures and start-up businesses with significant growth opportunities have the potential to attract other investors and grow and generate profit and return (financial and educational) to both the University and its graduates.

The commercialisation arm of QUT is qutbluebox, who works extensively with student groups, staff, alumni, and industry to build robust and suitable commercialisation relationships. Part of its updated focus is to more effectively link an organisational approach to entrepreneurism and commercialisation engagement through supporting and developing a broader range of initiatives to facilitate robust early stage commercial opportunities. This is done through a range of initiatives, either standalone or coordinated with the University's Faculties and Research Institutes to ensure integration into the education processes and exposure for students and staff to internal and external entrepreneurial and commercial activities. qutbluebox is a key point of contact for QUT to engage and build linkages and foster collaboration into the local, state, and national innovation and entrepreneurial ecosystem. It is working closely with new Federal Government initiatives focused on international linkages such as the Launch Pad program.

QUT CEA is the commercial arm of QUT's award winning Creative Industries Precinct. CEA was established by QUT to support entrepreneurial activity and business growth in the creative industries, in particular to foster start-up incubation and industry engagement. It is a unique and multi-faceted creative industries accelerator in Australia, incorporating incubation, acceleration, co-working, and mentoring to start-ups.

CEA is recognised as a key part of the Australian startup ecosystem by the StartupAus, Crossroads 2016 report for our work in stimulating creative tech investment, events and acceleration.[5]

[4] Frey, C. B., & Osborne, M. A. (2013). "The future of employment: how susceptible are jobs to computerisation"? Sept 17, 2013.
[5] Startup Aus Crossroads Report 2016 https://startupaus.org/crossroads/

Situated in the heart of QUT's Creative Industries Precinct at Kelvin Grove, CEA provides a fertile environment to allow start-ups to grow, while connecting to research and internship opportunities on campus.

Working across the creative industries, CEA specialises in fashion and design, film and television, games, music, interactive media, and wearable technology. Since 2008, over 4,000 entrepreneurs have engaged in CEA services, supporting over 500 creative industries businesses on site, established over 50 start-ups, and raising over $60 million capital. Currently 75 creative industries businesses are located on site.

All of CEA's clients are required to be connected to QUT to qualify for services. This is either the establishment of the company by a QUT alumnus or willingness for the venture to engage in work integrated learning, graduate employment, teaching, or research opportunities. To date 60 per cent of CEA clients are founded by a QUT alumnus and last year 50 per cent participated in work integrated learning programs.

QUT has been ahead of other Australian Universities in its approach to understanding barriers to creative industries business growth through the establishment of CEA. CEA provides an industry-driven structure to fast track industry engagement and commercialisation of creative start-up ideas.

CEA also has a very high business survival rate for member companies with over 90% with ventures flourishing after five years which is above the Australian Bureau of Statistics startup entry and exit survey (2014) averages of 62.9%. After our support, ventures continue to expand with an average of $300,000 in revenue after their participation in our programs. Our business development programs rank highly, receiving Net Promoter Scores of 71 or above from our members.

Further information on qutbluebox and CEA is provided in the context of terms 3 and 4. Appendix 1 provides a list of both qutbluebox's and CEA's programs, services, and activities.

Support from the Australian government for higher education continues to be important in order for Australia to meet its future workforce needs.

High female founder participation ratio

CEA has a higher than national average participation rate in startups that are led by female founders. Startup Muster's national survey (2015) highlighted that only 19% of startups were established by female founders:

- CEA has over 54% of entrepreneurs who are led by female founders across our Business incubation and co-working programs (total of 151 individuals across 80 businesses).
- Our fashion incubation and accelerator programs have had 90% female led founders over the last four years.
- Of the eight investments made by CEA through our Startup Fund, five have been made in female creative-tech founders representing 62.5% of our current investment portfolio which is one of the highest ratios in Australia.
- All of our events and our flagship conference, which is the largest startup event in Australia for creative tech, is Creative3 attract over 50% female attendance from entrepreneurs and startups given the high ratio of women employed in the creative industries.

2. Matters relating to laws and regulations that may act as a barrier to education providers being able to offer qualifications that meet the needs of the new economy and fastest growing sectors.

QUT has sought to develop innovative offerings through double degrees and courses such as the Bachelor of Creative Industries, which seeks to support our learners to develop breadth, as well as depth of experience in order to cultivate interdisciplinary learning. Developing a "T" profile can only be achieved when there is a deep understanding and practice in the fundamental discipline(s) (the base of the "T"). Individuals, including graduates, need to develop depth and breadth in order to achieve needed skill-sets to tackle complex problems and respond to industry needs. By developing an understanding of how disciplines relate to broader contexts, QUT has developed a competitive advantage and created linkages across its disciplinary areas through innovative course offerings.

The Tertiary Education Quality and Standards Agency (TEQSA) currently registers and evaluates the performance of higher education providers against the *Higher Education Standards Framework*. While it is recognised that there must be an internal capacity and desire to be more innovative in relation to course design that meets the needs of the new economy, the *Standards* include a broad set of expectations and requirements of universities in relation to quality, which could be perceived to constrain more innovative and agile course offerings.

Since the last accreditation period, QUT has seen a shift in the structure of some of its core Bachelor degree offerings to Level 8, embedding Honours. For accreditation and reputational purposes and facilitated through the *Australian Qualifications Framework* (AQF), universities strive to ensure their offerings are of the highest standard possible by demonstrating a higher level of complexity to the learning outcomes. Education and training is becoming even more important as the complexity of tasks is increasing and higher skill levels are required for entry into many professions and occupations. The volume of learning indicator is included as an integral part of the descriptor for each qualification type. This indicator represents a dimension of the complexity of the qualification type. QUT is proactively looking at alternate ways to secure future financial and reputational growth, such as that provided through innovative and customised education offerings. Market research suggests that individuals and corporations seek quality, competitive, and contemporary learning delivered by reputable instructors in a flexible manner, providing "just enough" learning. In some cases traditional Masters and postgraduate courses are no longer perceived as attractive or meeting the needs of individuals and industry. Lifelong learning needs to focus on preparing both young and old for new and different jobs and employment models. The volume of learning aspect of the AQF could be seen to limit these types of innovative learning offerings and experiences.

Consistent with the *National Strategy on Work Integrated Learning in University Education* and the need to coordinate partnerships between industry, community, educators, and researchers, QUT has developed InPlace, which seeks to build our knowledge of work integrated learning partners and support students within an increasingly regulatory environment. InPlace at QUT has over 90 academic staff advertising projects, over 135 staff using the placement functions, nearly 13,000 students interacting with the system, close to 12,000 agencies, and approximately 87,500 total recorded placements in the system. The system is fully integrated with the University's student system and allows academics, students, and employers, as required, to utilise different work integrated learning models to suit their varied requirements.

3. Factors that discourage closer partnerships between industry; in particular small and medium enterprises, the research sector and education providers; including but not limited to: intellectual property; technology transfer; and rapid commercialisation.

QUT's early focus on interdisciplinary research has provided a comparative advantage and enabled the University to leverage expertise across the institution. The University recognises that research has become significantly more interdisciplinary over time, both at QUT and world-wide. This is a crucial issue that will affect future Australian research innovation and which should be well supported through national initiatives and incentive schemes. QUT has diverse areas responsible for industry engagement and/or business development activities, who offer an interface between researchers and the various service entities responsible for research and commercialisation activities. QUT has been actively pursuing links with industry in order to develop partnerships and increase the flow of knowledge between the research sector and broader society. One of QUT's established longstanding research collaborations is with the key industry partner, Johnson & Johnson Vision Care Inc (Vistakon), based in the United States of America (USA). This partnership aims to develop breakthrough technologies and address a wide range of vision-related conditions that will eventually lead to incubation. In 2015, as part of the Queensland Government's Advance Queensland program, it was announced that QUT will host one of three major flagship partnerships, the Johnson & Johnson Innovation Partnering Office, that will facilitate access to resources and expertise within the Johnson & Johnson portfolio to deliver improved translation of research outcomes to commercial reality.
To strengthen closer partnerships between the University and industry, QUT is actively pursuing a coordinated and prioritised approach to industry engagement across the institution, which will assist to further internationalise and potentially commercialise, QUT's research. The University is actively working with its technology transfer company, qutbluebox, to build the portfolio of industry engagement, manage relationships, identify early potentially valuable intellectual property (IP), and undertake proactive business development activities. Small and medium sized enterprises (SMES) are suppliers of innovation and competition in many economic sectors. They account for a large proportion of employment in Australia and QUT recognises the benefits of further investing in this growing tier of activity (see term 1).

QUT's technology transfer company, qutbluebox, was created to expand and professionalise QUT's commercialisation and entrepreneur capabilities. Although qutbluebox was formed as a separate legal entity wholly owned by QEH in part to more effectively manage the risk associated with commercialisation (technology transfer) and related major commercial ventures, it operates closely with QUT and is highly reliant on the activities of the University as a key determinant of the prospects for commercialising IP created at QUT. QUT will be more engaged with qutbluebox in major commercial interactions as a means of strengthening the commercial processes around delivering greater impact from research. qutbluebox has responded to this opportunity by expanding its strategy to more effectively support QUT in this approach and build strong and more sustainable commercial collaborations with a particular focus on the SME sector as early adopters of innovation. Experience also indicates SME's are more adaptive at managing early stage technology risk and market adaption, particularly in the new platform areas around robotics, new materials, energy, biotechnology, biomedical, agribusiness, and service sectors.

CEA is operating in the most dynamic, disruptive and fast paced economic sector in the globe today. Australia's creative and digital industries are two of the fastest growing sectors of our economy.

Creative and digital industries overall grew by 70,000 jobs, or 2.8 per cent a year over the period 2006-2011, outstripping total Australian workforce growth by 40% (CCI 2013)[6].

In 2015, Australia was recognised as the Number 1 country in the Global Creative Index by Richard Florida's creative competitiveness across 139 nations based on technology, talent, and tolerance. These are three factors driving today's global economic development, which are being recognised in part in the National Innovation and Science Agenda (NISA)[7].

The focus of NISA's "ideas boom" involves driving more capital into start-ups, trying to attract entrepreneurial talent to Australia, and getting university researchers and industry to work more closely together. However, the importance of creative industries in Australia as a driver of innovation and future workforce skills is not featured strongly to date in NISA.

At CEA, we believe that because of the importance of the creative industries which represent $90 billion to the economy and employs over 6.2 per cent of the Australian workforce[8], which is more than mining and agriculture; this should be revisited as part of the execution and criteria for Industry Growth Centres. This is particularly important with significant investment overseas in creatives industries by countries like the United Kingdom (UK), Singapore, and China, as part of their knowledge economic strategy and investment over the last decade.

Creative Industries are at the forefront of innovation but often creative industries start-ups struggle to find capital as they are often viewed as high-risk by investors. It is important that pathways to undertake rapid commercialisation and technology transfer in the creative industries are included as part of NISA to address these capital raising challenges.

It should be recognised that the timelines for substantial research outcomes in select disciplinary areas take time and often do not meet the expectation of industries. An indicative timeline from concept to change in policy direction for a research project can in some instances take more than 10 years. This can be a major deterrent for fostering industry and potential commercialisation linkages. Enhanced communication with key decision-makers to heighten awareness and improve the expectations in terms of POC to commercial product would be beneficial and lead to improved industry collaboration. Acknowledging that industry has an important role to play in contributing to the development and implementation of innovation and entrepreneurship programs in universities (see term 4), Australia could offer further diversified funding schemes and initiatives, similar to that adopted in the UK ("Third Stream Funding"). Such funding would assist to incentivise industries to collaborate with universities, enhance community engagement, support technology and knowledge transfer to society, and further assist to increase partnerships, commercial operations, and activities between academia and commercial enterprise. As acknowledged by Universities Australia, reforms such as the announcement of NISA provide strong impetus for change within universities.

[6] Creative Precinct Industry Innovation Bid May 2013 (CEA as partner)
[2] Australian Bureau of Statistics (2013). ABS 8165.0 Counts of Australian Businesses (May 2013)
http://www.ausstats.abs.gov.au/Ausstats/subscriber.nsf/0/4461C2EEC98E3A47CA257B7100149A76/$File/81650_jun 2008 to jun 2012.pdf.
[3] Australian Computer Society (2012). 2012 Australian ICT Statistical Compendium. http://www.acs.org.au/__data/assets/pdf_file/0014/13541/2012_Statcompendium_final_web.pdf
[4] Centre for Creative Industries and Innovation (CCI) (2011). Australian Creative Economy Report Card 2011. http://www.cci.edu.au/sites/default/files/dbogg/Creative Economy report card March 2011.pdf.
CCI (2013). Australian Creative Economy Report Card 2013. http://www.cci.edu.au/sites/default/files/dbogg/Creative Economy report card March 2011.pdf.
[5] Bakhshi, H., Freeman, A. and Higgs, P. (2013). A Dynamic Mapping of the UK's Creative Industries. Nesta: London.
[7] The Global Creativity Index 2015. http://martinprosperity.org/content/the-global-creativity-index-2015/.
[8] CCI (2011). Australian Creative Economy Report Card 2011. http://www.cci.edu.au/sites/default/files/dbogg/Creative Economy report card March 2011.pdf.

4. Relationships between tertiary education entrepreneurship programs and private incubator and accelerators.

With over 47,000 students, including almost 8,000 international students and close to 13,000 staff, QUT brings a wealth of experience, support, research, and contact in a vibrant and community-based campus environment, inspiring the next generation of ground-breaking ideas. QUT has academic strengths in innovation, entrepreneurship, STEM, creative industries, and industry engagement through its interdisciplinary focus and recognises the benefits of leveraging this expertise, learning from world leading universities, and translating effective programs to the Australian context drawing on the principles articulated in the Australian Government's paper "Boosting High-Impact Entrepreneurship in Australia. A role for universities". QUT plans to expand on its existing activities, including those offered through its controlled entities, eg mentoring in incubators, accelerator program, and ideas competitions, to offer best practice innovation and entrepreneurship education and research. These activities support start-up teams comprised of students, staff, and alumni across a range of disciplines and provide education, mentoring, professional advice, accelerators, co-working space, and investment. The QUT Business School hosts the Australian Centre for Entrepreneurship Research that is a hub for research-based knowledge in entrepreneurship and extends into adjacent areas such as innovation and small business[9]. The Research Centre was founded in 2010 and is supported by a $1.5 million investment by the Talbot Family Foundation in addition to QUT Business School research funding. Through its lifetime, members of the Research Centre have earned significant research funding from the Australian Research Council and the Federal Department of Industry, Innovation, Science, Research and Technology. Its external funding enables data collection and analysis from the Australian arm of the Global Entrepreneurship Monitor (GEM), which is the world's foremost study of entrepreneurship. The GEM data collected by the Research Centre has been used to inform policy and practice around youth and female entrepreneurship, and new venture development more generally.

qutbluebox forms a 'concrete bridge' to the broader national and international innovation ecosystem and has been successful in demonstrating its flexibility to form part of the rapidly evolving arena. As mentioned earlier, it works across QUT in partnership with or through initial seed establishment of an integrated and coordinated set of initiatives, focused on providing a clear pathway of learning and support for budding entrepreneurs and commercialisation. QUT and qutbluebox support a range of education, networking, pitching, hackathon, start-up weekend, and other entrepreneur events (see Appendix 1). In addition to specifically focusing on developing entrepreneurial skills, QUT and qutbluebox run major initiatives such as:

- Start-Up Hatch—a Student Starters initiative established in late 2014 with support from qutbluebox, CEA, and the QUT Business School;
- Ubercamp;
- qutbluebox Innovation Challenge ($150,000 prize); and
- qutbluebox Start-Up Accelerator.

A further initiative established by the QUT Business School is gold sponsorship of the Start-Up Catalyst (in 2014 and 2015), which enables young people to visit Silicon Valley and participate in a start-up weekend.

Additional initiatives currently being developed include:

[9] "Australian Centre for Entrepreneurship Research". https://www.qut.edu.au/business/about/research-centres/australian-centre-for-entrepreneurship-research.

- Options for a virtual Venture Hub to more effectively support early stage ventures within QUT, which would create the interface for a stronger presence between QUT and industry. This will be facilitated through a suite of start-up initiatives, ranging from corporate hackathons to corporate accelerator programs.
- Pathways to more effectively connect QUT formed ventures (principle focus student and staff established initiatives or industry-related commercialisation collaborations) to local and international capital and early stage funding and expertise.

The "ideas ecosystem", that fosters start-up acceleration in the creative industries via CEA, is a further investment given QUT's significant research and graduate capability in this sector. CEA's approach has been to focus on QUT's discipline and sector strengths, to build specialised business development programs and expertise to drive business growth, employment, work integrated learning, research, and industry engagement opportunities.

Since 2008, over 4,000 entrepreneurs have engaged in CEA services, supporting over 500 creative industries businesses on site, established over 50 startups and raising over $60M capital. Currently 94 creative industries businesses are located on sites in verticals including wearable tech, fashion, design, screen, games and interactive media.

CEA programs are captured into four distinct product and service categories providing a range of services for early-stage members working on prototypes and ideation through to fast growth businesses seeking to develop international markets:

- Start – providing incubation and assistance to new business ideas and opportunities;
- Grow – providing growth support to early stage member businesses;
- Scale – providing business expansion support to member businesses; and
- Connect – providing collaborations, networks, and links for all members.

CEA operates in a highly dynamic, fast moving and entrepreneurial sector, which requires a market driven approach. CEA needs to be as adaptive and entrepreneurial as the creative industries market in order to be relevant and have impact. QUT has provided the framework and strategic direction in order for CEA to have the flexibility and relevance to its market fit.

A University-wide minor in Entrepreneurship and Innovation is currently available to any QUT student, ie four units of study within their degree. The QUT Business School, through its School of Management also teaches entrepreneurship as part of the Management major in the Bachelor of Business. These offerings have strong demand suggesting there is clearly an appetite for entrepreneurship education amongst the QUT undergraduate population. Building on these existing offerings and to capitalise on this latent demand, QUT is in the early stages of developing a whole of QUT strategy around practical and experiential entrepreneurial training to service all University-wide courses with an objective to build, communicate, and establish a visible whole of organisational approach to innovation and entrepreneurism. This demonstrates QUT's commitment to this early stage innovation fabric, as well as developing a new suite of commercial initiatives and establishing linkages to the local entrepreneurial community partners. CEA has already extensive connections with the local start-up ecosystem hosting regular pitching events, student engagement activities, collaborative events, and is part of the Advance Queensland Expert Panel advising on Queensland entrepreneurial funding and policy priorities. National incentives linked to funding would encourage universities to develop frameworks that promote student innovation and entrepreneurship.

Appendix 1: qutbluebox Programs, Services, and Activities and CEA Programs, Services, and Activities, Including CEA Collaborative Entrepreneurial Programs

qutbluebox Programs, Services, and Activities

qutbluebox's core role is to work together with QUT researchers to assess, develop, and protect innovative IP with the ultimate goal of transferring the innovations into the marketplace where they will have the greatest impact.

QUT and bluebox support a range of education, networking, pitching, hackathon, start-up weekend, and other entrepreneur events as follows:

- QUT Starters;
- QUT Code Network;
- QUT Robotics Club;
- QUT Mobile App Demo;
- QUT Institute for Future Environments Grand Challenge Lecture Series;
- Start-Up Weekend for Health;
- Start-Up Grind/Google for Entrepreneurs/QUT Business School;
- US Ambassador's Visiting Entrepreneur Program;
- Australian Centre for Entrepreneurship Event Series;
- PwC Chair in Digital Economy Event Series;
- QUT Real World Futures Event Series;
- QUT PwC Student Design Jams;
- Blue Sky Forum; and
- Creative Enterprise Australia Events.

Entrepreneurial training programs such as Ubercamp – An intensive weekend initiative developed externally and supported by qutbluebox.

Proof-of-Concept (POC) Program and Fund – The POC program, launched in 2008, is one of the cornerstones of bluebox's support to QUT. This successful initiative enables investment in key QUT projects with commercial potential.

Innovation Challenge – The Innovation Challenge is open to all entrepreneurially minded QUT alumni, students, and staff. In order to progress their innovation, the Challenge offers finalists the change to work with bluebox, secure seed funding, and gain publicity for their innovation.

qutbluebox Start-Up Accelerator – The qutbluebox Start-Up Accelerator program is a 3-month internal seed accelerator program to assist QUT staff, students, and alumni to develop a minimum viable product and/or service, refine a business model, and ultimately launch a start-up company. This program has been internationally recognised as a leading program and ranked in the top 10 per cent of the top 300 university business incubators and accelerators globally for start-up coaching and services, as recently ranked by UBI Global.

CEA Programs, Services, and Activities

QUT's commitment to the creative industries and understanding of the sector, enables this specialist focus afforded through CEA programs, services, and activities.

Fashion Accelerator – As the only program of its kind in Australia, the CEA Fashion Accelerator is an intensive five-month program designed to take budding designers and fashion entrepreneurs on a journey of business acceleration exploring the technical, business, growth, and financial side of a fashion business. Members also access CEA's Stitchlab to help with prototype testing and fashion product development throughout the year.

CEA Pre-Accelerator – With a focus on upskilling creative industry and business entrepreneurs aged between 18-24, the CEA Pre-Accelerator covers business skills, partnering, investment, IP, market analysis, and pitching skills for creative industry entrepreneurs' seeking to build global markets. The program kicks off in 2016 in partnership with QUT Business School and will run annually over a period of three months.

Fast-Track Accelerator – Open to creative industry entrepreneurs, the Fast-Track Accelerator builds the commercial, business, creative, and growth acumen of participants through tailored workshops and masterclasses leveraging the industries best minds. The participants pitch their final ideas to a panel of experts winning the chance to present their idea to the CEA Start-up Fund. This new program will be launched in 2016.

Creative Founders Forum – The CEA Creative Founders Forum is an 8-month business development program, addressing key business competencies – people and leadership, value propositions and finances, marketing and networking problem solving, vision, goal setting. It's a collaborative advisory based program leveraging the joint knowledge of other company founders in a structured environment. The program runs annually and has a very high customer satisfaction rate, with a Net Promoter Score of 75.

Start-up Fund – The CEA Start-up Fund invests in high-growth, scalable businesses that are tackling global markets in the creative industries. Funding from $25,000 up to $150,000 is available to businesses in high growth markets of the creative industries sector in an overall fund of $1.2 million which was established to address the sector wide problems of raising capital. CEA plays an active role in supporting the growth of these companies in scaling in terms of capital raising, corporate governance, and market development. Over 65 per cent of these start-up companies were founded by QUT graduates and the remaining interstate founders are now committed to connecting to QUT internship programs as a result of closer engagement via CEA.

Creative³ – Creative³ is CEA's flagship yearly event bringing together some of the world's brightest talent and industry practitioners from different creative fields, and creative enterprise leaders to share their insights, form partnerships, network, and do business. Now in its 7th year, Creative³ harnesses the power of three: creativity, investment, and enterprise and is designed to enable entrepreneurs and start-ups to build successful creative businesses. For more information www.creative3.com.au.

Creative³ Pitch – The Creative³ Pitch is Australia's only event dedicated to connecting creative industries ventures with investors. Recognising the need for creative businesses to understand the angel investment community and what they are seeking, this event focuses on building capacity of start-up founders in the creative industries and increasing the number of investor-ready businesses in Australia.

CEA Collaborative Entrepreneurial Programs

Based on CEA's experience, it is crucial for accelerators to engage with entrepreneurial activity on campus to provide pathways for students and graduates to connect with start-ups and to provide inspiration and role models of innovative business practices. CEA delivers this is in collaboration with key groups which is essential to embed entrepreneurial learning.

CEA collaboratively works with other co-working spaces and incubators across Australia to support entrepreneurship activity.

CEA assists entrepreneurship on campus through the following initiatives:

Visiting Entrepreneurs Program – In collaboration with Queensland Government, Department of Science, Information Technology and Innovation (DSITI) and other industry partners, CEA holds regular visiting entrepreneur roundtables where international founders and business experts provide case studies, guidance and advice to CEA members in a range of areas of business.

QUT Starters – In collaboration with CEA, qutbluebox, and QUT Business School, QUT Starters provides a forum for students to pitch business ideas, form start-up teams, and develop new ideas to pitch to a panel of experts and industry specialists.

Start-up Weekend – Powered by Google for Entrepreneurs, Start-up Weekend is an accelerated program run over a weekend (54 hours) providing participants with the opportunity to experience the highs, lows, fun, and pressure that make up life as a start-up. Participants learn how to create a real company, meet industry leading mentors, investors, cofounders, and sponsors. CEA is delivering a Start-up Weekend event in 18-20 March 2016, focussed solely on the creative tech sector which is the first time in Australia.

YouTube Creative Entrepreneurship Program – In partnership with the Queensland Government, QUT, Griffith, and YouTube, CEA will be managing the YouTube Creative Entrepreneurship Program providing Queensland YouTube entrepreneurs with the opportunity to learn about growing their subscription bases globally. The program will also offer emerging and established content creators to receive additional mentoring via the opportunity to be pitch for development funding and access to YouTube's US headquarters to develop content for their channel.

Submission prepared by:
Strategic Intelligence Unit, Chancellery, QUT

Contact:
Dr Sam Nielsen
Director, Strategic Intelligence Unit

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