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Ms Francesca Astolfi
General Manager A/g
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Department of Industry, Innovation and Science
GPO Box 2013
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Dear Ms Astolfi,

The Digital Economy: Opening Up the Conversation Paper — Submission from The University of Technology Sydney

The University of Technology Sydney (UTS) welcomes the opportunity to provide input in the Department of Industry, Innovation and Science's (DIIS) Digital Economy Conversation Paper.

UTS welcomed the National Innovation and Science Agenda as a pivotal approach to embracing innovation and sowing the seeds for Australia's future prosperity and wellbeing. The Digital Economy is key facilitator of an innovative Australia and as such UTS supports the Australian's Government's proposal to develop a new Digital Economy Strategy.

Technological disruption will profoundly change the way we learn, teach, work and do business. These changes will bring opportunities as well as challenges to Australian business, workers and society at large. In order for us to capitalise on those opportunities and mitigate the changes in the emerging digital space, the Government needs to provide leadership and the supportive policy environment that will shape the creation of a positive digital future that benefits all.

Universities play a pivotal role in driving digital literacy and enabling the nation to harness the power of technological advances to drive growth and prosperity. The core functions of higher education—research, learning and teaching—directly relate to all four themes outlined in the Government's roadmap for the Digital Economy:

1. *build competitive strength and develop new ones*—through development of in-depth knowledge, collaboration with industry to bring knowledge to market; investment in innovation incubators and connecting research to real life problems;
2. *develop world-leading digital business capability*—through working with industry to develop technological solutions and pioneering education offerings focused on developing skills in data science, innovation and digital transformation;
3. *drive a culture and mindset that supports lifelong learning, a global outlook, and helps us respond positively to change*—through the development of short courses, flexible learning options and integrated digital platforms that enable students to balance work, life and study.
4. *address the 'digital divide' in skills and confidence to help all Australians succeed in a digital economy*—through thought leadership, contributing to a greater understanding of the human impacts of technological disruption, and practicing what we preach by ensuring the principles of fairness and equality through in our teaching and focus on research outcomes that drive positive social impact.

As a leading University of Technology and Australia's number one young university[1], UTS has a clear vision of what an inclusive digital future should look like. We also recognise that the industry, government and education sectors need to act with a sense of urgency. That is why we are focusing our research, prioritising industry collaborations and preparing our students *now* to adequately skill and equip them to flourish in the digital age.

Below, we provide our views on the key opportunities and challenges outlined in the Conversation Paper.

1) Our vision for an Australia that thrives in a digital economy

- **We will be skilled for the future.** A thriving Australia will be underpinned by a population that is sufficiently skilled and ready to take advantage of the opportunities in the future of work. Already, the most in-demand occupations today did not exist t years ago, and the pace of change will undoubtedly accelerate[2]. Our graduates need not just awareness, but mastery of the key disruptive technologies for their chosen future to enable them to adapt to rapidly changing work environments. To do so, learning will be lifelong, and no longer bound by a classroom or a single degree.
- **We will embrace a culture of lifelong learning.** Students and business will continue to bridge existing and emerging skills gaps via agile learning platforms (such as digital, short courses, micro credentials) to stay in step with digital transformation. Mastery pathways based on 'badge and bridge' or passport model that will offer flexibility to the

[1] Today, we're the highest performing university in Australia under 50 years old according to both the THE Top 200 under 50 2017, and the QS Top 50 Under 50

[2] World Economic Forum, 2016. 'The Future of Jobs' http://www3.weforum.org/docs/WEF_FOJ_Executive_Summary_Jobs.pdf.

student who is mixing work, life and study, enabling a modular approach to study with pathways to various types of accreditation including, Diploma, Certificate or Degree.

- **We will have technologically savvy businesses.** Industry will have a nuanced understanding of the opportunities, the challenges and the true value of technology for business. Through collaboration with research, digitally savvy businesses will be capable of harnessing digital technology to create new and innovative products and services, boost productivity and drive growth and jobs. Organisations will apply data analysis and visualisation to inform decision making as standard practice. They will also support and invest in the continued upskilling of their workforce as a means to secure and enhance their organisation's digital capabilities.
- **We will have spaces that facilitate innovation and knowledge transfer to industry.** Innovation is a driver of job creation and productivity. Australia will need supportive ecosystems to attract, grow and retain talent in technological innovation. Major cities around world have achieved success in fostering innovation and industry collaboration via precincts[3], and Australia needs to do the same in order to remain internationally competitive.

  Emerging urban knowledge precincts in Australia include the Innovation Precinct in Ultimo, home to many of Australia's digital, creative startups and companies, the Australian Technology Park in Sydney, Parkville Knowledge Precinct in Melbourne, and Kelvin Grove Urban Village in Brisbane. We will need to continue to foster world class precincts focused on stimulating innovation by nurturing high-technology start-ups, translating research and transferring the knowledge and tools created by university to application by industry, recognising that each precinct will have its own unique characters and attributes.
- **The digital future must enhance fairness and social inclusion for all Australians.** We need to better understand the potential human, social and cultural impacts of digital disruption and ensure that benefits flow to all parts of the community and that no one is left behind.

2) The role of government in achieving that vision

The Federal government plays a critical role in providing the right policy environment, including the infrastructure and incentives that will drive efforts by all sectors to towards achieving the vision of a prosperous digital future for Australia.

- **Funding for applied research and innovation with impact.** Researchers should be encouraged to focus their efforts on solving industry and community problems. The creation of new knowledge, innovation and the process of transfer to industry requires significant resources, time and commitment by both research teams and industry. Appropriate incentives and funding programs should be developed to drive innovative

[3] Global success stories include Silicon Valley in San Francisco, Silicon Alley in New York, Silicon Roundabout in London, Orestad in Copenhagen, Brainport in Eindhoven, and one-north in Singapore

research focused on achieving real world impact, industry and community collaboration, and industry outcomes.

Businesses would benefit from opportunities to 'sandbox' and prototype new technologies. Regulatory and compliance frameworks that impede local businesses' ability to innovate, and test and adopt new technologies, should be reviewed as barriers to innovation. Where possible, flexibility and temporary exemptions would encourage the private sector to take risks, invest in innovation and be in a better position to compete with their international competitors.

Incentives such as subsidies for businesses to tap into universities' expertise in digital technologies and to partner with universities to develop and support creative technology solutions would also drive a culture of discovery and entrepreneurism.

- **Supporting higher education to thrive amidst disruption.** The higher education sector is undergoing a major transformation—democratisation of knowledge and access, increased global competition and contestability of student funds, digital disruptions to core systems and deliveries, and increased global mobility of students are some examples of how we are fundamentally changing the way we do business.

  With Education as Australia's third biggest export, it is clear that life-long learning will be both a significant consumer of digital change and critical producer of that change. Government needs to support the essential growth in our sector to build upon this huge strength.

  Universities would embrace the opportunity to work with governments in adapting to these changes in education delivery, and in particular, in responding to the needs of the next generation of learners.

- **Incentives for upskilling and retraining** will help retain talent in Australia for digital economy development rather than losing the best and brightest to work in companies and startups overseas.

- **Growing physical spaces for collaboration** to maximise impact through industry clusters and precincts. For example, UTS' city campus is at the epicentre of the highest density of digital and creative industries in Australia. UTS is actively engaged in partnerships throughout the city, especially in the Pyrmont and Ultimo-Surry Hills spaces with its concentration of entrepreneurial startup activity. Our students have close access to companies and industries that are strategically critical to their learning and career development.

  Government can support such precincts to reach their full potential by planning for such spaces in urban design and offering supportive digital infrastructure.

- **Government as exemplar**. Government can re-imagine and redesign its non-digital core services and value within the digital sphere while aiming to preserve the core values of equity, transparency, accountability.

- **Protect the most vulnerable.** Government has a role in providing infrastructure as a basis for universal access for engaged digital citizenship; this may include access to hardware and services, building new digital infrastructure and education in digital literacy and skills. The government can also lead discussion and debate around ethics

and community expectations of new technologies. Also see the section ‘Digital skills in inclusion’ below.

3) Key disruptive technologies and challenges for business

Every field of human endeavour is now being digitalised. Therefore data, data analytics, artificial intelligence and related technologies will significantly impact the way we work, learn, do business and live.

- Artificial Intelligence has already shown mainstream prominence in some areas of industry and the private business sector. The main challenge remains that most businesses don’t understand Artificial Intelligence, particularly at the Board level. Some businesses have gone out to purchase ‘off-the-shelf’ products, without realising what actual business problems will be addressed.

  Universities can play a significant part in offering training to businesses and staff in such areas as Artificial Intelligence, and can also provide much needed advice as well as R&D capability to enhance the industry, and to provide customised/advanced Artificial Intelligence solutions, informed by cutting-edge research.

- Advances in Quantum Software have attracted the attention of entrepreneurs, and have even led to new businesses being created in the start-up space. The interest in Quantum Software has been instigated (in part) due to the potential it holds for Crypto-Currencies such as Bitcoin, and will in turn be of interest to the Block Chain and Fin-Tech communities. The new start-ups that will emerge could contribute to our technology ecosystem and spawn new/innovative businesses in the future.

  At present, Universities active in the Quantum research space, are the keys for unlocking the Quantum era for Australian businesses. In 2017, the international quantum community established a new journal *Quantum*, supported by UTS:QSI, Australia's only quantum software research centre. This new journal was established by the international quantum community to make their work more visible, open and accessible, and in response to increasing focus of their work on software development.

- Platform technology is no longer new. However platform ecosystems will continue to expand and evolve at rapid rate, transforming the way we organise and interact with each other (as seen from the influence and far reach of major companies such as Facebook, Amazon, and Apple). The adoption of cloud computing, virtualisation and web-based services in regular business processes will unleash organsations from physical geographical boarders, allowing multiple agents to work from anywhere in the world. This will drive global competition for skills, both in attracting and retaining the best talent.

4) Cyber security

One important aspect often goes missing in the discussion on enabling the growth of the Nation's Cyber Security industry — advancing education and research in the sector.

From an educational perspective, there are simply too few skilled workers in the Cyber Security area. The required skill levels may vary, from VET to Tertiary Education, but the reality is that there is a dearth of expertise in Australia, which threatens the industry in the future. The launch of the Academic Centres of Cyber Security Excellence (ACCSE) program was a step in the right direction for putting an emphasis on cyber security education, however the $1.9 million investment over four years to only two Universities will not be enough to see significant advancement across the Tertiary Sector. Aside from training its students, the University sector has the potential to provide Executive training to businesses and their staff. This requires a significant boost in support over a number of years.

From the perspective of research, Australia is in a prime position to be a leader in the development of Cyber-related technology, informed by academic-led breakthrough research in the area. Cyber Security is a now National Research Priority and has recently been given a much-needed boost via the announcement of a new Cyber Security CRC. The prospect of integrating cutting-edge R&D into Australian businesses and the potential for developing home-grown technologies/spin-offs should increase. The main challenge, however, still remains the lack of funding dedicated to fundamental research that could significantly enhance our international position in delivering breakthrough Cyber Security research and technology.

5) What is holding Australian businesses back in terms of benefiting from digital technologies?

The key barriers to take up of new tehcnoloies by Australian busineses are:

- lack of access to skills and expertise; and
- limited entrepreneurial and creative thinking.

6) How UTS is responding to the challenge of preparing for the digital future

UTS is focused on driving initiatives that will prepare our students, our researchers and industry engagement for a digital future. Our efforts centre on:

- providing lifelong educational opportunities for students to develop skills in innovation and entrepreneurship;
- developing new more flexible online learning offerings for students;
- building research strengths in digital technology, artificial intelligence, machine

learning, quantum software; industry application and on understanding the human impacts of digital change;

- investing in our local precincts to develop local ecosystems to grow startup, innovation and the creative economy;
- engaging closely with industry to drive skills development and collaborate on challenging industry problems.

Examples of our teaching and learning initiatives include:

- *learning.futures* – UTS's university-wide approach to blended learning. It aligns future-focused curriculum with informed technology use and has been designed in tandem with a AU$1 billion redesign of campus learning spaces to shape the future of student learning. A series of programs promote innovation in learning by integrating the best of online and face-to-face experiences.
- *postgraduate.futures* –an initiative that is rolling out postgraduate education which is digital, modular and flexible, providing adaptable options for the lifelong future learners.
- *The UTS Hatchery* – this UTS entrepreneurial incubator and accelerator program has been recognised for helping students to engage with industry and innovation networks. It was designed to create the entrepreneurs of the future and empower UTS graduates to shape their own career paths.
- *UTS Faculty of Transdisciplinary Innovation* – is a world-first Faculty created to undertake transdisciplinary research and teaching, drawing on multiple disciplines to provide the knowledge base to address complex problems in society.
- Leading new forms of creative thinking – with entry level degrees such as the Bachelor of Creative Intelligence and Innovation; Bachelor of Technology and Innovation.

Our research has a sharp focus on deep multi-disciplinary and industry collaborations to solve real life problems. Examples include:

- The *UTS Transport Research Centre* is partnering with Downer Rail and the Rail Manufacturing Cooperative Research Centre (RMCRC) and applying big data to better understand how we can put an end to overcrowded and delayed trains.
- In Health, UTS data scientists are working with Workforce Health Assessors to clean up and make better use of 10 years of digital data that will access to specific workforce statistics to better inform decisions about insurance premiums and the health of workers
- The *Food Agility Cooperative Research Centre* (CRC), backed by government, is working to accelerate research adoption and commercialisation – including ag tech start-ups – to improve digital services to the sector.

We are developing tools and thought leadership to guide the adoption of new technologies in the real world:

- Our *Perceptual Imaging Lab* (πLab) works with Industry and Government to develop technologies to improve on the perceived quality and user experience of modern imagery, particularly in the emerging domains of Virtual Reality, Augmented Reality and 3D imaging.

- Researchers from the Faculty of Arts and Social Sciences are developing a best practice model for utilising mobile devices in STEM to help teachers and students make the most of new technologies. This is helping Australian schools understand what their increasing implementation of 'bring your own device' schemes will mean for learning.

- The *UTS Data Arena* is a 360-degree interactive data visualisation facility set to change the way we view and interact with data. It offers high-end computer graphics pipelines to help make sense of big data. Deep visual immersion can assist industry and government identify patterns, discover trends, and steer research.

- Our *Centre for Media Transition* is working with industry, public and private institutions to explore the ongoing movements and pressures wrought by disruption in the media industry. The Centre investigates three key areas: journalism and industry best practice; new business models; and regulatory adaptation.

7) Digital skills and inclusion

Higher education is key to providing future business leaders and creators with better access to the expertise in universities, making it more accessible for Australians of all socio-economic levels to achieve a deeper understanding of the digital economy, and mastery of the changing technologies.

In the face of a rapidly changing environment, universities must also provide thought leadership to ensure that this transformation is just, fair and socially inclusive. In this space, we are committed to developing knowledge and leadership around the potential human impact of technological disruption.

- *Think Digital Futures* is a radio program/podcast run in partnership with 2SER, which explores how technological developments impact our daily lives – both work and personal – and how they might shape the future. The program won a silver medal at this year's New York Festivals International Radio Program Awards.

- *Humans, Data, AI & Ethics: The Great Debate* is an event run by the Connected Intelligence Centre, that will explore the profound systemic (political and social) issues in our increasing reliance on machines.

- UTS is developing a university-wide strategy addressing the fundamental role research in the Humanities, Arts and Social Sciences (HASS) plays in imagining and brining into being a just future. Drawing on our research expertise in education, media, communication, health, law, and creative practices such as design and architecture, the strategy defines approaches to investigating the human side of technological transformation. For example, some of our researchers are examining the use of big data from a sociological perspective to ensure unchecked assumptions don't reinforce privilege, prejudice and inequity.

- The UTS Women in Engineering and IT (WiEIT) Program fosters a network of passionate females and males who are actively involved in the development of our next generation of young engineering and IT professionals. The program aims to engage with young women across NSW through our high-school outreach programs to share the breadth of opportunities available for STEM-related degree.

Conclusion

By definition, disruption causes discomfort because it interrupts existing 'settled' processes in the ways we work, do business and live. Unchecked, it may cause fear about what is to come, preventing us from embracing the opportunities present in technological advances. We need to future proof our workforce and businesses, and equip them with the skills, tools and entrepreneurial know how to drive our national prosperity and global competitiveness. Universities, through our teaching, learning and research, can play a critical role in helping Australians to bridge the skills and knowledge gap.

The time is ripe for the release of a new Digital Economy Strategy that outlines the areas of opportunities for our nation and how the Government can provide the enabling conditions and infrastructure for industry and universities, working together, to help bring them to fruition.

We look forward to working in partnership with government, industry and the community on our journey into a bright digital future.

Yours sincerely,

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