

Design 42:

ASSH IN AN AGE OF DISRUPTION



STEM + A = TEAMS
The Way Forward

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Cover image: **We are human too:** Software development school, Paris's 42: Heart of Code

Acronyms

ASSH: Arts, Social Sciences & Humanities

STEM: Science, Technology, Engineering, Mathematics (+ Medicine = STEMM)

STEAM: Science, Technology, Engineering, Arts & Mathematics

TEAMS: Technology, Engineering (+ Education & Enterprise), Arts, Mathematics (+ Media & Medicine) & Sciences (including Social Sciences).

42: from Douglas Adams, *The Hitchhiker's Guide to the Galaxy*, Pan Books, 1979. 42 is the answer to the ultimate question of life, the universe and everything.

The ASSH challenge

ASSH disciplines often appear disadvantaged within universities, particularly those that emphasise the study of STEM (Science, Technology, Engineering and Mathematics). Nonetheless, ASSH disciplines play an increasingly vital role in developing the skills that graduates require to participate in an agile workforce capable of adapting to rapidly changing market needs. As a recent Australian Council of Learned Academies (ACOLA) report noted, the basis for innovation in a knowledge-based economy cannot be derived solely from science and technology. To succeed, it is dependent also on social, economic and administrative knowledge as well as intellectual and creative capacity¹. Science and technology do not exist independently of the people they derive from and serve. They do not exist within a vacuum alongside society.

Hence the very creative, analytical and people-focused skills that ASSH promotes are essential if we are to properly utilize those derived from STEM. Arts, Social Sciences and Humanities (ASSH) are an integral part of contemporary universities and play a major role in educating the citizens of tomorrow (64 per cent of all graduates entering the workforce each year²), developing the *deep* (but never *soft*) emotional and social skills required for team work and for research which addresses complex economic, social, political and cultural issues in ways that translate into innovative approaches to problem solving with high social and economic impact³.

Despite this, the contemporary focus on STEM disciplines within universities has raised broad questions about the role of discipline clusters such as ASSH within the education systems of Australia and within those of countries we often compare ourselves with (notably the UK and Canada). Following a review of ASSH in the UK, the President of the British Academy (Adam Roberts) provided a succinct summary of their contribution:

The humanities explore what it means to be human: the words, ideas, narratives and the art and artefacts that help us make sense of our lives and the world we live in; how we have created it and are created by it. The social sciences seek to explore through observation and reflection the processes that govern the behaviour of individuals and groups. Together they help us to understand ourselves, our society and our place in the world⁴.

Universities Canada has re-iterated the need for multidisciplinary to promote innovation, in particular the connection between the STEM disciplines and ASSH⁵. Multidisciplinary implies inclusion. Acronyms such as STEM do not. Hence proposals that place 'A' for Arts into the acronym, producing STEAM or ESTEAM if Enterprise is also added.

Because STEAM drove the technology of the first industrial revolution (Industry 1.0) and bears little relationship with the demands of the 21st century, we prefer the more collaborative acronym TEAMS which - appropriately for an age of globalisation- incorporates also the aspiration inherent in the Chinese word *gong he*, i.e. working together in harmony. TEAMS could also be presented as MATES, but TEAMS represents working

together less ambiguously. Collaboration has to be central in our age of rapid change. In the past, collaboration was never a particularly conspicuous feature of adaptation to change, and those political, economic and social failures carried with them tremendous costs in the last century. We cannot afford such repetitions again.

We should never forget that what makes us human is our ability to transmit skills and ideas. By learning from each other, we create and recreate ourselves⁶. Because our world is changing –economically, technologically, socially, and politically at a globally faster pace than ever before, we need help from a broad range of non-technological innovators, including designers, film and animation makers, gamers, economists, business managers, political scientists and sociologists, humanities researchers, psychologists, social workers, legal experts and artists, from diverse backgrounds if we are to meet the challenges ahead. Their crucial contribution must be fully embraced as we build a new TEAMS-based innovation agenda⁷.

To drive that innovation, we must ensure our investment in human capital equips graduates with the skills needed to work collaboratively within and across organisations. Hence the way we develop skills within our students now assumes greater importance. Thomas Malone in *Superminds* argues that 3 factors most determine the collective intelligence of collaborative groups: social intelligence, equal participation by group members and -significantly- the proportion of women in groups. Teamwork does not reduce the importance of the individual; indeed, it is essential to avoid ‘group think’ or the ‘wisdom of crowds’⁸. Additionally, the way we develop new learning environments to support collaboration is also important for both students and staff. In fact, these changes possibly represent the most significant challenges that have faced higher education in recent years.

Although many academics shun the use of the word ‘customer’ to describe their students, the reality is that we are similar to many innovative organisations whose survival depends on making sense of customer information and determining what customers will next want or need. This requires rethinking not only what we teach but perhaps just as importantly how we teach and how we engage our students in activities that impart the skills they require to begin the human journey of lifetime learning.

Common challenges

There are common challenges that confront most ASSH schools and departments, their staff and their students. These relate, firstly, to the uncertain and often changing regulatory environments that university sectors face in general, and secondly, to the difficulties we now confront in preparing our students for a workforce undergoing change as it adjusts to transformation in the nature of work or to its anticipated transformation. These challenges impact both on how we teach our students and on the content of our programs. Unlike the first set of challenges, which are largely

determined by political preferences for private or public goods⁹ (or for budget savings), the latter challenges are ones that we can most address proactively rather than reactively, but they present themselves in at least two different forms.

Employment challenges

First, these challenges relate immediately to the changing employment prospects confronting both our students and our graduates. Youth (15-24 years) unemployment in Australia, for example, has risen from 9 per cent in 2007 to nearly 13 per cent in 2016. Only 25 per cent of youth are now in fulltime employment compared with 34 per cent in 2007. Graduate fulltime employment experiences similar difficulties, having fallen from 81 per cent to 71 per cent during the same time frame, with a quarter of graduates being in casual employment within four months of graduating¹⁰. Fortunately, within three years, graduate fulltime employment rises to nearly 90%¹¹.

The cause of these changes is sometimes blamed on universities (they do not train people adequately for the changing needs of the workforce), on globalisation and growing economic complexity, or on the disruptive nature of technological change¹². But there are commentators who argue instead that what we are witnessing is simply the outcome of prolonged slow growth following the Global Financial Crisis (the American Great Recession) and the end of Australia's mining boom. Australian Catholic University's Omer Yezdani notes that graduate employment has always fluctuated during the past 35 years and dipped in line with every major economic shock. Therefore, just as the health of local job markets influences perceptions of the usefulness of degrees, so too a good economy is a strong predictor of graduate employment success¹³.

Technological challenges

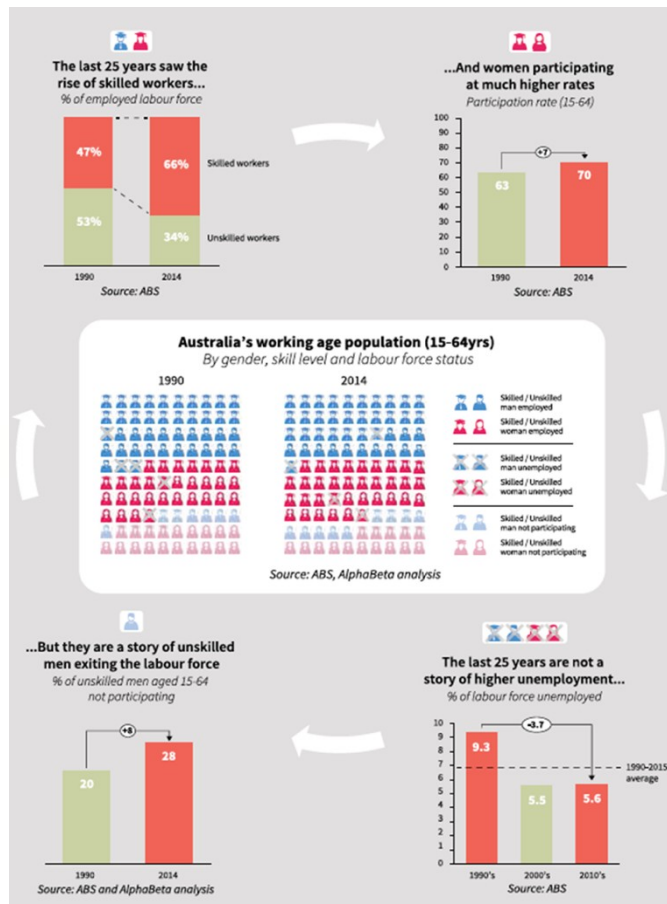
Second, is the challenge presented by technological change. There is little consensus as to what technological change entails or how it will impact on societies. The World Economic Forum has defined the drivers of growth as high-speed mobile networks, artificial intelligence, big data analysis and cloud technologies¹⁴. Unfortunately these drivers are often portrayed in misleading and apocalyptic forms; for example, that half the world's 4 billion jobs will be eliminated within the next two decades¹⁵, that 40 per cent of Australian jobs are at risk of automation in 10 to 15 years¹⁶, that non metropolitan communities will be gutted as professional services migrate to Australia's capital cities, that automation will undermine existing incomes and create few low paid alternatives¹⁷, and that the 'melancholic' state of journalism today foreshadows the fate of many professions in the near future¹⁸.

Indeed, the Foundation for Young Australians (FYA) argues that 70 per cent of young Australians are getting their first job in roles that might be lost to automation in 10- or 15-years' time, that 60 per cent of students are currently studying for occupations in which at least two thirds of jobs will be

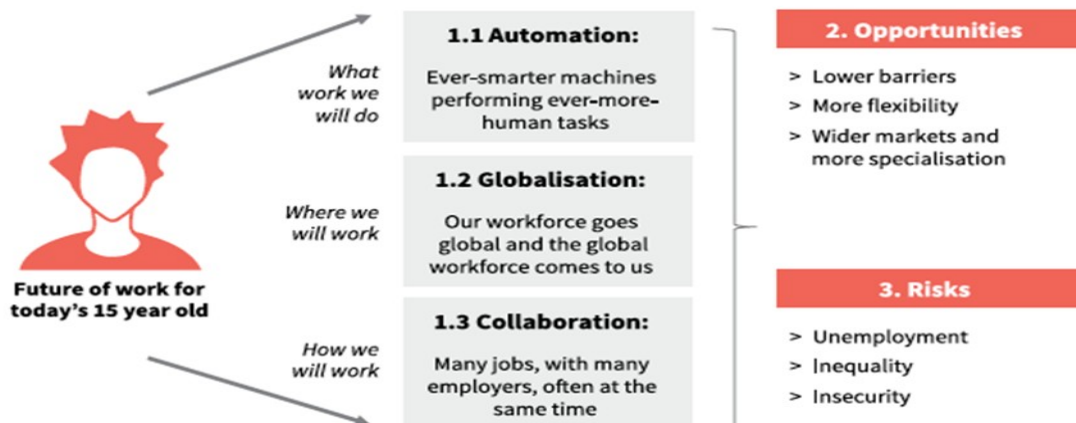
automated, and that 50 per cent of jobs will require digital skills that students are not presently learning¹⁹.



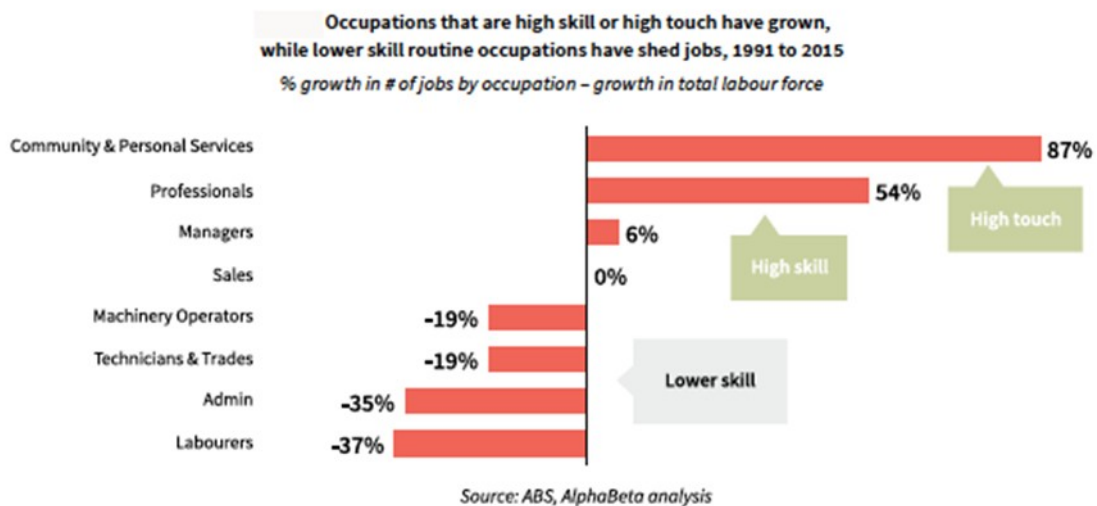
Source: *The New Work Order*, FYA: Sydney, 2015, p. 10.



Source: *The New Work Order*, p. 6.



Source: *The New Work Order*, p. 7.



Source: *The New Work Order*, p. 12.

The focus of this set of seemingly Hollywood-inspired challenges should really be on the pace of change. As the Fairfax economics editor, Ross Gittins, recently noted, there has been in fact a long-term trend away from routine jobs and only a small decline in the number of manual jobs. Over 30 years there has been no acceleration in those trends. Berkeley's Professor of Economics and Political Science, Barry Eichengreen, concurs. There is no evidence that computerisation has reduced the amount of work done by people, although it has changed the nature of work that people do. And again, there is no evidence of any acceleration in compositional change. Nor is there any evidence that computerisation is creating insecurity in the labour market. If anything, the opposite is the case, especially for women. Even the much talked about gig economy of temps has not expanded over the past 15 years²⁰.

All this suggests that our anxieties (aside from that produced by media alarmism) are in fact driven by the business cycle (in particular weak wages growth following the collapse of the Australian mining boom) and the rise in part time employment and under employment), even while we chose to interpret it as a harbinger of a highly transformative fourth industrial revolution (Industry 4.0). Eichengreen reminds us, however, that being transformed is not the same as being threatened. Jobs are changing but not disappearing. Industry 4.0 will not entail occupational shifts on the scale witnessed during the industrial revolution of the early 19th century²¹. But it will require constant retraining because the human touch is always needed. Hence, we need to remember interminably that the data we produce is only as good as the skills of those who input it²² and that AI is really nothing more than a tool created by humans for humans. It only does what we tell it to do²³.

Our reaction to the threats posed by artificial intelligence may also be premature. Recent reports suggest that artificial general intelligence is still at least two decades away, although in the meantime people will have to update skills faster and renew training more frequently as technology continuously reshapes occupations²⁴. In other words, change may be disruptive. But just as the early 19th century industrial revolution -by changing the nature of work and the skills required for work- reduced costs, boosted demand, and precipitated an expansion in employment as a result, so automation today and into the future is less likely to destroy jobs than reallocate them and prioritise different skills, in particular human creativity and interpersonal skills²⁵.

Societies have never been good at managing change. The 20th century bore witness to many dismal failures to manage the competition generated by industrial change (and later globalisation and innovation) which blighted the lives of millions of people. Economist Joseph Stiglitz argues that we need to change the rules in order to regulate IT companies, minimize monopolies, protect labour bargaining powers, intellectual property rights and competition laws alongside strengthening corporate governance and finance. Failure will threaten rising inequalities, unemployment and social division²⁶. This should remind us that the greatest threat we face comes not from robots but from ourselves. UTS's Carl Rhodes argues that blaming a faceless 'technology' for destroying jobs avoids assigning responsibility to business leaders seeking to prevent the democratisation of prosperity²⁷. Or perhaps the politicians and regulators asleep at the wheel²⁸. Technology cannot exist without recognising the human component. For that reason, STEM can only succeed with ASSH in TEAMS.

Indeed, the movement today towards Industry 4.0 faces similar hurdles to those confronting the initial industrial revolutions. During Industry 2.0 electricity took nearly 50 years to transform manufacturing and impact on productivity because its adoption necessitated dramatic changes in factory and production design to be effective. These were costly, and with no immediate returns on investment guaranteed. Only the rising cost of labour

in the US during the 1920s provided the necessary impetus towards wholesale change²⁹. Hence the danger today, that the rising cost of skilled workers –to date the principal beneficiaries of computerisation- might incentivise employers to replace them with technology³⁰. Contrast other sectors, such as construction, where volatility in demand and an inability to consolidate has curbed capital investment in technology and, as a result, reduced productivity³¹. That certainly is not the outcome facing emerging green technologies or the changing geographies of production, distribution and value chains³².

Indeed, how change manifests itself over the next few decades will continue to be highly differentiated. We can already see that in the way employment growth has been distributed in Australia since 2000. Most knowledge-based jobs are clustered around the CBDs in Sydney, Melbourne, Canberra, Brisbane and Perth (in that order), although other areas have grown much more strongly in terms of employment than the national average (38%). Mandurah, Melton, Gold Coast and Sunshine Coast, for example, have nearly doubled the national average by achieving strong population growth, being commuter-enabled, and -in some instances- offering lifestyle and retirement opportunities. Overall, employment growth has been strongest in healthcare, professional services, education and construction³³.

Consequently, the recent University of Canberra's Knowledge City Index describes changes in the nature of work as both 'the best of times' and the 'worst of times' for workers and professionals. Because many cities 'lack the infrastructure and capacity to resist and survive the impacts of technological redundancy', the 'dichotomy of decline and resilience' will not be evenly distributed. But how that decline or resilience emerges is highly uncertain; recent plans for new metropolitan and regional train networks within Victoria, for example, could dramatically transform the connectivity of Victorian residents and the nature of their work. Outcomes are never preordained.

Nonetheless, if the challenge is to consolidate the transition to a knowledge-based economy, then Australia is already on that pathway. In 2018 its universities contributed nearly \$34 billion to the Australian economy from the export of education, making it the country's third largest export after iron and coal. We just need to remember that because technology interacts with social, economic and political institutions, change will never be linear, predictable or evenly distributed³⁴. Even with respect to Australian interactions with the international education market, changes in foreign national education policies and investments will undoubtedly present new challenges ahead. In the long term, success will depend as much on consolidating the pathway to a knowledge-based and greener economy as on adjusting to the vagaries of the international market.

Demographic & geopolitical challenges

There is in fact a third but rarely mentioned future challenge, the potentially rapid fall in working populations in many countries in Europe and East Asia

and its impact on economic growth, innovation and productivity as populations age and social spending increases. One recent US report argues that 'Existing shortages in job-specific skills will become more pronounced as more than 76 million baby boomers in America retire, cutting their labor force participation rate from 80% in the early 2000s to less than 40% by 2022'³⁵.

In the past, migration and the recruitment of women into workforces helped offset some of that decline, particularly in North America, Europe and Australia³⁶. But with the rise of protectionist and anti-migrant sentiment, such responses to the loss of their demographic dividend have become less politically viable than in the past. One consequence might be rising dependency ratios and economic stagnation, as Japan recently experienced, despite belatedly encouraging its women to enter the workforce and older workers to stay employed for longer. In this scenario, technological change might eventually be regarded as a blessing rather than a challenge³⁷. But technological change will not, in itself, address the problems an older population might confront with regard to employment, namely ageism and the need for continuing education³⁸. That requires cultural change.

Australia's population is also aging, although because of rapid migration over the past 25 years its workforce is still expected to grow some 25% by 2050, three times the US rate, five times Canada's and six times Britain's. In contrast China's workforce is expected to decrease by one third. Nonetheless, economist John Edwards argues that Australia cannot depend on workforce growth alone to accelerate economic wellbeing. Instead it must raise productivity in services by increasing levels of education and skills, and adopting new technology more rapidly³⁹. Here TEAMS have a fundamental role to play.

Nor will workforce growth address the fifth future challenge, namely the changing global context in which all countries operate. By 2050 Asia will account for 53 per cent of global GDP compared with 32 per cent today. India will join China and the US as the largest three economies by 2030 and Indonesia will join the top 10 over the following 20 years. This transformation is being driven by expanding middle classes and the provision of tertiary education, both factors which lay behind the success of the late 20th century's Industry 3.0, the information revolution. Its expansion today into Asia need not be regarded as a challenge; indeed, it should really be welcomed as a new opportunity for global collaboration.

Workforce growth also fuelled global economic expansion in the late 20th century. In the future, only African and some West Asian countries will be able to pursue economic growth in this manner. For the rest, declining labour forces may substantially reduce growth unless investments in research and development spur alternative sources for growth⁴⁰. Hence, these challenges should also remain within our purview. Of course, nothing is predetermined. We need only remember how European conflict and

economic mismanagement set back globalisation by nearly 70 years in the last century.

Our tasks

Developing human capital

Regardless of the very different nature of these challenges, they all suggest changes in the nature of work either as a result of continued global economic integration or technological development, or both⁴¹. Irrespective of the choices we make, or perhaps because of them, work growth will increasingly be focused in non-routine activities that require innovation, creativity, problem-solving, developing networks and relationships, risk taking and experimentation, adaptability, and responsiveness to change⁴², skills that technology cannot easily replace, and jobs that 'are the least susceptible to future automation'⁴³. Hence the importance of personal, thinking, digital and job-specific skills, the components of which are listed below.

PERSONAL SKILLS

- Communication – writing and speaking clearly
- Teamwork – working effectively with others
- Professionalism – maintaining a professional demeanor at work
- Management – motivating and guiding others
- Motivation – demonstrating a willingness to work and seek out new challenges or tasks
- Integrity – treating others with honesty, fairness, and respect
- Reliability – displaying responsible behaviors
- Adaptability – displaying ability to adapt to new, different, or changing requirements

DIGITAL SKILLS

- Basic digital literacy – ability to use computers and Internet for common tasks, like emailing
- Workplace technology – using the technologies required by the job
- Digital learning – using software or online tools to learn new skills or information
- Confidence and facility learning and using new technologies
- Determining trustworthiness of online information

THINKING SKILLS

- Critical Thinking – using logical thought processes to analyze information and draw conclusions
- Problem solving – generating, evaluating, and implementing solutions to problems
- Decision making – prioritizing issues, making decisions, and anticipating consequences
- Information use – finding relevant information and applying it to work tasks
- Customer focus – identifying and meeting customer or client needs
- Organization – planning and prioritizing work to manage time and resources effectively
- Systems thinking – understanding, using, monitoring, and improving systems
- Applied learning – using academic skills (reading, math) in the context of work tasks

JOB-SPECIFIC SKILLS

- Business fundamentals – understanding of company functions and one's own role within those functions
- Industry knowledge – up-to-date knowledge of the industry and of the company's position within it
- Technical skills – ability to complete tasks specific to the job and/or the employer

Source: Rachel Stephens, 'Automate This: Building the Perfect 21st-Century Worker', 7 April 2017, www.thirdway.org/report/automate-this-building-the-perfect-21st-century-worker

These are all attributes which ASSH disciplines have long laid claim to and should now reassert within new more focused strategies that address the changing nature of future employment. The innovation foundation, Nesta, warns that, 'History is a reminder that investment in skills must be at the centre of any long-term strategy for adjusting to structural change'⁴⁴. Elana Douglas, CEO of the Knowledge Society, makes a similar case while examining a LinkedIn survey of what business leaders expect from employees. It found that the biggest gap lies in interpersonal skills around leadership, communication and collaboration, but Douglas believes we could add teamwork and resilience to that list. In the past we might have expected sport, community and civic organisations to foster some of these skills, but increasingly education is being asked to develop these outcomes through real-life and practical experience, and the quality of relationships forged between students and educators⁴⁵. The difficulty lies in anticipating the changing set of skills required by workforces in the not-to-distant future.

Comparing skills demand, 2018 vs. 2022, top ten

Today, 2018	Trending, 2022	Declining, 2022
Analytical thinking and innovation	Analytical thinking and innovation	Manual dexterity, endurance and precision
Complex problem-solving	Active learning and learning strategies	Memory, verbal, auditory and spatial abilities
Critical thinking and analysis	Creativity, originality and initiative	Management of financial, material resources
Active learning and learning strategies	Technology design and programming	Technology installation and maintenance
Creativity, originality and initiative	Critical thinking and analysis	Reading, writing, math and active listening
Attention to detail, trustworthiness	Complex problem-solving	Management of personnel
Emotional intelligence	Leadership and social influence	Quality control and safety awareness
Reasoning, problem-solving and ideation	Emotional intelligence	Coordination and time management
Leadership and social influence	Reasoning, problem-solving and ideation	Visual, auditory and speech abilities
Coordination and time management	Systems analysis and evaluation	Technology use, monitoring and control

Source: Future of Jobs Survey 2018, World Economic Forum.

It helps if universities lay the foundations for a fundamental transformation of courses and units by emphasising employability (professional degrees, placements, internships, study tours abroad, exchanges, and industry engagement) as well as innovation and entrepreneurship⁴⁶). For example, Swinburne University of Technology's *2025 Strategic Plan* commits to creating:

future-ready graduates by taking our students outside of the conventional classroom, introducing them to new and different ways of learning and thinking. It comes from hands-on experience, industry leaders, from the world around us, and from one another⁴⁷.

Swinburne's undergraduate course reforms in 2015 also reduced the primacy of single disciplines, allowing students in non-specialised courses to experience at least 3 disciplines as majors and minors.

The central task of most ASSH disciplines is to ensure that teaching strategies improve student employability in challenging markets by ensuring workplace-

ready graduates with good communication and strategic decision-making abilities, critical thinking and problem-solving skills, networking competencies, and emotional intelligence understanding⁴⁸. Onnida Thongpravati –a researcher in innovation and entrepreneurship at the ARC Training Centre in Biodevices and at Swinburne’s Centre for Transformative Innovation -claims that, over the next 50 years, innovation and skills development will drive economic growth through productivity gains in order to counterbalance aging populations, climate change and rising income inequality. As economies become more knowledge-based, globalised, and as human capital drives competitiveness, productivity and innovation, our futures will become even more dependent on human capital, in particular –to paraphrase Thongpravati- on our graduates’ ability to be entrepreneurial and innovative in order to develop something new from their own local resources and capabilities that will impact on communities, shape well-being, improve living standards, and transform markets and industries⁴⁹.

How to achieve these outcomes is of course the central challenge for all TEAMS disciplines. Each may approach it in different ways: developing stronger industry linkages, expanding team work, building group synergies, and growing network capabilities. Producing a future innovative and creative workforce, as Thongpravati notes, requires us to develop many of the graduate skills that have often been heralded as intrinsic to the ASSH disciplines⁵⁰. And skills need to be given the centrality in marketing that previously has been largely the domain of disciplines. But more is required.

Given the cost of higher education, potential students will need to be convinced that their investment in degrees is worthwhile. As we noted earlier, initial graduate employment has deteriorated in the past decade, but it still remains the case that ‘graduates are less likely to be unemployed than people with lower levels of education attainment’. Indeed, bachelor degrees halve the risk of unemployment, improve the rate of fulltime employment, and enable higher earnings⁵¹. Britain’s former higher education minister, David Willetts, likens it to a social good. Since the 1960s, holders of undergraduate degrees (in Australia, now 28% of men and 35% of women aged 15-74) have increased more than four-fold, and universities have displaced apprenticeships and the armed forces as the main pathway to adulthood. And, Willetts argues, their graduates are wealthier, happier, healthier and less criminal⁵².

The value of diversity

Although disciplines tend to remain our main pedagogical focus, transitioning to education for the future requires that the skills we emphasise are more multi-functional and boundary free than in the past. It has been argued that while our reliance on 19th century forms of disciplinary specialisation helped renewal after

the mid-20th century, it did little to prepare students to 'learn to relearn' or how to interweave education with work. Both skills will be essential during Industry 4.0 and beyond when knowledge may become obsolete more quickly than in the past⁵³ or is challenged more frequently. Indeed, Boyer lecturer Genevieve Bell argues that it is not good enough just to tweak existing disciplines. We need instead to develop a new set of critical questions and perspectives that will serve the practitioners of the new digital world⁵⁴. Hence the importance of interdisciplinary or transdisciplinary skills, especially for students whose future workforce lives will possibly require more adaptability than their predecessors experienced. Most will never obtain work directly related to their disciplines (if indeed they do now). Instead they will need to demonstrate an ability to work across fields, draw on real world case studies, and collaborate and innovate within a 'network of teams', especially for complex tasks⁵⁵.

Some commentators believe they will also need to know how to coach others, communicate well, listen, and be empathetic. Hence the importance of reducing discipline silos. STEM units can be embedded within ASSH courses (e.g. data analytics) and ASSH units need to be available in STEM courses. Diversity, not specialization, in TEAMS will most promote graduate creativity, resilience and adaptability. And it will create the diversity required by leading firms⁵⁶. Hence also the importance of transferable skills to accommodate and shape occupational changes. The Council for Economic Development of Australia (CEDA) refers to these as enterprise skills⁵⁷. The end result might well be a 'portfolio career', made up of disparate projects and roles, but still a career.

In countries like Finland, school counsellors already urge students to think less about jobs, and more about challenges and problems⁵⁸. Here study exchanges, social learning, work placements and study tours will play increasingly important roles. So too BA units such as those within Swinburne's core minor- 'The Grand Challenges' which focuses on the way communities are being transformed. They encourage forward thinking research, problem solving, thinking outside the box, and social skills through teamwork in a non-traditional pedagogical environment around real world problems (such as housing, urban planning, digital disruption and navigating difference) that cross discipline boundaries. Such outcomes need to be realised in all our programs, and the tendency to retreat into silos to protect core interests when times are tough firmly resisted. Specialisations make it harder to sell achievements and skills⁵⁹; they also potentially compromise agility and adaptability in an era of unpredictability and disruption, and thereby reduce the duration of careers⁶⁰.

It is sometimes suggested that ASSH programs are less needed in a data-driven digital world. But if we are to develop new practitioners able to manage and

regulate our changing world, it will –as Bell argues- be ‘short-sighted at best and detrimental at worst’ to privilege STEM at the expense of other disciplines. A university degree is not a short-term investment. Yezdani sees it as a long-term investment for a life of critical thinking and self-awareness, the making of which derives from an innovative ecosystem that drives a smart economy and a flourishing society⁶¹. ASSH graduates have already demonstrated their capacity to ride the wave of change since the 1960s⁶²; they must continue to do so in the future.

Changing the focus on learning

But if we are to be truly innovative, we need also to reduce the time we encourage students to engage with passive learning in lecture theatres and tutorial rooms. Unfortunately, many academics are their own worst enemies in this respect, resisting change and foregoing innovation on the grounds that change threatens the essence of ASSH disciplines. In fact, the opposite is the case. Survival requires innovation. Digital platforms –if utilised appropriately- enable much of student learning to be accommodated within a student’s own time (blended learning), leaving learning on campus to be firmly active and engaged. The flipped classroom and its workshops are obvious examples which we need to promote more strongly, both to emphasise our commitment to innovation and to enhance the student experience through peer-to-peer interaction and digital interconnectedness⁶³. In any case, as the student market gradually shifts away from school leavers, we have little choice but to pursue adaptive learning and produce integrated innovative courses that are globally adept and meet the needs of very different student cohorts, problematize complexity, transcend disciplines, and assess new skills and mindsets differently⁶⁴. Only then can we deliver clear value propositions, especially for courses such as the BA which have always been presented as pathways to a variety of careers rather than portals into a defined and predetermined career⁶⁵.

LSE anthropologist David Graeber believes that rather than feeling that they have the capacity to transform the world, many graduates stress over student loans and their inability to get decent paying jobs. This is not what being human should be about⁶⁶. KPMG’s Stephen Parker notes that while ‘There is more to education than preparing people for work ... unless people are prepared for work, we will lose the prosperity that finances the education system to begin with’⁶⁷. Hence, Thongpravati envisages one possible consequence of such an approach: today’s lecturers will become tomorrow’s inspirational mentors⁶⁸. To cement its commitment to change, universities should replace lecturers with assistant professors, and remove once and for all the link with old ways of teaching (i.e. lectures)⁶⁹. They also need to radically rethink their use of space, both for learning and innovation, and especially for peer-to-peer engagement.

They might also begin the adaption to workforce relearning by creating a suite of nanodegrees and a framework for the extensive use of e-portfolios.

The learning environment

Transforming learning environments for the 21st century is one of the greatest challenges facing universities today as staff and student needs change. The tiered benches of 19th century lecture rooms no longer work for our contemporary diverse and technology-soaked student cohorts. As Monash University's John Loughran reminds us, teaching is not telling and learning is not listening⁷⁰. Similarly, the dark corridors of closed staff offices no longer invite, if ever they did. Workspaces should be inspiring, demonstrate the exciting culture of the university, allow people to flourish, help attract and retain talent, and encourage group interaction⁷¹.

Staff spaces

The rush to appear modern while simultaneously effecting savings has pushed many universities to follow businesses in providing open plan spaces for staff. Open plan spaces have also been sold as vital for improving collaboration and for satisfying the needs of millennials. Digital nomads, we are assured, work from home, on the road or in the cloud. When they do come into their workplace, what satisfies them most is something akin to open family spaces. And the better employees feel -we are reminded- the better they work. Hence the drive to incorporate fully equipped kitchens into open plan spaces to encourage socialisation and engagement, and in some businesses -natural light, green spaces, massage and meditation rooms, meeting rooms and gyms to accommodate a variety of staff needs⁷². The segmentation of the workplace also encourages cafes and town squares in which people can mix and engage.

Unfortunately for digital nomads, external cafes and homes do not always make for more productive work environments. Instead they often promote isolation or prove distractive⁷³. So too open plan work spaces. Distraction is a regular complaint of many staff in open plan spaces which headphones alone will not solve. An inability to concentrate not only reduces productivity but also increases stress and absenteeism. Paradoxically, open plan work spaces also decrease communication. The Harvard Business School's recent report on open work spaces found that, contrary to expectations, open spaces decreased face-to-face interactions (by up to 70%) and raised the use of emails and instant messaging apps as a form of communication. 'In short', the authors argue, 'open architecture appeared to trigger a natural human response to socially withdraw from officemates and interact instead over email and IM⁷⁴. In any case, we need also to remember that not all employees are extroverts. Cubicles are not much

better, although as one reviewer noted, they do at least allow staff to personalise their space and as a result make people -especially introverts- more relaxed and happier. Hotdesking performs worst. Indeed, it sends a message that staff are simply disposable cogs in a machine and potentially transforms the workplace into a depressing place⁷⁵.

Universities need to be honest about their intentions when designing spaces for staff. Their staff are diverse and perform different roles and tasks. In particular, academics multitask as researchers and teachers. Of course, they need to be accommodated affordably within available space, but diversity requires exactly the same kind of thinking that we desire from our graduates, namely innovation and creativity. Above all workplaces must be aesthetically appealing if they are to promote trust and function well. Like the business of education itself, workplaces are for humans. Academics require space and quiet to contemplate, to research and to write. Collaboration and teamwork are important but should never be physically emphasised above other needs⁷⁶. The result might be something we could call blended; transparent offices for permanent academic staff clustered around an open plan space for sessionals, temporary researchers and higher degree students, and with space for formal meetings and for informal engagement around a kitchen.



Combining transparency and privacy: Steelcase's private offices 2014



Glass offices at MarketAxess' New York headquarters at Hudson Yards, Spacesmith, 2018.








If you have the money: Creating a welcome environment-Amazon's Seattle staff rooftop-NBBJ

If teamwork becomes groupthink, it stifles creativity and productivity. Apple's co-founder, Steve Wozniak, once argued that 'You're going to be best able to design revolutionary products and features if you're working on your own. Not on a committee. Not on a team'⁷⁷. Wozniak's experience might not be universal, but we should never forget Graeber's observation, that people want to feel that they can make a difference. This after all is what being human is about⁷⁸ and what universities must focus on as they experiment and create new spaces in which their staff can become creative and innovative.

The cultures universities create are also vitally important for the health of learning environments. Human Resource departments often segment the different activities of staff, but as a Deloitte report notes, employees tend to see what happens at work as an integrated experience that impacts clearly on life both within and outside their workplaces⁷⁹.

Factors that contribute to a positive employee experience

Simply Irresistible Organization™ model				
				
Meaningful work	Supportive management	Positive work environment	Growth opportunity	Trust in leadership
Autonomy	Clear and transparent goals	Flexible work environment	Training and support on the job	Mission and purpose
Select to fit	Coaching	Humanistic workplace	Facilitated talent mobility	Continuous investment in people
Small, empowered teams	Investment in development of managers	Culture of recognition	Self-directed, dynamic learning	Transparency and honesty
Time for slack	Agile performance management	Fair, inclusive, diverse work environment	High-impact learning culture	Inspiration
Cross-organization collaboration and communication				

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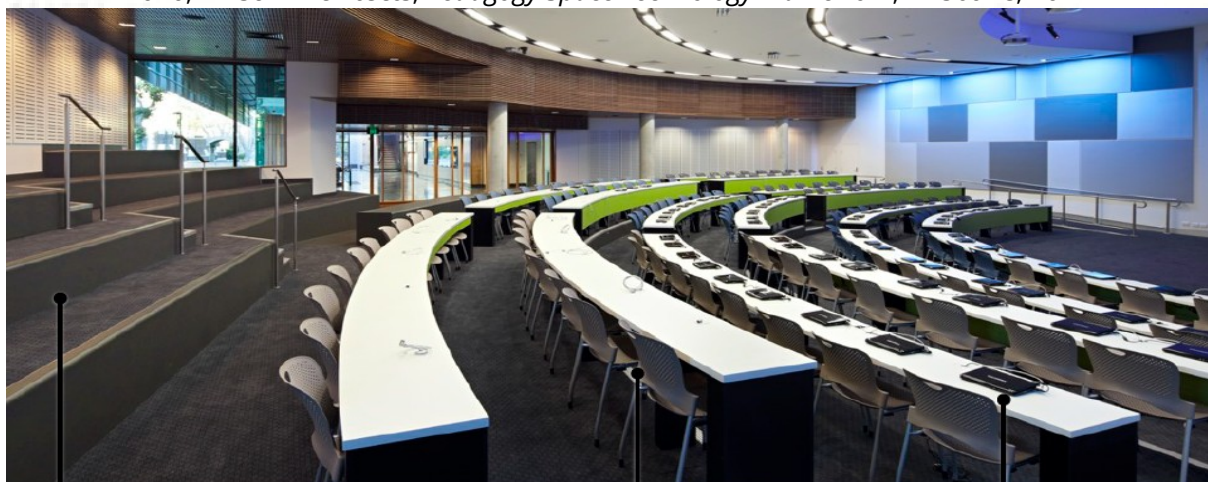
The need is always for a holistic and integrated approach if the goal is to create an academic culture that benefits the university, the staff and its students.

Student spaces

Student spaces are also vital to connect students with their university and with learning, but they also need to enable students to learn by collaboration and solution seeking.

This does not mean that teaching practices need to be revolutionised, but they do need to change. Indeed, they have.

The repurposed lecture room: Brisbane Grammar School, The Lilley Centre -Wilson Architects 2010, Wilson Architects, *Pedagogy Space Technology Framework*, Brisbane, 2011

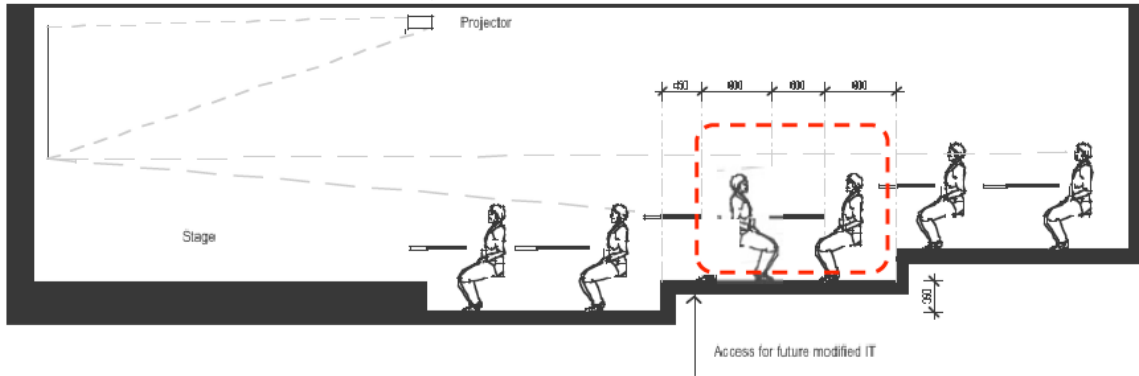


Seating for informal observation

Loose seats on wheels enable small group work

Tethered laptops increase interaction

The Forum
150 cohort Active Learning Lecture Theatre



An alternative arrangement for student engagement and collaboration: AGSE 202 lecture theatre at Swinburne University of Technology (Robertson 2018).

The old lecture room can still work, especially if repurposed for engagement and collaboration, but its pre-eminence has been lost in the wake of the flipped classroom or lectorial where -with the assistance of restructured online materials such as short 15-minute video vignettes - the emphasis is on analysis and engagement, not listening and note-taking.

Here the lecturer is no longer the 'sage on a stage' but a facilitator of learning⁸⁰ who transforms the former tutorial experience through small group work within technology enhanced active learning (TEAL) workshops of up to 70 students. Engagement is not only within small groups but between groups. Workshops typically begin with a summary of the content of online lectures or materials before moving on to small group work and ending with plenary discussions.



TEAL space: University of Queensland Axon Learning Lab -Wilson Architects 2011. Wilson Architects, *Pedagogy Space Technology Framework*, Brisbane, 2011

Unfortunately, economics catches up with many universities. Even if the cost of building new teaching and learning facilities or refashioning old ones is overcome, universities often struggle with retraining staff and providing them with the necessary technological and design support. Students today are accustomed to well produced media. In fact, we all are. Who would watch the news if it comprised a presenter speaking to a camera (or in most instances speaking instead to a hidden audience and not directly at the camera), with no video reports and with content dot-pointed on a background PowerPoint? We are accustomed to sleek well-crafted productions but this requires teams of professionals working in the background and dedicated time. Few academics are so directly supported with expert support staff or workload allowances. Consequently, many universities outsource the production of online teaching, leaving their academics to grumble about the added burdens of blended learning.

Education is expensive if done well. From new learning facilities to design and production support, nothing is cheap. This applies to ASSH as well as to STEM, and one reason why the TEAMS approach is vital for students who not only pay for their education but also expect that it will serve them well through the changes looming in the 21st century. Many universities have found it easier to accommodate new informal learning spaces for their students, providing 24-

hour access to safe and inviting spaces that can accommodate the need for students to work in teams on problem-based activities or -in many instances- simply alone. If designed well with ergonomic furniture and adjacent eating and drinking facilities, such spaces enhance peer-to-peer engagement and help consolidate student identity with their university and their school. The goal should always be to improve the student experience.



Informal learning spaces: Singapore Management University- Hassell 2017



Informal learning spaces: Oxford Brookes University- 2017

Design 42

New approaches to staff and student spaces within universities reflect the fundamental challenges universities have confronted during the slow roll out of Industry 4.0 and the transformation of educational services. We live in societies that are undergoing change. This is not new. But few societies have been so blessed with the wealth of resources and the know-how to understand and tackle change as our societies do. We are richer than ever before, more knowledgeable, and -according to the optimist in me- wiser. We know also that most of the challenges we confront today can never be resolved with one-dimensional responses. They represent complex problems requiring complex responses, which in turn necessitate society-wide dialogue and collaborations. Democracies such as our own are well placed to meet these challenges, if only we can push aside the tribal demons of our past, and augment the once sacred segmentation of knowledge with a new understanding of life's connectivities. TEAMS rather than separate configurations of ASSH and STEM will go some way to meeting those challenges and prepare today's students to become national and global collaborators of the future. As a universal challenge, it is most appropriate that the way forward should come from today's universities.

ENDNOTES

¹ 'Skills and capabilities for Australian enterprise innovation', Australian Council of Learned Academies (ACOLA), Melbourne: 2016, pp. 4-5. The report notes that ASSH disciplines train 65% of Australia's students with 52% of staff but generate only 16% of its research income and receive only 28% of higher education research and development funds, despite generating 34% of all research outputs (p.104). See also Tony Featherstone, 'Are STEM skill overhyped?' *Age*, 18 January 2018.

² DASSH Report, 'HASS Degrees: Powering Workforce Transformation through Creativity, Critical Thinking and Human Interaction', Canberra: 2018, p.2.

³ ACOLA, 'Skills and capabilities for Australian enterprise innovation', p. 8. STEM subjects are often described as 'hard', with ASSH as 'soft' in comparison and -by implication- easy and less important. Such descriptions undermine the value and potential of ASSH education (DASSH Report, 2018, p.6).

⁴ Roberts, A (2010) *Past, present and future: The public value of the Humanities and Social Sciences*, The British Academy; <https://www.britac.ac.uk/sites/default/files/Past-Present-Future.pdf>. Adam Roberts is the President of the British Academy.

⁵ Susan Davis ('Arts Education is vital to help foster creativity & innovation', Australian Association for Research Education, 22 May 2017) argues for ESTEAM, adding Entrepreneurship into the mix.

⁶ Adam Rutherford, *The Book of Humans: The story of how we became us*. London: Weidenfeld & Nicolson, 2018.

⁷ Stephen J. Toope, president, Federation for the Humanities and Social Sciences, and Director, Munk School of Global Affairs, University of Toronto, *The Hill Times*, July 4, 2016 reported in Universities Canada, *The Future of the Liberal Arts, A global conversation*, Workshop 7-8 March 2016 Montreal <https://www.univcan.ca/wp-content/uploads/2016/08/liberal-arts-report-2016.pdf>

⁸ Bartleby, 'The pros and cons of collaboration', *Economist*, 6 September 2018.

⁹ John McCollow, 'Retheorising and Reimagining Higher Education: A Review Essay of Simon Marginson's Higher Education and the Common Good, MUP, 2016', TJ Ryan Foundation Policy Paper, 26 April 2017, pp. 10-11.

¹⁰ Catherine Hanrahan, 'What the 'typical' Australian worker doesn't tell us about modern work', *ABC News*, 16 May 2017. The proportion of the workforce in part time employment rose from 15.4% in 1978 to 20% in 1988, to 26% in 1998, to 28.7% in 2008, and 31.1% in 2016; 2/3 of part timers are women. The proportion of women in part time work -45.6%- has remained largely unchanged for a decade, although that for men has risen from 13.8% in 2005 to 18% in 2016. The persistence of part time employment has been attributed to business requirements for a more flexible and agile workforce, changes in the nature of work (i.e. the expansion in services and hospitality), and the growth in female participation (Bernard Salt, 'Where the jobs of the future will be', *Australian*, 18 May 2017). However, because growth in part time work is now 3-times that for fulltime work, there is always the risk that this might eventually impact on mortgagees (1/3 of households) and precipitate a recession (Burgess, 'The "jobs growth" myth'). See also Greg Jericho, 'Full-time becoming a fantasy as Australians work fewer hours than ever before', *Guardian*, 25 April 2017. Average hours of fulltime workers rose during the 1970s, 80s and 90s but fell thereafter, with the proportion working under 40 hours rising from 30% to 34% between 2006 and 2016. Part time workers now work more hours per week on average than in the past (16.9 hours 1988, 16.58 hours in 1998, 17.59 hours in 2008 and 18.38 hours in 2016). Underemployment, always hostage to recessions and slowing growth, has increased from 4% in the 1980s, 7% in the early 1990s, 5.9% in the early 2000s, to 8.59% in 2017. Underemployment is likely to suppress wages growth in the foreseeable future (Greg Jericho, 'How the collapse in full time jobs for men is fuelling record underemployment', *Guardian*, 23 March 2017). See also Kate

Tori & Megan O'Connell, 'Preparing Young People for the Future of Work', Melbourne: Mitchell Institute Policy Paper 1/2017, p.2; and Omer Yezdani, 'Five myths about Australian university graduate outcomes', *The Conversation*, 24 November 2017.

¹¹ Rob Burgess, 'The 'jobs growth' myth leading us to breaking point', *The New Daily*, 24 May 2017. The workforce continues to grow about 13% faster than the number of jobs created each year.

¹² Noah Smith argues that we should worry about income inequality and low growth rather than raging against technological change ('The Robot Takeover is greatly exaggerated', *Bloomberg.com*, 15 July 2017).

¹³ Yezdani, 'Five myths about Australian university graduate outcomes'.

¹⁴ World Economic Forum (WEF), *The Future of Jobs Report 2018*. Geneva, 2018.

¹⁵ Robert Gottliebsen, 'Technology to eliminate half the world's jobs in a decade or two', *Australian*, 22 May 2017. Gottliebsen argues that drones will be the first disruptor, with artificial intelligence and driverless vehicles following. Quantum computing and data gathering will transform the public service and agriculture, and require the next generation to develop entrepreneurial skills and create their own jobs. If the transition is not handled well, the result could be unsustainable wealth inequality and a loss of faith in political systems. Neither are new phenomenon; contemporary examples of populist identity politics in Europe and North America derive at least from the 1990s (excluding examples from the 1930s), especially in Europe. But given past experience with hybrid and electric cars (after 2 decades, they comprise only 2% of new car sales), Gottliebsen's timelines could be challenged. Meanwhile disruptive technologies like Uber and Airbnb are more immediate within certain sectors ('The long, winding road for driverless cars', *Economist*, 25 May 2017). It needs to be remembered that within the US, the 2 sectors that have most experienced technological disruption (ICT and Media) account for less than 10% of GDP (Dani Rodrik, 'Innovation is not enough', *Project Syndicate*, 9 June 2016). But this could change, as the Oxford Martin School report noted in 2013 when it predicted 47% of US jobs were at risk from robot-led automation over the next 20 years (Carl Frey & Michael Osborne, 'The Future of Employment: How susceptible are jobs to computerisation?' 2013 paper to Machines & Employment Workshop, Oxford Martin School, University of Oxford).

¹⁶ AlphaBeta, *The New Work Order*, Foundation for Young Australians (FYA): Sydney, 2015, p. 2. *New Work Order* is licensed under a Creative Commons. Attribution-NonCommercial-NoDerivatives 3.0 Australian license (CC BY-NC-ND 3.0 AU)

<http://creativecommons.org/licenses/by-nc-nd/3.0/au/>. No changes have been made to the following 4 table and diagrams from *The New Work Order*.

¹⁷ David Kennedy & Nathan Taylor, 'Future Jobs: Automation will ruin regions unless they adapt', *Australian*, 20 May 2017. Kennedy & Taylor argue, for instance, that 40% of accountants will become redundant and that potentially 90% of some construction trades will be similarly affected. Regional cities may lose up to 60% of their existing jobs (cf 40% in capital city CBDs). The solution, they argue, is to invest strongly in social capital to maintain local industry and prevent social fragmentation, to better connect regional cities with capital CBDs, and invest in health and education. Of course, this requires political will and coordination.

¹⁸ Phil Lewis, 'There are jobs in journalism, just not traditional ones', *The Conversation*, 19 May 2017. Journalism's reputation has suffered from high profile redundancies as major print newspapers confront the creative destructionism of digitisation, but the profession continues to expand in social media, online publications and multimedia. Lewis argues that Australia is also living with the legacy of over enrolment in journalism courses during 2006 to 2011, when demand could never keep up with supply. Journalism and writers' share of the workforce has shrunk 5% since 2012 (Adam Creighton & Emily Ritchie, 'New jobs put bodies to the test, not brains', *Australian*, 6 June 2017). Nonetheless, growth in journalism jobs is still predicted at 10% by 2020, higher than employment in general (8%) but lower than other professions (14.4%). In 2002 the American reporter Russell Baker wrote of 'journalism's age of melancholy' (Mark Colvin, 'Facts matter as readers select their own truth', *Age*, 3 November 2012).

¹⁹ *The New Work Order*, p. 23.

²⁰ The Melbourne Institute's Households, Income and Labour Dynamics in Australia (HILDA) survey in 2018 showed rates of self employment falling since 2001 to 8.5% in 2016 and their workers from 7.7% to 5.5% of the workforce. Hence self employment is not an engine for employment growth (Eryk Bagshaw, 'The gig economy is a myth, survey finds', *Age*, 30 July 2018). Similarly, casualisation of the workforce has been stable at 25% over the past 20 years ('Fact check: Has the rate of casualisation in the workforce remained steady for the last 20 years?' *ABC News*, 17 April 2018).

²¹ Ross Gittins, 'Jobs being taken by robots? Where's your evidence', *Age*, 5 August 2017. Gittins quotes Melbourne University's Jeff Borland and his Labour Market Snapshots website (<https://sites.google.com/site/borlandjum/labour-market-snapshots>) to report that the proportion of women in their job for more than 10 years has increased from 12% in the early 1980s to 25% today. Gittins argues that this is not to say that some version of AI future won't happen, just that we can't know with the precision that some experts claim. Alternate modelling by the OECD across 21 countries found only 9% of jobs at risk of automation (Ross Gittins, 'Why the robot revolution won't play out as predicted', *Age*, 12 September 2017). See also Barry Eichengreen, 'Two Myths about Automation', *Project Syndicate*, 12 December 2017. Eichengreen argues that the rate of change of occupational structures has been slowing and jobs lost in declining occupations also slowing, not accelerating since the 1980s. Hence, the pace of change is not quickening.

²² Bartleby, 'AI may not be bad news for workers', *Economist*, 13 September 2018.

²³ David Tuffey, 'We should learn to work with robots and not worry about them taking our jobs', *The Conversation*, 19 February 2018.

²⁴ Eichengreen, 'Two Myths about Automation'. Marita Cheng, the 2012 Young Australian of the Year and Aubot startup founder, argues that it will be a long time before artificial intelligence produces human functionality and capability (Jamie Walker, 'The ghost in the machine is reshaping society', *Australian*, 14 June 2017).

²⁵ Tom Standage, 'Special Report, Artificial Intelligence: The return of the machinery question', *Economist*, 25 June 2016, pp. 7-8. Automated Teller Machines represent an early contemporary example. By reducing the cost of maintaining branches, ATMs enabled banks to open more branches and increase employment in sales and customer service areas. Deloitte also argues that artificial intelligence is most likely to force companies to retrain their staff or redesign their jobs, rather than spark mass redundancies (*2017 Deloitte Global Human Capital Trends: Rewriting the rules for the digital age*. Deloitte University Press, 2017, p. 121). Adobe's Mark Henley believes that if computers ever reach the stage where they can think creatively and imaginatively, workers 'will have to acquire creative and social skills' in order to survive and rethink what it means to be creative (Walker, 'The ghost in the machine'). Lawrence Mishel and Josh Bivens ('The zombie robot argument lurches on: There is no evidence that automation leads to joblessness or inequality', *Economic Policy Institute Report*, 24 May 2017) tend to support the Standage view, but with the caveat that that US workers have not in fact been changing occupations as much as in past decades. If people were losing jobs to automation more quickly now, they would also be retraining more frequently, and there is no evidence yet of such a trend. Indeed, productivity and corporate investment in information technology has fallen, hardly demonstrating a threat of accelerating automation. If anything, 'technology remains good for human employment' (Noah Smith, 'The Robot Takeover is greatly exaggerated'). Indeed, that explains the current conundrum: technological innovation has sparked low wage growth and stifled economic growth (Ian Verrender, 'The G20 failed our youth as globalisation, deregulation and technology alienates workers', *ABC News*, 10 July 2017). However, there is a concern that South Asian workers in manufacturing hubs will be severely impacted by automation (Annie Kelly, 'Robot workers will lead to surge in slavery in SE Asia, report finds', *Guardian*, 12 July 2018). Indeed, diversity is likely to be the strongest feature of Industry 4.0 globally. This is the main argument behind Price

Waterhouse Cooper's report, 'Will robots really steal our jobs: An international analysis of the potential long term impact of automation' (London, 2018). It examines 3 waves of change over the next 20 years, their differing impact on clusters of countries, industries and workers, and recommends boosting education and skills, government investment in job creation and enhanced safety nets.

²⁶ Ian Sample, 'Joseph Stiglitz on artificial intelligence: "We're going towards a more divided society"', *Guardian*, 8 September 2018.

²⁷ Carl Rhodes, 'The future of work is under threat, but it's not robots we need to fear', *ABC News*, 22 March 2018. In the US the ratio of CEO pay to workers' average pay in large corporation rose from 20:1 in 1965 to 271:1 in 2016. Shahid M Shahiduzzamin, Marek Kowalkiewicz and Rowena Barrett argue that this change does not auger well for the future spread of wealth from automation ('The benefits of job automation are not likely to be shared equally', *The Conversation*, 5 February 2018).

²⁸ Tuffey, 'We should learn to work with robots'.

²⁹ Tim Harford, 'Why didn't electricity immediately change manufacturing?' *BBC*, 21 August 2017. Electrical technology became available in the 1870s; the first generating stations in the 1880s. Yet by 1900 only 5% of American manufacturing machinery was driven by electricity. Since we are now 50 years past the first computer program, Harford argues that the same logic applies. You cannot use old systems and just add new computers. Things have to be done differently. Tellingly, Australia only has one research institute dedicated to Industry 4.0, at Swinburne University of Technology in partnership with Siemens.

³⁰ 'What history says about inequality and technology', *Economist*, 15 June 2017. In the past 4 decades, real wages for university graduates in the US have risen by over one third. But with 4 of the 5 fastest growing occupations in the US involving personal care, the wage premium for skilled workers can no longer be taken for granted. Economic historian Harold James argues that there exists a risk that just as the first industrial revolutions deemphasised the role of fitness in work, so Industry 4.0 might deemphasise intelligence; flabby brains might now join flabby waistlines as the new human condition ('The stupid economy', *Project Syndicate*, 22 January 2018).

³¹ 'Efficiency eludes the construction industry', *Economist*, 17 August 2017. *The Economist* argues that the industry's fear of being caught in the next recession and the lack of consistent building codes within and between countries makes investment unattractive and economies of scale difficult to achieve, particularly in the US and Europe. In contrast, marine contraction has met the challenge of large and difficult projects by investing heavily in technology and consolidating ('Marine contractors have made huge leaps in productivity', *Economist*, 17 August 2017). And modular building and computer-aided design has spurred productivity to 7% pa in China compared with less than 1% in the US.

³² WEF, *The Future of Jobs 2018*, p. vii.

³³ Salt, 'Where the jobs of the future will be'. Job losses over the past 17 years have been highest in Outback Queensland, the West Australian wheat belt, and far west NSW. Employment in manufacturing and agriculture has declined because of globalisation, mechanisation and/or farm aggregation. Nonetheless, Susan Davis ('Arts Education is vital to help foster creativity & innovation', Australian Association for Research Education, 22 May 2017) argues that growth will be dominant in sectors relying on creative capital and social interaction, people and household/business services, food, arts and recreation, agribusiness, tourism, international education, and wealth management. To that list must be added nursing, aged care and disability care –among the fastest growing employment areas in the past 5 years– along with personal care consultants, fitness managers, and –surprisingly– sales assistants and café workers. In comparison, only 12 of 21 STEM occupations have grown since 2012 (Creighton & Ritchie, 'New jobs put bodies to the test, not brains'). How this assists fast growing suburbs is uncertain. They generate 13% of Australian jobs, 11% of GDP, 35% of population growth and contain 19% of the workforce. But their workforces face high commuting costs and low productivity because

industries remain low tech and infrastructure investment sits at a low 13% of the Australian total (id Consulting Pty Ltd, 'State of Australia's Fast Growing Outer Suburbs', Report for National Growth Areas Alliance, August 2017).

³⁴ Lawrence Pratchett, Richard Hu, Michael Walsh and Sajeda Tuli, *The Knowledge City Index: A Tale of 25 Cities in Australia*, Canberra: University of Canberra, 2017, pp. 6, 8-10. The Index considers two domains, knowledge capital (knowledge capacity, knowledge mobility, and digital access) and knowledge economy (the preponderance of knowledge industries and people working from home). See also Tim Dodd, 'Overseas student earnings hit \$33bn', *Australian*, 6 February 2019.

³⁵ Rachel Stephens, 'Automate This: Building the Perfect 21st-Century Worker', 7 April 2017, www.thirdway.org/report/automate-this-building-the-perfect-21st-century-worker

³⁶ In Australia, the proportion of females in the workforce rose from 34% in 1961 to 60% by 2017.

³⁷ Sami J Karam, 'The Economics of Dependency: How countries hit the demographic sweet spot', *Foreign Affairs*, 27 February 2017. By the end of the century, it will be sub-Saharan African and South Asian countries which will potentially benefit from a demographic dividend, but only if they can resolve difficult governance issues and if rich countries globally extend to them the same opportunities that permitted China to become the engine for global economic growth in the 1990s and after. Additionally, the transformation of global population distribution –with Africa the most populous continent by 2060- will be profound and add pressure for a global rethink on the nature of work (Lorenzo Fioramonti, 'How to create jobs in the age of robots and low growth', *The Conversation*, 13 June 2017). Rich countries will also need to better plan for a very different economic future, as Japan is doing. Japan's over 65-year-olds comprise 22% of its current population. This will reach 40% by 2060, by which time its population will have fallen from 127 million to 100 million. In addition, Japan will have 69 old people for every 100 of working age by 2035, up from 43 in 2010. In the US, the old-age dependency rate will increase 70% to 44, in China it will more than double to 36, and in Latin America it will rise from 14 to 27. No particular policy outcome is inevitable as a result of demographic change, but in democratic countries it will be influenced by the greater share of the voting population aged people comprise ('The incredible shrinking country' & 'Age invaders', *Economist*, 25 March & 26 April 2014). However, with consumption comprising nearly 70% of GDP, compared with only 45% in China, Japan does not see fewer people as a bad thing. It is belatedly increasing female participation and experimenting with robots. It foresees lifestyle opportunities from a smaller but more affluent population (Rowan Callick, 'Countries like Japan are increasingly home to moneyed older consumers', *Australian*, 2 February 2017).

³⁸ Philip Taylor and Warwick Smith, *What's Age Got To Do With It? Towards a New Advocacy on Ageing and Work*, Per Capita Australia, 2017, p. 5.

³⁹ John Ross, 'Workforce growth our 'greatest strength': Edwards', *Australian*, 6 November 2017.

⁴⁰ 'Long-term macroeconomic forecasts: Key trends to 2050', *Economist Intelligence Unit*, London, 2015. Europe's labour force will fall by over 20% between 2014 and 2050, China's and South Korea's by 18%, and Japan's by 25%.

⁴¹ Given that the future is dependent on variable and complex human interactions, we can never fully anticipate outcomes. However, Richard Bookstaber (*The End of Theory: Financial Crises, the Failure of Economics and the Sweep of Human Interaction*, Princeton University Press, 2017) argues that we still need to embrace complexity and understand how the world works ('Predicting our economic future', *Economist*, 18 May 2017).

⁴² Tori & O'Connell, 'Preparing Young People for the Future of Work', p.4. Susan Davis ('Arts Education') argues that too much emphasis is placed on STEM (Science, Technology, Engineering, Mathematics) and not on enough on STEAM (STEM with Arts included) or more importantly ESTEAM (with entrepreneurship added). Creativity, innovation and entrepreneurship should be cultivated in all subjects across the education lifespan, particularly for STEM students if they are going to meet the challenge presented by artificial intelligence. Simon Tyrell, chief product officer for software company LiveTiles, thinks that STEM will be affected by artificial intelligence; simply

adding arts to STEM will not produce the creative tech thinkers the industry needs. He argues for creativity not STEAM (Simon Tyrell, 'Training needed to take tech national', *Australian*, 6 June 2017). Stephen Parker, KPMG's national education sector leader, argues for science and humanities to reconcile, and for the divide between academic and vocational training (together with accompanying cultural attitudes) to be bridged (Stephen Parker, 'Readiness for work trends of the future is essential for success', *Australian*, 7 June 2017).

⁴³ Stephens, 'Automate This'. Stephens cites reports that suggest employers place a high premium on soft skills (critical thinking & problem solving -72%, collaboration & teamwork -62%, communication -48% and professionalism -32%), and notes that between 1980 and 2015, jobs requiring analytical skills grew 4 times faster than those requiring physical skills (77% compared with 18%). She also argues that digital skills contribute to skill dynamism, but that given their shrinking applicability, digital retraining is necessary every 2 to 3 years. This she sees as crucial to ensure that technological change does not exacerbate income and skill polarisation.

⁴⁴ H Bakhshi, JM Downing, MA Osborne & P Schneider, *The Future of Skills: Employment in 2030*. London: Pearson & Nesta, 2017, p. 16.

⁴⁵ Elana Douglas, 'Social Skills top academic achievement', *Australian*, 17 August 2018.

⁴⁶ Lorenzo Fioramonti argues in *Wellbeing Economy: Success in a World without Growth* (Johannesburg: Pan Macmillan, 2017) that old vertical structures of production will never produce sufficient jobs and that we need to empower people to become both producers and consumers; i.e. 'prosumers'. Horizontal local systems of co-production and networks of small businesses will, he contends, be assisted by new technologies such as 3D printers to develop a new form of post-industrial artisanship that 'may challenge conventional assumptions about the efficiency of economies of scale' (Fioramonti, 'How to create jobs'). Hence the importance of entrepreneurship in assisting the transition from a growth economy to a wellbeing economy.

⁴⁷ Swinburne University of Technology, *Strategic Plan 2025*, March 2017. In addition, a new 'Transforming Learning Strategy (2017-2020)' prioritises employability and business creation outcomes, technology-rich learning and teaching environments, student-centred learning, flexible and personalised learning options, authentic and relevant learning experiences, and the development of a sense of global citizenship.

⁴⁸ Yana Haletes, 'The HE Sector: Where have they been and where are we now?' in R. Gutierrez (ed.), *The University for the Future: Evolutions, Revolutions and Transformations*. Sydney: Lee Hecht Harrison, 2016, p. 21).

⁴⁹ Onnida Thangpravati, 'The Student of the Future', in Gutierrez, *The University for the Future*, p. 60. The WEF (*The Future of Jobs*, Geneva: 2016, p. 3) believes that industrial demand for deep (or social) skills will supersede narrow technical skills by 2020.

⁵⁰ Thangpravati, 'The Student of the Future', p. 68.

⁵¹ Ittima Cherastidtham, 'Higher education fees are rising – so is it still worthwhile enrolling?' *The Conversation*, 4 July 2017. 2011 Census data suggests that male graduates earn 20% more than a diploma holder and 61% more than a school leaver; for women, the differences are 31% and 70% respectively.

⁵² 'The Benefits of a University Education', *Economist*, 6 January 2018; Yezdani, 'Five myths about Australian university graduate outcomes'.

⁵³ Tom Standage, p.9. Joel Moky of Northwestern University argues that specialisation simply encouraged students to 'learn more and more about less and less'.

⁵⁴ Genevieve Bell, 'Episode 4: Fast, Smart & Connected: How to build our digital future', *ABC Radio National*, 23 October 2017.

⁵⁵ 2017 *Deloitte Global Human Capital Trends*, p. 21. See also Innes Willox. 'Workplaces increasingly demand future recruits are better skilled', *Australian*, 8 January 2018.

⁵⁶ Tony Featherstone, 'Are STEM skills overhyped?' *Age*, 18 January 2018.

⁵⁷ It notes that 'These skills are not role- or industry-specific, but enduring capabilities such as problem solving, financial literacy, digital literacy, teamwork, communication, intercultural skills,

creativity, critical thinking and presentation skills. Many of these skills are critical to service industries – such as additional languages and intercultural skills in tourism or health services’. The Business Council of Australia defines work-ready skills as sense-making, social intelligence, design mindset, computational thinking, new media literacy, cross cultural competency and virtual collaboration. The World Economic Forum ‘refers to these skills as digital intelligence, underpinned by eight interconnected areas such as digital identity, digital emotional intelligence, digital communication and digital rights’ (CEDA, *Improving service sector productivity: the economic imperative*. 2017, pp. 55-58).

⁵⁸ Alina Dizik, ‘The next generation of jobs won’t be made up of professions’, *BBC*, 24 April 2017. See also Andrew Palmer, ‘Lifelong learning is becoming an economic imperative’, *Economist*, 12 January 2017. Finland is already experimenting with Project-Based Learning in its schools, although one UK study found no compelling evidence that PBL is a more efficient way of teaching or that it improved student literacy and engagement with learning. However, it did enhance student skills in communication, teamwork and self-managed study (Penny Spiller, ‘Could subjects soon be a thing of the past in Finland?’ *BBC*, 29 May 2017).

⁵⁹ Judy Raper, ‘Academics must not retreat to the safety of the silos’, *Australian*, 18 November 2015.

⁶⁰ 2017 *Deloitte Global Human Capital Trends*, p. 20. McCrindle (<https://mccrindle.com.au/insights/blog/job-mobility-australia/>) estimates that a school leaver today will experience 17 different employers by the time they reach 75 years, and 5 separate careers. It will be driven largely by opportunity than economic uncertainty. An era of employment flexibility and empowered workers, McCrindle argues, puts employers on notice.

⁶¹ Bell, ‘Episode 4: Fast, Smart & Connected: How to build our digital future’; Yezdani, ‘Five myths about Australian university graduate outcomes’.

⁶² Philip Kreager, *Humanities Graduates and the British Economy: The Hidden Impact*, Oxford: University of Oxford, 2013.

⁶³ Lectures should not be copied and placed online. Instead staff should break them in 10-15-minute vignettes and record them from their computers. That way they speak directly to the students utilising online delivery, rather than have students feel that they are eavesdropping on a class.

⁶⁴ It argues that educational institutions ‘will need to transform from a producer-driven business model to one that is increasingly shaped by student and consumer demands’. Hence the importance of ‘new, pragmatic frameworks to accurately assess competency with a view that extends beyond one-off pass-or-fail performances to lifelong learning and improvement’ in order to compete in a global market (CEDA, *Improving service sector productivity*, p. 58).

⁶⁵ Deanne Gannaway, comments at the HASS Futures Think Tank, Melbourne, 17 May 2017.

⁶⁶ Open Future, ‘Bullshit jobs & the yoke of managerial feudalism’, *Economist*, 29 June 2018.

⁶⁷ Parker, ‘Readiness for work trends of the future is essential for success’.

⁶⁸ Thangpravati, ‘The Student of the Future’, p. 77.

⁶⁹ Swinburne has already done this to some extent with respect to the roles of its Associate Deans for Learning and Innovation, referred to in many universities as Learning and Teaching. A common business designation is Learning and Development, which Deloitte describes as a focus on innovation and leadership development that delivers a world-class learning experience, promotes lifetime learning for longer careers, and brings multifunction teams together to connect, collaborate and converge (2017 *Deloitte Global Human Capital Trends*, pp. 29-32). The description is not dissimilar to that outlined in Swinburne’s *2025 Strategy*.

⁷⁰ ‘Telling evidence on complexities of teaching’, *Australian*, 12 September 2018.

⁷¹ Justin Reynolds ‘Want to attract top talent? Throw art on the wall’, *insurancebusinessmag.com*, 28 August 2018; Julie Wagner & Dan Watch, *Innovative Spaces: The New Design of Work*. Anne T & Robert M Bass Initiative on Innovation and Placemaking, The Brookings Institution and Project for Public Spaces, Washington and New York, 2017.

⁷² Keith Flamer, 'Is this the future of the Open Office Space?' *forbes.com*, 31 December 2017.

⁷³ George Morgan, 'The perils of working in the "coffice"', *Age*, 9 July 2018.

⁷⁴ Ethan Bernstein & Stephen Turban, 'The impact of the 'open' workspace on human collaboration', 2 July 2018. DOI: 10.1098/rstb.2017.0239, *Philosophical Transactions, The Royal Society*.

⁷⁵ Bartleby, 'Open offices can lead to closed minds', *Economist*, 26 July 2018.

⁷⁶ Bartleby, 'The pros and cons of collaboration', *Economist*, 6 September 2018

⁷⁷ Steve Wozniak, *iWoz*, quoted in Susan Cain, 'The rise of the new groupthink and the power of working alone', *linkedin.com/pulse*, 4 June 2015. See also Susan Cain, 'The Rise of the New Groupthink', *New York Times*, 13 January 2012.

⁷⁸ Open Future, 'Bullshit jobs & the yoke of managerial feudalism', *Economist*, 29 June 2018

⁷⁹ Josh Bersin, Jason Flynn, Art Mazor & Veronica Melian, 'The employee experience: culture, engagement & beyond', in *Rewriting the rules for the digital age, 2017 Deloitte Global Human Capital Trends, Deloitte Insights*, 28 February 2017, p. 54. The inserted Table 4 is found on p. 55.

<https://www2.deloitte.com/insights/us/en/focus/human-capital-trends/2017/improving-the-employee-experience-culture-engagement.html>

⁸⁰ Abigail Walthausen, 'Don't give up on the lecture', *The Atlantic*, 21 November 2013. See also, "I don't like this one little bit", *Tales from a Flipped Classroom, Faculty Focus*, 22 July 2013.