Digital Futures: What Employers Want from Graduates

A Report on the Industry Roundtable Discussions held for the project: *Digital Work Practices: where are the jobs, what are they, and how prepared are graduates?*

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ACKNOWLEDGEMENTS

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INTRODUCTION

Digital work practices: where are the jobs, what are they, and how prepared are graduates? is an Australian Technology Network of Universities (ATN) Excellence in Learning and Teaching funded project for scholarship, research and innovation. It was led by RMIT University, with Queensland University of Technology and the University of Technology Sydney.

The aim of the project was to create a learning model that supports the teaching of digital capabilities in Creative Arts, Communications, Business & Management, and Engineering, with future application to other disciplines. The intention was to meet new industry needs while positioning graduates for emerging digital work opportunities in the globalised world of work.

This multi-university, cross-disciplinary project focuses on preparing graduates for digital work and considers how to embed the development of digital capabilities into university curriculum. The project team were drawn from the academic disciplines of Creative Arts, Communications, Business and Management, Engineering, and Education, and have research interests in employability, pedagogy, interdisciplinary practice and the future of work.

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As part of this project, a series of roundtable discussions with representatives from industry were held in Sydney, Melbourne and Brisbane. The roundtable discussions were facilitated by project team members at each partner institution. The purpose of the discussions was to gain insight into the digital capabilities that employers seek in their graduate employees, and use this information to inform the development of a learning model to support the teaching of digital capabilities in tertiary education. This report provides a summary of the findings from the roundtable discussions, considered within the context of the need to develop digital capabilities for work.

ABOUT THE PROJECT

This multi-university, cross-disciplinary research project focused on preparing graduates for work in the digital age and considered how to embed the development of digital capabilities into the tertiary education curriculum. The aim of the project was to create a learning model that supports the teaching of digital capabilities in Creative Arts, Communications, Business and Management, and Engineering, with future application to other disciplines. The intention was to identify and meet industry needs while positioning graduates for new and emerging digital work opportunities in the globalised world of work.

In designing the learning model, stakeholders from across industry and the tertiary education sector were consulted in various ways. The data gathered from these consultations resulted in the creation of *Digital Capability Descriptors*, which describe the key digital capabilities required for graduates to be successful in each of the target disciplines - Creative Arts, Communications, Business and Management, and Engineering. This report focuses on the findings of the data obtained through roundtable discussions conducted with industry representatives from the target disciplines in Melbourne, Sydney and Brisbane in mid-2017 (Figure 1, Method 3).
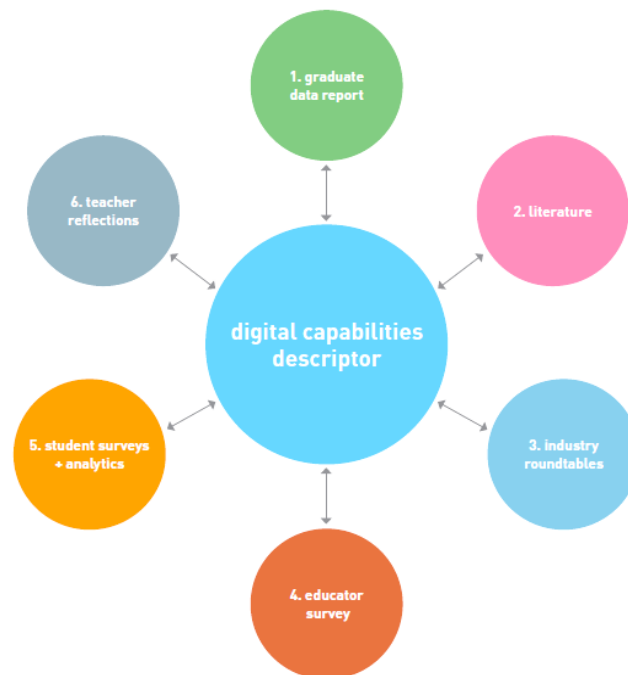

Figure 1: Methods underpinning the development and refinement of the Digital Capabilities Descriptors

WHY INDUSTRY ROUNDTABLES?

The project was concerned with aligning teaching in tertiary institutions with industry needs to overcome often differing opinions about the relative importance of skills for labour markets (Rosenberg, Heimler and Morote, 2012). Consultation with industry representatives was therefore an essential element of the project. Roundtables were an ideal method for obtaining rich, insightful data from industry experts because the group environment promotes debate and discussion amongst participants and draws out varying perspectives in a short amount of time (Weerakkody 2009). The roundtable environment also allowed the facilitators to immediately clarify and tease out statements made by the participants, to provide comprehensive insight around the digital capabilities required by industry.

WHO PARTICIPATED?

Four[1] industry roundtables were conducted for the project in mid-2017 – two in Sydney and one each in Melbourne and Brisbane. Participants were identified through institutional partnerships or the Program Advisory groups associated with the target disciplines at the participating universities and invited via email. All participants had leadership roles in organisations (public and private sector) that employed graduates. Table 1 provides an overview of the participants.

Table 1: Industry Roundtable Participants

Roundtable Location	Number of participants	Disciplines represented	Participants' median number of years' experience
Sydney 1	N=9	Creative Arts (Design)	>5 years
Sydney 2	N=8	Communications (Journalism)	>15 years
Melbourne	N=10	Business and Management Creative Arts Communications Engineering	>22.5 years
Brisbane	N=15	Business and Management Engineering Science	>15 years
TOTAL	42		

Data was collected during the roundtables using two methods. Firstly, participants were provided with a short questionnaire (see Appendix) and asked to record written responses before the discussion began. Secondly, participants provided verbal responses to a series of

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[1] A fifth industry roundtable was held in Melbourne in February 2018. The focus of this roundtable was to gather feedback on the proposed learning model. The outcomes of that roundtable are hence not included here.

questions relating to digital capabilities and graduate employment. The same core questions were initiated by the project team in each roundtable, but free flowing discussion was encouraged so that the participants could shape the focus. Discussions were audio recorded and transcribed, and de-identified so only a code was assigned to indicate location and industry. Statements were analysed to identify key themes. This report focuses on capabilities identified to deal with themes of digital change, technology and big data.

DIGITAL CAPABILITIES IN CONTEXT

New Ways of Working Needs New Skill Sets

Employability can be understood as the package of skills, personal attributes, attitudes, knowledges, and experiences that enhance an individual's likelihood of gaining employment (Fugate et al., 2004). In recent years there has been widespread debate and discussion in Australia about the extent to which young people are adequately prepared to participate in the labour market, especially as organisations increasingly demand flexible, creative and mobile workers (Hajkowicz et al., 2016). Others have argued that there is a shortage of people worldwide with the skills and knowledge needed for new and emerging roles (Bhens, Lau and Sarrazin, 2016). Central to this concern has been a focus on digital capabilities, as technology is embedded in every element of society and seen as inextricably connected to future forms of work (Ala-Mutka, 2011). Furthermore, digital capabilities and technologies are considered to be key drivers of innovation (House of Lords 2015, Hajkowicz et. al, 2016, Van Laar et. al, 2017).

There is general consensus that digital capabilities need to be developed in young people, so that they are prepared and productive when they enter the labour force (Foundation for Young Australians, 2016, Hajkowicz et. al, 2016). In recent years, the focus has moved from schools to tertiary education and there is a growing concern that Universities are not equipping graduates with the capabilities they need for work (Creighton 2018; QILT 2018). This challenge is exacerbated by the speed of technological development and proliferation of new technologies used by individuals and organisations. One powerful example of this is the use of social media in organisational life which has fundamentally altered the reach, speed, and permanency of work-related conduct and expectations (Ellerbrok 2010; Jacobson & Howle Tufts 2013).

A key challenge faced by educators is that there are many different interpretations of what it means to be digitally capable. For the purposes of this project, digital capabilities include the knowledge, skills and attributes required for a user to interact productively with technology.

Digital capabilities are both specialized -situated within a particular profession and not easily transferrable, and general -encompassing familiarity and ease with a range of digital technologies that are transferable between professions and contexts (for example collaborating with others online) (Beetham, 2015).

Even Digital Natives Need Development

Recent empirical studies have identified that young people are not necessarily as naturally proficient in using digital technologies as first thought (Henderson et. al, 2016, Eynon and Geniets, 2016). Similarly, industry has come to expect that graduates will be digitally capable but the digital skills of graduates do not always meet those industry expectations (Haukka, 2010). There can be stark differences between the digital capabilities taught at university and the digital capabilities required by industry, an issue compacted by the "rapid rate of technological change" within industry (Bridgstock 2016, 308). Graduates themselves have noted that they often acquire most of their digital capabilities outside traditional learning environments (Maeda 2017). While industry is largely satisfied with technical skills in graduates (QILT 2018), there is room for improvement where digital capabilities are concerned.

Government policy, both in Australia and internationally, is largely focused on how to integrate digital learning into school curricula, often overlooking the tertiary sector. There is also little consistency between tertiary institutions around what digital capabilities are taught and how they are taught (Coldwell-Neilson 2017).

Affordances of Technology

Affordance theory defines a technology in terms of the uses, interactions and possibilities that the technology affords to its users. Affordances can be categorized according to their potential for achieving outcomes as functional, perceptual, maintenance and contextual (Best 2009; Evans et al. 2017). Affordance theory provides a useful framework for scaffolding student learning of digital capabilities, and has been adapted by the project team to develop a learning model with the aim of improving the digital capabilities of students. A key strategy in the project was to consider responses from all participants in relation to affordances of digital technology and to identify whether industry needs and graduate capabilities where across three affordance categories. These were defined as:

Functional – affordances relating to the operation of a technology, including naming, knowing and operating the features of a technology to perform tasks

Perceptual – affordances relating to interpretation and being discerning about technology tools and practices for their suitability and in-context operation for outcomes in known contexts.

Adaptive – affordances relating to imagining, adapting and extending technology use in previously unexplored and emerging contexts for innovative outcomes; this requires functional knowledge/skills and perceptual experience.

The key themes emerging from the industry roundtable discussions are summarized in this report, and will be used to inform the learning model being developed by the project team. In summary this report reflects on how the digital capabilities required by employers relate to technology affordances and the implication for developing the digital capabilities of students in higher education.

KEY THEMES FROM THE ROUNDTABLES

The following section summarises the key themes emerging from the four industry roundtable discussions held during 2017. Roundtable participants identified a range of challenges facing their industry or occupation that are impacting upon the types of jobs and skill sets needed within their workforces. The suitability of graduates to meet these capability gaps were discussed, with a particular emphasis on digital capabilities. Industry participants also provided ideas on how tertiary institutions can help build future capability.

Digital Disruption and Incremental Change

Across all roundtables, participants noted that their respective industries had been affected by digital disruption and technological change in recent years. For some participants, new technologies had revolutionised work and jobs in their industries. For others, digital disruption provided opportunities for new businesses and new products and services. These opportunities and challenges played an integral role in shaping the digital capabilities required in the participants' industries, particularly from new graduates. Significantly, industry participants talked not simply about the creation of new digital work roles, but also about the way that digital capabilities were an expectation across all roles:

> *…you truly have a digital thread running all the way along.* (*Melbourne, Engineering, Large, E1-v*)

> *We've always been a digital organisation and it's always been evolving. It's just the way it's evolving now is different with online, with cloud and those type of things, automation and drone activity in particular are all very disruptive to our organisation. (Brisbane, IT, Large, B5-v)*

> *from a technical perspective the changes have been as dramatic in my opinion and the workforce is changing incredibly quickly. Their knowledge and what they bring prepared… you know the digital revolution has created a situation where everyone can be an expert overnight. (Melbourne, Engineering, Large, E3-v)*

> *I notice social communications and media monitoring is now really a big part of any project…it never used to be. (Melbourne, Engineering, Large, E3-v)*

Digital technology wasn't disrupting all industries, but creeping digital dependence was evident across all domains and some participants actively challenged the idea that disruption was

occurring but instead argued that they were simply being proactive in using new technologies to make work more productive:

> *For us it hasn't changed the job at all…we haven't had a disruption. That says damage and there's no damage. Fine we've going to the cloud and we're using drones more and we're reviewing [mine] radar monitoring systems …It's not disruption it's just what you do. (Brisbane, Engineer, Medium, E1-v)*

The pace of technological change posed a challenge for many and the words used by participants to describe what was happening in their organisations often emphasised the loss of control and pressure that many felt. Participants noted that technology was updated so quickly and so frequently that existing platforms rapidly became out of date, along with associated knowledge and skill sets.

> *I think the major effect of digital disruption has been quite dramatic in our industry… I think the pace of change for us has been quite dramatic. If we look at our technological tools if you looked at something like augmented reality or virtual reality what was happening 6 months ago to 3 months ago to now, … the organisational structures of clients and agencies have not caught up with that. There's a danger in that. (Melbourne, Communications, Large, Com2-v)*

> *We're moving our entire broadcast network into a digital environment and it's happening really quickly because we're so far behind. (Sydney, Creative Arts (Design), CAD3-v)*

> *Every time you get a handle on one thing another thing comes out….it's just really hard to know where to prioritise because it changes really quickly. (Sydney, Journalism, Large, ComJ2-v)*

Industry participants noted two primary drivers of change; the customer, and social media/communication-based technology. Much of the change that was occurring within organisations was driven by a belief that customers/clients expect to have services provided online or via an app, or arose because of a desire to understand and engage more actively with customers through digital platforms.

> *The proliferation of platforms is really notable…they're all just coming in like a tsunami all at once…there's just so much of it…We've got one set of production people who are trying to juggle countless things now. (Sydney, Journalism, Large, ComJ2-v)*

Social media and other technologies that facilitate customer/client or public communication were integral to this process. Social media and platforms such as Google and Amazon, provided an additional force for change within organisations because they provided a platform for industry competition. In some industries, such as journalism, the ease and speed of access to information provided via these platforms posed a direct threat to established models of work.

Big Data Benefits

Despite some anxiety around the pace of change, participants were overwhelmingly positive about the opportunities afforded through the adoption of new technologies. They believed that the availability of data provided better opportunity to understand the needs of the customer and the workforce. Accessing, analysing and applying insights from data was a key theme across industries.

> *we've got sensors you can put almost anywhere and get data and I think the opportunities or challenges are understanding that data obtained and evaluating, assessing, and interpreting that data to optimise, processes for making it commercial. (Melbourne, Engineering, Small, E4-v)*

> *the ability to turn that large amount of data into knowledge is a real key skill set. Not just getting the data…information and dissemination of that information, so how consumers come to hear about your product or your brand or your offering, …we have to move from deciding how we want to sell something to understanding how people want to buy it as well. (Melbourne, Communications, Large, Com2-v)*

> *One of the companies I work with, they're dumping all their stuff into data lake… what they call data lake, …. And they can start investigating the reality of everything they're doing out there and so I think that's a big opportunity. (Melbourne, Engineering, Small, E4-v)*

> *so the data and insights that are available to you now versus what was available even a year ago. We're moving from research, for example, we're moving from claimed behaviour to actually looking at real behaviour and that's quite an incredible difference. (Melbourne, Communications, Large, Com2-v)*

Digital technologies were also driving change in relation to communication. Participants described how technologies were providing access to global workforces, cross-collaboration, and access to training, as well as the opportunity to more readily interact with the public and/or clients.

Obviously the opportunities with digital in terms of communication are absolutely huge, particularly with the opportunities to work with data (Melbourne, Government, Large, Com1-v)

…it's forced my clients to pick up digital technologies. Whereas previously they did lots of things manually. They would employ a lot of resource people to do that, bookkeepers and the like. Now a lot of stuff is electronic so automatic invoice feeds, communication with customers via SMS rather than picking up the phone or waiting for them to come back. So it's kind of forced my client base to adopt more technology. (Brisbane, IT, Small, B1-v)

a lot of the digital technology like cloud really what it does is bring the world closer together and it increases the ability to communicate. (Brisbane, Finance, Large, B11-v)

A number of participants explained that they had harnessed the power of digital technologies to grow their business and operate at a scale that previously hadn't been possible. This included using social media to promote and sell products and services, as well as drawing on technology to research and build market share.

Where previously there would have been more a traditional style around selling engaging face-to-face and developing relationships and sharing material as the consumer wanted it. We've taken that on our digital platform. So we've created pitches with technology that we can deploy out to hundreds of thousands of people. (Brisbane, Consulting, Large, B2-v)

So the engagement in Facebook and social media from really identifying who our customer is has been enormous. There's been an enormous amount of research into understanding not only what our customers want but actually who are our customers as well. (Brisbane, Health, Large, B10-v)

Realising that a huge number of your audience are never actually going to come through the front door. They might not be able to, they might not want to, they might not be in the right place for it. That push to think of digital audiences not as secondary or supplementary but as your audience and not just the people who walk through the front door, by a ticket, go to the shop sort of thing. (Sydney, Design, Small, CAD6-v)

Benefits have also been realised in terms of speed, efficiency and productivity – for organisations, their workforces, and their clients. Some participants talked about improvements

in health and safety as a direct result of new technologies available to them, others noted that digital platforms enabled them to monitor and control employees:

> *Since we rolled out an iPad to all of our staff and we use that platform there for all of our clinical practices, manuals and we push all updates and all of those things out to our staff through that. (Brisbane, Health, B3-v)*

> *For us some of these things are making it a safer place to work for people who work in a high risk industry. (Brisbane, Resources, Large, E2-v)*

> *Oculus Rift technology or virtual reality technology…being able to experience that in a safe space to practise those skills of going to a station, buying a ticket and hopping on a train in that virtual reality space and practising that a hundred times over before actually taking that person out to actually do it in the real world. That's kind of a big game changer around technology. That's really small scale at the moment. But I can imagine in 10 years' time that sort of service could be quite a big business. (Brisbane, Health, Large, B10-v)*

> *It's been really, really difficult to prove the impact designers have. But because of digital, I think it's much, much easier to do that. (Sydney, Creative Arts (Design), CAD2-v)*

New Technology, New Jobs, New Capabilities

Digital technologies had created new jobs in many industries, and growth in digital jobs was happening at a rapid pace.

> *There were no digital jobs six years ago. Now there's chief digital officer jobs and head of digital. So the titles are actually coming out that didn't even exist before. In our organisation I just doubled the size of my team in the last two months and a lot of other areas are cutting. So it's an investment area that we are growing. (Brisbane, Insurance, B4-v)*

Even where job titles or responsibilities had largely remained the same, digital technologies had changed how the job was done.

> *The tools they use are really what has changed. Then the management and supervisory aspects of leading an organisation have become more transparent so that through the*

layers of management when everybody knows the data is real and live and visible to everybody that has changed the focus around time. (Brisbane, Health, B3-v)

I don't think our jobs have actually - job titles haven't changed. The way we do things … (Brisbane, Science, Medium, Sc1-v)

I guess our roles per se haven't really changed that much. But maybe how we do them and how we fill them has. (Brisbane, Consulting, B6-v)

it's more the job still exists, but the technical expertise has changed. (Melbourne, Communications, Large, Com2-v)

Artificial intelligence, automation and machine learning in particular were identified by participants as factors which were changing and challenging existing jobs and existing ways of working.

In our environment, the threat of machine learning to our editors and our curators is very real. (Sydney, Creative Arts (Design), CAD2-v)

now we've got the proliferation of technologies like AI. Which again, then throws it all into turmoil again. What's the role of a digital or a UX or a UI designer in a voice based conversational interface where there is no interface, or the interface is actually the conversation? How much of the business understands AI algorithms, data analysis, and those sorts of things which are actually a change to the way customer experience is perceived or received. (Sydney, Creative Arts (Design), CAD8-v)

Automation of machines (e.g. driver-less trucks, haulage)…results in a reduction of roles but an increase in the Operations Centre. (Brisbane, Resources, Large, B9-w)

Industry participants explained that they often struggled to recruit the right people for new digitally focused roles, especially when these needed specific technical competences or broad generalised digital capabilities:

It is tough going trying to get UX person in Brisbane right now.
(Brisbane, Insurance, B4-v)

We needed a jack of all trades who knew Photoshop, who could edit, who could write, who could find photos, who could upload, who could use WordPress.(Sydney, Journalism, Small, ComJ4-v)

That's something everyone needs video ... They become the most hotly contested roles. Things like social community managers, that was not even on the radar two years ago. Now everyone wants one. (Sydney, Journalism, Large, ComJ2-v)

Regardless of the industry, the depth and breadth of capabilities required in the digital space have expanded considerably, raising not just the skill level and expertise required, but also the profile of roles that require digital capabilities. It was clear that for many employers there had been a change in the way they perceived digital work, no longer seeing it as an add-on or discretionary part of a role, but instead as central to strategy:

Even digital native jobs like social media have changed heaps. That used to be a junior role. It's an afterthought. You put something on Twitter. Oh we need to get it up on Facebook. But now that role requires editorial nous and experience. (Sydney, Journalism, ComJ5-v)

It's almost a news desk job that's a senior role, strategy, relationships with all the platforms. That's how it's evolved even in the last two or three years. (Sydney, Journalism, ComJ5-v)

The mechanical engineer and the electrical engineer are sort of merged together and became a manufacturing engineer and industrial engineer and automation engineer and electronics engineer. (Melbourne, Aerospace, Large, E1-v)

One of the things about engineering is that when I started we had a hierarchy, you had an engineer, a senior designer, and a design draftsman, and detail draftsman… Now they do it all. And so it comes back, you need a broader depth of skills. (Melbourne, Consulting, Small, E2-v)

That used to be a really big skill set of an art director, you couldn't be an art director if you couldn't draw – if you can only draw now and can't use a number of quite sophisticated programs, you can't work in our industry. (Melbourne, Communications, Large, Com2-v)

New and emerging jobs identified by multiple participants included:

- Mobile Application Developers
- Cyber-security experts
- Digital strategists (and related roles eg: Digital Officers, Head of Digital)
- Digital Content Authors/Creators
- Data Platform Managers
- Data Detectives
- Customer Experience Officers/Managers
- Systems designers

In Science and Engineering:

- Geotechnical engineers
- Tunnel designers
- Engineering geologists
- Remote sensing/Geographic Information System/Image Analysis experts
- Software Developers, testers and engineers

In Creative Arts (Design) and Communications (Journalism):

- Digital designer/Art director
- Immersive/Experiential Designers
- Social Community Managers

The Graduate (Digital) Capability Gap

Industry participants presented contradictory positions when asked to reflect on whether recent graduates had capabilities that they identified as necessary for employment. Participants stated that graduates already had some digital capability strengths, with some presenting views consistent with the assumption of the digital native. That is, comments from participants indicated that many believed graduates would have already developed digital capabilities as a by-product of their youth and through exposure to technology since childhood.

The younger generation are more digitally savvy and they want to tweet and twit or whatever you do and Facebook and so on. (Melbourne, Construction, Small, E5-v)

Quite honestly, young people get the stuff. They get it very quickly. They've grown up with Facebook and Twitter. (Sydney, Journalism, ComJ5-v)

My expectation would be that people would be coming out of university, coming into a newsroom and educating the older members of the newsroom about more cutting edge areas and not having to train them in areas that are already outdated. (Sydney, Journalism, Large, ComJ8-v)

In contradiction, participants complained that new graduates lacked fundamental digital capabilities and a basic ability to use and interpret data:

Because the social sciences have failed to keep up with the requirements basically in the analytic space, in the quantum space, they've failed (Brisbane, Finance, Large, B11-v)

[Graduates have] very poor skill in programming (Brisbane, IT, Large, B7-v)

There's really low understanding…graduates understanding of how open source actually works… (Sydney, Government, Small, CAD4-v)

The basics are going missing….a good understanding of the principles that really support these algorithms. All the logic that goes on behind the scenes in the black box are starting to go missing, so what we see is particularly from the younger generation is a lack of experience in what's being presented and that's the real danger (Melbourne, Engineering, Large, E3-v)

Data analysis capability was considered vital and included the ability to compile data to identify problems, the ability to interpret data diagnose and/or solve problems, and the ability to use data to communicate or "tell a story". Mathematics ability and numerical and data literacy were all identified as current skill gaps in graduates. Algorithm development was identified as future (or continuing) capability requirement, as was UX skills for developers.

Participants across industries identified basic coding skills as a core capability in graduates. Current graduates (particularly in business/management) were perceived as lacking suitable coding or programming skills and employers who traditionally had recruited business graduates were now looking to IT graduates for the coding skills they needed. Interestingly traditional employers of IT graduates also noted a need for improved programming capability, calling for a return to fundamentals in these disciplines.

If we look from technology graduates they don't have the basics….they don't know basic algorithms and structures, so when they have to address deep problems maybe they

have the skills to analyse the problem but they don't have the tools to create the right structures in the right way…They have to go back to basics. (Brisbane, IT, Large, B7-v)

Graduate (Digital) Capability Strengths

In addition to their perceived ability to adapt quickly to new technologies, industry participants observed that graduates were particularly comfortable with:

- Communicating using digital media;
- Gathering information using digital tools or sources; and
- How to use, or could quickly learn to use, most digital tools.

I've never had a graduate come in where I'm concerned by their digital skills. They've never not been able to grasp something if they don't already know it. (Sydney, Journalism, ComJ5-v)

Many know how to use the tools. The ones that are the best ones are the ones that grab the use of those tools in the real world. They're the ones that tend to be more successful. (Melbourne, Aerospace, Large, E1-v)

The ability to kind of use the online world to find what they need to find. (Sydney, Journalism, Large, ComJ1-v)

There was a strong emphasis on communication skills as a key capability required of graduates and new capabilities in social media marketing and the development and use of video content were identified. Graduates need to be able to communicate in different contexts, including written, online and face-to-face. They also require the ability to use different mediums (digital and non-digital) to communicate a message or tell a story. The ability to collaborate with team members in a virtual environment (as well as in person) was also a key theme in discussions.

Agile Learners and Problem Solvers

Industry participants highlighted key digital capabilities that graduates need for the existing and emerging jobs in their industries, however roundtable discussions also suggested that non-digital capabilities remained equally, if not more, important to many of them. Participants emphasised that they wanted to employ graduates who would be agile learners, adaptable and resourceful within the digital world. The willingness to participate in continual learning was a consistent theme across industries. As the following quotes illustrate, industry participants also tied digital capabilities to problem-solving, explaining that a key requirement for graduates was

the ability to use digital tools or analyse digital data, to solve problems. Critical thinking and complex problem solving thus remain vital graduate capabilities, albeit in a digital context.

> *Is it the digital capabilities you want or is it the other capabilities that you need to have in order to be able to make use of the digital capabilities. (Melbourne, Aerospace, Large, E1-v)*

> *understated is having the basic knowledge and the basic ability to learn. (Melbourne, Consulting, Small, E2-v)*

> *that ability to see the big picture or a willingness to want to be able to see the big picture (Melbourne, Government, Large, Com1-v)*

> *the ability to be agile … that flexible thinking, … it's a real skill of people thinking outside the square and being able to focus on thinking in different areas. (Melbourne, Business, Small, B3-v)*

> *the ability to think, becomes more and more important…. self-learning and constantly upgrading your technical skills will become a massive part of your job. (Melbourne, Communications, Large, Com2-v)*

In addition to problem solving and critical thinking, industry participants also identified that graduates need to be resilient and adaptable to change. In part, this reflected the pace of change in organisations, with participants acknowledging that things were evolving so quickly that they couldn't forecast accurately the business priorities or needs in the medium or long term. For organisations to move forward in the digital world, they need workers able to use digital technologies but also be strategic leaders to push business models and ideas forward.

> *There's a lot of data that's available….but there seems to be a real lack of connectivity between the business requirement and the IT solution. There's this disconnect abd you need to have those people in between that both have the business acumen but also enough tech savvy they can make that connection. (Brisbane, Consultant, Large, B2-v)*

Participants highlighted that being digitally capable is only one part of what makes a graduate appealing to employers. Graduates also need communication skills, business acumen, problem solving skills, emotional intelligence and critical thinking in order to succeed in industry.

Developing Digital Capabilities – What more can be done?

Overall, there was broad acknowledgement that as technology continues to change the way we work, there is a need to develop digital capabilities in the workforce. Participants spoke of the training that was being undertaken to develop the capabilities required for the future, – but noted that training was reactive and not easily planned.

whatever the technology is or digital product solution you could train people to do what they need to do. The problem is resistance to change. (Brisbane, Insurance, B4-v)

it's almost ad hoc as needs training, rather than we're going to send you on a … course for three months and you'll be off site. And so training has become a really different prospect as well. (Melbourne, Communications, Large, Com2-v)

Education was considered to be an important contributor to the development of digital capabilities, and a key theme was the need to work with industry to provide graduates with exposure to applying digital capabilities in a work environment. Using digital technology to create virtual projects was an idea that was heavily supported at each roundtable. Project based work was considered to provide graduates with an opportunity to be exposed to real working problems and be able to safely make mistakes, and importantly, give them an opportunity to work and communicate within multi-disciplinary teams.

Virtual projects have potential to demonstrate multidisciplinary skills and team work. (Brisbane, Science, Medium, Sc1-w)

Projects, Virtual projects, Internships, Sandwich courses, Vacation programs, Cross faculty/multidiscipline team projects. (Brisbane, Resources, Large, E2-w)

Virtual is useful, good comparative studies/examples or projects that illustrate real world situations are utilised, practical very useful. (Melbourne, Engineering, Small, E4-w)

that kind of thing even just practical assignment work or internship type work, that gives you the type of capabilities that you need to be able to use digital tools effectively…. Instead of just going in and learning a thing… whatever that subject is, have a more realistic learning experience where you're getting elements of an effective learning experience put into context. (Melbourne, Aerospace, Large, E1-v)

Certainly internships, the right kind of internships and the right kind of projects are going to give them a sense of that. It doesn't take long for your own child to fall off a bike and

scratch their elbow to realise how important it is to be able to stay up straight on the road. The earlier you learn that, the more valuable the learning you get from that point on. (Melbourne, Aerospace, Large, E1-v)

We've had success in hiring graduates where they've done significant project based work in their final year typically…. We place a lot of emphasis on that understanding from the candidate how the role they play how they work with the team. (Brisbane, Consulting, Large, B2-v)

I think projects of multidiscipline teams so that you're seeing them interact together. So you might have a digital expert as well as a mine engineer in a project. So cross faculty, cross discipline. (Brisbane, Consulting, Large, B2-v)

Closer ties to industry (but institutions need to make it worth industry's while). Project competitions – group of students get to work in company to get their idea/design made/brought to life. (Melbourne, Communications, Large, Com2-w)

Well, why don't you teach it in practice? Like put it into practice and get people to have to do that as part of the curriculum. Not just in this topic, we're going to deal with this company for this project and that's our industry collaboration.   (Sydney, Design, Small, CAD8-v)

Being able to contribute constructive design in an agile way to something like that is something that could be learnt in university. Like they could actually require students to contribute to open source projects and I think that would be very interesting to do. (Sydney, Government, Small, CAD4-v)

project based interns is a great idea. It means you can give them a task. You can then see how they are able to work solo. A little bit of instruction of course but then how do they then go about that task would give us a great indication and give them the ability to show some of these things that we're talking about. I have learning over here in this area that I'm using and I'm bringing that in and we'd never even thought of it. So their own sort of ingenuity could come into that. I think it would be really helpful. (Sydney, Journalism, Large, ComJ1-v)

SUMMARY

Consistent with government reports and contemporary research, industry roundtable participants supported the need to develop digital capabilities in graduates. Initial discussions with industry participants focused on the functional affordances of technology and the need for graduates who would know how to use a wide range of digital tools. However, as the dialogue continued many participants moved away from the functional to focus more on adaptive and perceptual affordances and the 'softer skills' that graduates need to take advantage of these.

The digital capabilities considered most important and in need of development were:
- Coding
- Data analysis capability
- Communicating using digital mediums

Importantly, digital capability development must coincide with development of more generic graduate capabilities such as mathematics, problem solving, critical thinking and communication skills. Graduates who are inter-disciplinary and who can solve problems through creativity and collaboration are sought after. Of most importance is the ability to learn new technologies and apply them to new situations or problems. In terms of the affordance model, this suggests that Adaptive Affordances/Capabilities are a differentiator for graduate employability. In practice, this suggests that universities need to focus on developing agile learners, particularly in a digital context. The risk of focussing solely on adaptive capabilities is that, as research has demonstrated, not all graduates are digital natives, and the foundation of adaptive affordance is functional affordance. Digital literacy depends upon access to technology and the progressive acquisition of digital capabilities – which for socio-economic or geographical reasons may not be obtainable for all graduates equally (Eynon and Geniets, 2016). Universities therefore have a role in developing both functional and perceptual affordances to facilitate graduates' adaptive capabilities.

The findings from Industry also suggest that given the pace of technological change, partnerships with industry and project based work are essential to ensure the capabilities developed maintain relevance and application to new employment environments.

FUTURE DIRECTIONS OF THE RESEARCH

The findings presented within this report represent only one type of data collected for the project *Digital work practices: where are the jobs, what are they, and how prepared are graduates?*

The project aims to use the data contained within this report, along with data sourced from surveys of educators and students, teacher reflections, and other sources, to develop a Learning Model to support the teaching of digital capabilities in specific disciplines.

At the completion of the project in April 2018, the Learning Model and other key findings will be published online at https://sites.rmit.edu.au/digitalworkpractices/. Additional publications authored by project team members will also be made available over the coming months.

For more information on the future of work and employability, please visit the Work Industry Futures Research Group website.

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REFERENCES

Ala-Mutka, K. (2011). Mapping digital competence: towards a conceptual understanding. European Commission, Joint Research Centre, Institute for Prospective Technological Studies. 1-62.

Beetham, H. (2015). *Deepening digital know-how: building digital talent*. Bristol, UK. Retrieved from www.jisc.ac.uk

Best, K. (2009). Invalid command: affordances, ICT's and user control. Information, *Communication and Society*, 12, 1015-1040

Bhens, S., Lau, L. and Sarrazin, H. (2016). Finding tech talent for your company's digital transformation. Retrieved from https://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/the-new-tech-talent-you-need-to-succeed-in-digital

Bridgstock, R. (2016). Educating for digital futures: What the learning strategies of digital media professionals can teach higher education. Innovations in Education and Teaching International, 53:3, 306-315. DOI: 10.1080/14703297.2014.956779

Coldwell-Neilson, J. (2017). Assumed digital literacy knowledge by Australian universities: Are students informed? In *ACE '17 Proceedings of the Nineteenth Australasian Computing Education Conference*. Pages 75-80. http://dx.doi.org/10.1145/3013499.3013505

Creighton, A. (2018, January 8). University degrees are failing to deliver for business. *The Australian*. Retrieved from https://www.theaustralian.com.au/higher-education/university-degrees-are-failing-to-deliver-for-business/news-story/554c2003268743 14f8b14ff161296503

Ellerbrok, A. (2010). Empowerment: Analysing technologies of multiple variable visibility. *Surveillance & Society,* 8(2), 200-220.

Evans, S., Pearce, K., Vitak, J. and Treem, J. (2017). Explicating affordances: a conceptual framework for understanding affordances in communication research. *Journal of Computer-Mediated Communication*, 22, 35-42.

Eynon, R. and Geniets, A. (2016). The digital skills paradox: how do digitally excluded youth develop skills to use the internet? Learning, Media and Technology, 41:3, 463-479. DOI:10.1080/17439884.2014.1002845

Foundation for Young Australians. (2016). New Work Order Report: The New Basics. Melbourne. 1-24.

Fugate M, Kinicki A.J. and Ashforth B.E. (2004). Employability: A psycho-social construct, its dimensions, and applications. *Journal of Vocational Behavior*, 65(1), 14-38.

Hajkowicz, S., Reeson, A., Rudd, L., Bratanova, A., Hodgers, L., and Mason, C. (2016). Tomorrow's Digitally Enabled Workforce: Megatrends and scenarios for jobs and employment in Australia over the coming twenty years. Brisbane: CSIRO. https://doi.org/10.4225/08/58557df808f71

Haukka, S. (2010). From education to work in Australia's Creative Digital Industries: Comparing the opinions and practices of employers and aspiring creatives. ARC Centre of Excellence for Creative Industries and Innovation. Brisbane, Australia. 1-58.

Henderson, M., Finger, G. and Selwyn, N. (2016). What's used and what's useful? Exploring digital technology use(s) among taught postgraduate students. *Active Learning in Higher Education*, 17(3), 235-247. doi: 10.1177/1469787416654798

House of Lords Select Committee on Digital Skills. (2015). Make or Break: The UK's Digital Future. Paper 111. Pages 1-144.

Jacobson, W. and Howle Tufts, S. (2013). To post or not to post: Employee rights and social media. *Review of Public Personnel Administration,* 33(1), 84-107.

Maeda, J. (2017). Design In Tech Report 2017. https://designintechreport.wordpress.com

QILT (Quality Indicators for Learning and Teaching). (2018). *2017 Employer Satisfaction Survey*. Victoria, Australia.

Rosenberg, S., Heimler, R. and Morote, E. (2012). Basic employability skills: a triangular design approach. Education + Training, 54:1, 7-20. https://doi.org/10.1108/004009112 11198869

van Laar, E., van Deursen, A., van Dijk, J. and de Haan, J. (2017). The relation between 21st-century skills and digital skills: A systematic literature review. Computers in Human Behaviour, 72, 577-588. http://dx.doi.org/10.1016/j.chb.2017.03.010

Weerakkody, N. (2009). *Research methods for media and communication*. South Melbourne: Oxford University Press.

APPENDIX A

INDUSTRY ROUNDTABLE WORKSHEET

Digital work practices: where are the jobs, what are they, and how prepared are graduates?

Participant data please (to be de-identified and coded):

Your name:

Your email (for your review of transcript after roundtable):

Your career experience: *(please circle)*

>30 years   >15 years   >5 years   <5 years

Your own discipline/s:

Your role:

Your organization's name:

Industry or field (e.g. construction, tourism):

Scale of your organization: (*please circle*)

>2000 employees   >1000 employees   >500 employees

<500 employees   <50 employees

Scope of your organisation: local   national   international   (*please circle*)

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Worksheet Questions

1. Introductions and your context:

    a) **Main effect of digital disruption in your industry or organization – what has been the major change in the last two years?**

    b) **What key opportunity / challenge do you see coming up?**

2. What are the jobs and where are they?

    a) **What jobs / roles are available and emerging for Communication, Engineering, Business & Management, or Creative Arts (big data, analytics, other)?**

       Are they completely new jobs, or different versions of existing jobs?

       Some examples please:

    b) **Employee or contract work, in large / global organization or SME – are there trends by discipline, or for cross-functional teams?**

    c) **Where are graduates most likely to be employed – Australian or international city or region?**

3. Graduate Capabilities

    a) **What does a graduate need to be employable in the digital space – what digital knowledge, skills and attributes are required?**

       Some general and/or discipline specific examples please:

    b) **In your experience, how ready are graduates now for digital work practices in your organization? Strengths and areas for improvement?**

    c) **What digital capabilities (top 3) should we focus on with students?**

    d) **Could we develop these capabilities through internships or virtual projects?**