# Positioning graduates for digital work futures

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**DIGITAL WORK PRACTICES: WHERE ARE THE JOBS, WHAT ARE THEY, AND HOW PREPARED ARE GRADUATES?**
Australian Technology Network of Universities: Excellence in Learning and Teaching Project

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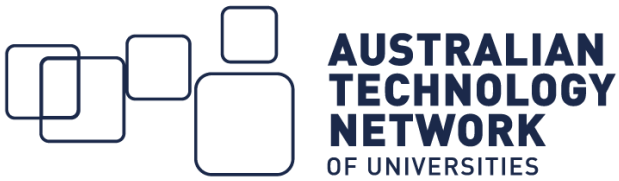
**Ethics Approval:** CHEAN A 20765-03/17 (RMIT), 1700000520 (QUT), ETH17-1399 (UTS)

# ACKNOWLEDGEMENTS

This report presents a learning model, including the work undertaken with students in pilot teaching interventions as part of the project: *Digital work practices: where are the jobs, what are they, and how prepared are graduates?* The project team would like to thank the students who participated.

Support from the ***School of Media and Communication at RMIT University*** is also acknowledged by the Project Leader, Associate Professor Fiona Peterson.




This is an ***Australian Technology Network of Universities*** **(*ATN*)** Excellence in Learning and Teaching funded project for scholarship, research and innovation. The *Australian Technology Network of Universities* is a collaborative partnership between five Australian universities which is committed to forging partnerships with industry and government to deliver practical results through real world research. The five universities are: RMIT University, Queensland University of Technology (QUT), University of Technology Sydney (UTS), University of South Australia and Curtin University.

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# ABOUT THE PROJECT

## Project focus and team

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.

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.

| RMIT | UTS | QUT |
|---|---|---|
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## Project aim

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 potential 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.

Stakeholders from both industry and the tertiary education sector were consulted in various ways to inform the development of a learning model rapid prototype.

## Project reports

The following reports have been produced in the project:

- *Digital educators teaching digital natives? The challenges of developing digital capabilities in a Higher Education context* (Educator Survey Report)
- *Translating digital capabilities: using affordance theory for a developmental learning model across disciplines* (Educator Workshops Report)
- *Digital futures: what employers want from graduates* (Industry Roundtables 1-4 Report)
- *Employment trend data: where are the jobs?* (Employment/Labour Insights Data Report)
- *'Connecting the dots' between industry and higher education: the evolving landscape of digital work* (Industry Roundtables 1-5 and Employment/Labour Insights Data Report)
- *Positioning graduates for digital work futures* (Learning Model and Student Pilots Report)

**Industry** input was invited at a series of four roundtables in Melbourne (1), Sydney (2) and Brisbane (1) in June-September 2017. A fifth industry roundtable was held in Melbourne in February 2018 to seek further input and feedback on the learning model developed by the research team.

Input was invited from **Educators** at all five ATN universities through a survey in September-October 2017. The survey was followed by five workshops six months later in March 2018, where Educators were asked to provide feedback and further input on the learning model prototype developed by the research team.

This report focuses on development of the prototype learning model and its implementation in pilot teaching interventions with students. Two of the pilots, where the learning model was translated for existing curriculum, are discussed in depth.

# INTRODUCTION

Action research cycles in this project have involved development of a scaffolded learning model as a rapid prototype, drawing on technology affordance theory and developmental learning theory. At the heart of the model, Digital Capabilities Descriptors illustrate domains of digital practice in sample fields of Design, Journalism, Engineering, and Music Industry. The Descriptors have then been translated to existing curriculum for working with students.

At the time of this report, two pilots are in progress at RMIT University: Undergraduate Engineering commenced a work-integrated learning intervention (*n*=50); and Undergraduate Music Industry is a 5-week intervention starting in May 2018 (*n*=20-25). Two pilots have been completed at the University of Technology Sydney (UTS): Postgraduate Design started in July 2017 (*n*=12); and Postgraduate Journalism in September 2017 (*n*=16).

In Section 1 of this report, the **learning model** concept is explained. Sample Digital Capabilities Descriptors were developed iteratively, informed by literature and input from industry, educators and students. Examples for Journalism and Design are included within this report. Descriptors for Engineering, Music Industry, Design and Journalism are in the project website (*https://sites.rmit.edu.au/digitalworkpractices/*).

Section 2 covers the **teaching strategies** trialled. The **learning model** in action is summed up. Then the process of mapping a Digital Capabilities Descriptor to existing curriculum is described. Teacher reflections highlight their key learning from the pilots, with links to their spoken commentary in the project website.

Section 3 focuses on **resources** that may be useful for educators across disciplines. Website links include examples of learning and teaching resources collated to support capability development (e.g., collaboration). A case study then shows how the learning model is being applied to updating three different undergraduate subjects/units in Design in 2018, building on the pilot with postgraduate Design students in 2017. Suggestions and prompts are also provided for program/course teams to use in workshops for reviewing curriculum in relation to the learning model put forward.

In Section 4, discussion of **assessment** includes the survey questions used as pilots with sample groups of students in Design and Journalism. Indicative results are provided from the small sample responses. Diagnostic, formative and summative assessment ideas used, including multiple choice, short answer and particularly scenarios, can also be used as resources for learning activities. Through such activities students can be encouraged to *experience and explain* their digital capability development, in terms of digital affordances underpinning the learning model.

Section 5 offers an overall **reflection on the model** and its implementation in Journalism as a case in point. This reflection focuses on a review of the learning model for Journalism with the Digital Capabilities Descriptor at its heart, taking account of the project's input from industry and educators, employment data, and the planning and implementation of the pilot teaching intervention with students in 2017.

Finally, recommendations are made for further work needed.

# SECTION 1: LEARNING MODEL

## Concept

In this project, a scaffolded or developmental approach to learning about the use of technology has been developed as a rapid prototype model. The scaffold moves learning through the increasingly complex affordances of technology and associated digital capabilities, from FUNCTIONAL (the what and how-to of using technology), to PERCEPTUAL (the when and why, in known contexts), to ADAPTIVE (extending, in new and emerging contexts) towards a goal of INNOVATION (realising potential).

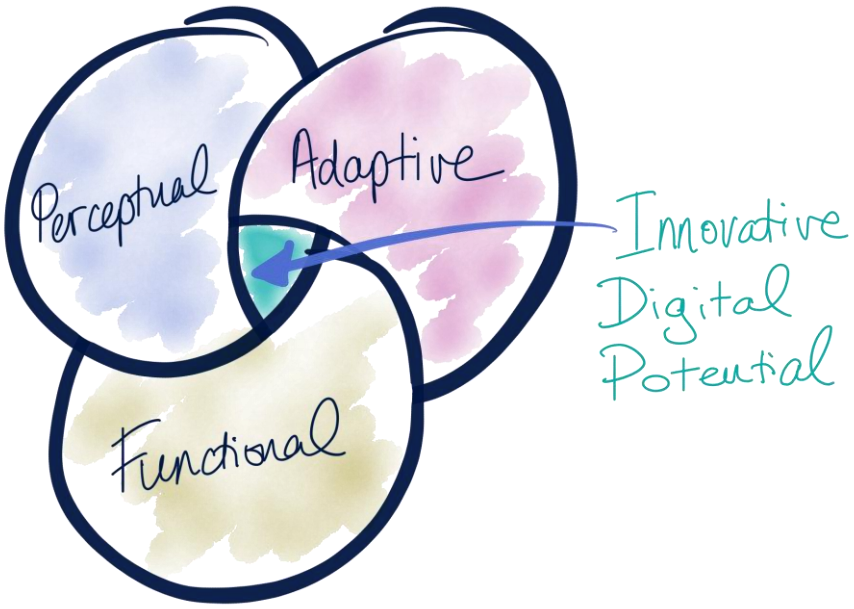


**Figure 1: The affordance concept**

Affordance theory defines a technology in terms of the uses, interactions and possibilities that the technology affords to its users; and affordances can be categorised – according to their potential for achieving outcomes – as Functional, Perceptual, Maintenance and Contextual (Best 2009; Evans et al. 2017; Fray et al. 2017). These categories of affordance have been adapted in this project and re-named as 'Functional, Perceptual and Adaptive', to clarify that contextual application does not constitute a separate affordance and to highlight that the final layer focuses on emergence and new possibilities.

For the purposes of this project, affordances are defined as follows:

- **Functional affordances** relate to the operation of technology; this includes naming, knowing and operating the features of a technology/technologies to perform tasks.
- **Perceptual affordances** relate to interpretation and being discerning about technology tools and practices for their suitability and in-context operation for outcomes in known contexts.
- **Adaptive affordances** relate to imagining, adapting and extending technology use in previously unexplored and emerging contexts for innovative outcomes; this requires functional knowledge/skills and perceptual experience.

(Source: adapted from Best 2009; Evans et al. 2017; Fray et al. 2017)

The developmental learning ideas integrated with affordance theory are underpinned by educational theory, including hierarchies and stages of learning with acknowledgement of the learner, the environment, the outcomes and increasing complexity; and highlighting the importance of reflection-**in**-action for professional learning and practice in unpredictable, unexpected and new circumstances (e.g., Piaget 1936; Bloom 1956; Biggs and Collis 1982; Schön 1983; Gagné 1984; Anderson et al. 2001; Scott 2016; Stein 2017).

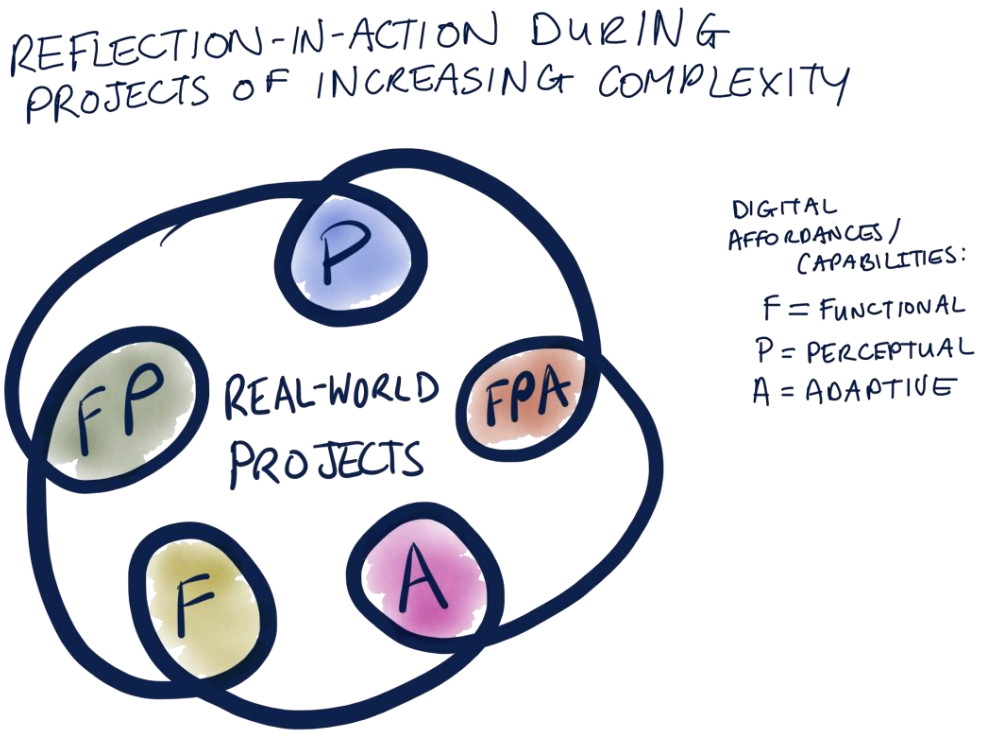


**Figure 2: Reflection-in-action on affordances and real-world projects**

We may view the three affordance layers as having 'shades of grey'. For example, in order to be truly 'Adaptive' at the most advanced level, this would involve pushing boundaries with the use of technology in new ways in new contexts (i.e. not only new to the learner). We may, realistically, support students in working towards this aspiration, with emphasis on imagination and 'seeing' possibilities, rather than expecting that all graduates will be capable of absolute innovation with technology. Similarly, in the 'Functional' and 'Perceptual' layers, there may be a spectrum of lower to higher levels of capability. However, using the three lenses of Functional, Perceptual and Adaptive can help to frame and express learning about the use of technology in work practices.

## Building the model

We can think of the three affordance layers as having 'shades of grey'. For example, being truly 'Adaptive' at the most advanced level would involve pushing boundaries with the use of technology in new ways in new contexts (i.e. not only new to the learner). Realistically, we may support students in working towards this aspiration, with emphasis on imagination and 'seeing' possibilities, rather than expect that all graduates will be capable of true innovation with technology. Similarly, in the 'Functional' and 'Perceptual' layers, there may be a spectrum of lower to higher levels of capability.

Expectations also need to relate to the Australian Qualifications Framework (AQF), so we would not have the same requirements for Bachelor degree and Master degree students. However, using the three lenses of Functional, Perceptual and Adaptive can help to frame and express learning about the use of technology in contemporary and future work practices.

Although the Functional, Perceptual, Adaptive scaffold may be implemented in a linear way, it is highly recommended instead that the affordances are considered holistically and the layers are integrated. Educators may emphasise particular affordances in different ways at different times, depending on their students' stage of learning, the context, the learning outcomes, etc. It is also highly recommended that Adaptive capability development is emphasised most strongly as the student approaches graduation.

The three layers of Functional, Perceptual and Adaptive are hierarchical but integrated. It is vital that students are encouraged to **reflect upon and discuss** the scaffold in relation to their own digital capabilities and practices for work futures.

## Digital Capabilities Descriptors

For the purposes of this project, digital capabilities include the knowledge, skills and attributes required for a user to interact productively with technology. Digital work practices apply digital capabilities in a work context. Digital capabilities and practices are both specialised (situated within a particular profession and not easily transferable), and general (encompassing familiarity and ease with a range of digital technologies that are transferable between professions and contexts e.g. collaborating with others online) (Beetham 2015).

***Sample Descriptors*** have been developed for:

- Journalism
- Design
- Engineering
- Music Industry

These are intended to illustrate ways in which affordance theory can be interpreted for scaffolded or developmental learning about industry-relevant digital work practices in different disciplines.

The Digital Capabilities Descriptors can be used in different ways, such as:

1. guiding the design of assessment and learning activities to enhance existing curriculum
2. guiding new program and course/unit development

The Descriptors interpret affordances in sample domains, which are categories of practice and related capabilities for existing and emerging jobs/roles.

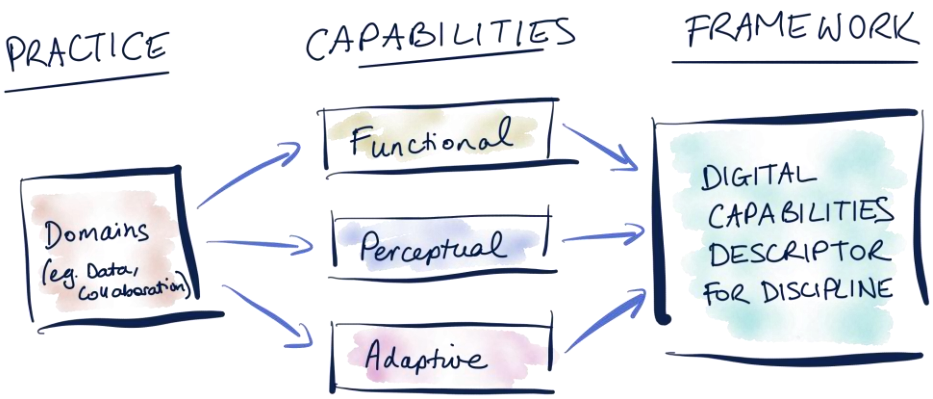


**Figure 3: Using real-world practice and an affordance lens to develop descriptors**

Iterative development and refinement of the learning model in the project included sample Digital Capabilities Descriptors to illustrate the model interpreted for disciplinary contexts. This involved multiple methods – the project team drew upon graduate employment and labour insights data, literature, five industry roundtables, educator survey and workshops, work with students in trialling the model, and teacher reflections on the pilots with students.

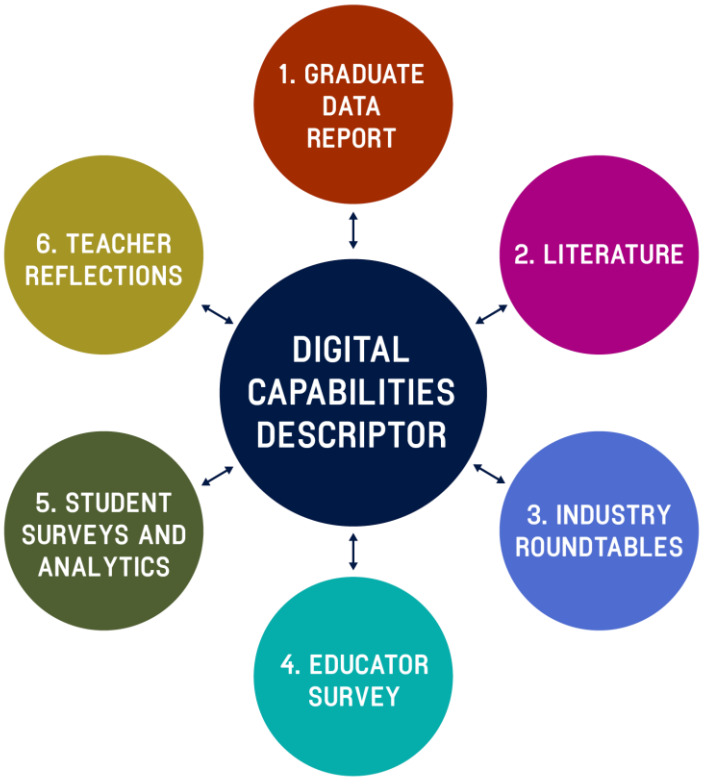


**Figure 4: Sources used for developing Digital Capabilities Descriptors**

The Digital Capabilities Descriptor for **Journalism** is provided on the following pages (as Table 1). was the first one drafted and has been refined iteratively. Its development by project team members has built upon a range of literature spanning affordance theory and journalism practice and education, as well as ongoing insights from the project's interactions with industry practitioners, educators and students.

In this case, four sample practice domains are proposed for graduate journalists:  coding; data; external communication; and internal communication. These are explained below, with Functional, Perceptual and Adaptive digital capability examples within each domain.

As illustrated, the associated capabilities are hierarchical but integrated. Adaptive capabilities are underpinned by some Functional knowledge/skills and Perceptual experience.

Table 1: A digital capabilities descriptor for journalism (4 pages)

## 1: Coding domain

We define coding as the knowledge and skills required to write and organise instructions to direct a computer to achieve specific tasks using machine-readable languages. We do not propose that journalism graduates need to be able to code. While it is obviously advantageous for them to have this ability, we do not see technical scripting and 'debugging' skills as essential within this domain. These skills are easily and increasingly outsourced; automation, especially for the generation of boilerplate code, is increasingly common; coding is taught in schools i.e., there is diminishing value in attempting to teach graduate-age journalists foundational coding skills.

Rather, we propose that journalists need to be fluent in the principles, language and potential of code, so they can direct coding projects, interact with specialist and generalist coders and use the potential of scripted computing power for research and storytelling. Coding can add value to the adaptive affordance level for creating something new. Overall, there is a role for being the 'translator', 'explainer', the 'go between' – from the realm of the technical world, to the realm of the narrative storytelling and text-based world of the working journalist.

### Functional capabilities

**Language of code:**

Name and define programming concepts; name the principles and limitations of automated processing and define them appropriately.

**Relationship between code and journalism:**

Name and define programming concepts; articulate ways in which code can be used to support journalism.

### Perceptual capabilities

**Language of code:**

Use concepts appropriately in communications with programmers; and in communications with others about coding.

**Relationship between code and journalism:**

Employ code directly, or employ programmers, in the most effective way to perform journalism and to tell stories.

### Adaptive capabilities

**Language of code:**

Use concepts to direct programmers strategically to achieve journalistic outcomes; experiment with new forms of storytelling; and conceive of new editorial products.

**Relationship between code and journalism:**

Explain the influence of code (and automation) on the production and consumption of news; translate into journalism.

Table 1: A digital capabilities descriptor for journalism (cont.)

## 2: Data domain

We differentiate between coding and data capabilities. We treat coding as technical, computer-control skills, whilst data handling is underpinned by the knowledge required to identify, process and interpret qualitative and quantitative data (representing, in sum or in part, news value). At present, these domains (coding and data) often seem to be confused, which we would argue makes pedagogical scaffolding difficult. Data capabilities are far broader than technical coding capabilities – they require statistical knowledge, familiarity with empirics, and the use of software programmes to organise and process datasets.

Within industry, data is used to understand what audiences want and do and thus guide editorial decision making — and it is increasingly used to make actual data stories and create new narratives. This duality may lead to a level of confusion in the news room. For the sake of clarity, data journalism should mean someone who uncovers patterns in data to unearth insights about the world in which we live; whereas someone who interprets and analyses data is in essence part of an 'insights' team. They seek to understand what audiences are doing online and how best to serve them.

### Functional capabilities

**Statistics:**

Name basic statistical concepts and perform basic statistical calculations.

**Data processing:**

Operate data processing software packages; control user interface.

### Perceptual capabilities

**Statistics:**

Interpret statistical findings to identify news value; use statistical findings in support of stories.

**Data processing:**

Produce analysis and visualisations to support a story.

### Adaptive capabilities

**Statistics:**

Select appropriate statistical tools to investigate data sources, to identify news value and to illustrate news value in innovative ways.

**Data processing:**

Select software appropriate to data and to news value; support new forms of storytelling in collaboration with design, business/IT, PR, advertising, marketing, sales.

Table 1: A digital capabilities descriptor for journalism (cont.)

## 3: External communication domain

We argue that the two domains of external and internal communication reflect different journalistic responsibilities and therefore require different knowledge and skillsets. External communication tends to require visibility, transparency, network building and audience engagement. In other words, external communication refers to the relationship between a journalist and her publication-audience and her personal public (Schmidt 2014).

### Functional capabilities

**Social media software:**

Identify and operate a range of social media software packages relevant to audiences; establish connections; engage interactively; publish content.

**Networked audiences:**

Name and define concepts and actions related to networks and engagement.

### Perceptual capabilities

**Social media software:**

Direct social media applications to fulfil journalistic requirements: build personal following; disseminate stories to audience; develop content and storytelling techniques appropriate to medium.

**Networked audiences:**

Interpret audience and traffic data; interpret social metrics and engagement measures; distinguish between good and bad strategies.

### Adaptive capabilities

**Social media software:**

Differentiate strategically between platforms: select platforms appropriate to both stories and audiences; tell stories in new ways that maximise the potential of different platforms – media and audiences.

**Networked audiences:**

Make strategic decisions based on network knowledge and news value, in collaboration with advertising/marketing/PR, design, business/IT, to increase audience engagement with stories.

Table 1: A digital capabilities descriptor for journalism (cont.)

## 4: Internal communication domain

Internal communication capabilities are required to source, research and prepare a story for publication. The emphasis is frequently on privacy, security, anonymity and small team coordination with fellow specialists and different specialists (i.e., including cross-functional teams). Consequently, it makes sense to treat internal communication as a separate domain.

### Functional capabilities

**Collaboration:**

Name and define internal communication and project management principles and tools.

**Security:**

Name and define security concepts and tools: anonymity, encryption, virtual private networks (VPNs)

### Perceptual capabilities

**Collaboration:**

Apply those principles and tools to support journalistic practices.

**Security:**

Employ tools appropriately during journalism to ensure privacy and security for all participants: journalists, stringers and sources.

### Adaptive capabilities

**Collaboration:**

Adapt established principles and tools to emergent contexts to increase productivity and minimise risk; work with different specialists; be a connector, explainer, translator across parts of the organisation/business units.

**Security:**

Respond to emergent security threats by employing available tools appropriately; develop new approaches to enhance security for vulnerable stakeholders.

*Source: adapted from Fray et al. 2017, building upon Best 2009; Cullen 2015, 2016; Cullen et al. 2014; Davies and Cullen 2016; Evans et al. 2017; Finberg and Klinger 2014; Gibson 1979; Hartson 2003; Hunter and Nel 2011; Hutchby 2001; Joinson and Piwek 2013; Mullin 2016; Norman 1988, 1999; Schmidt and Rosenberg 2014; Schmidt 2014; Schwab 2016; Stencel and Perry 2016; Tanner et al. 2014; Wake and Farrer 2016*

The Digital Capabilities Descriptor for **Design** was the second Descriptor drafted. In this case, four sample practice 'families' (domains) are proposed for graduates: Persuasion; Collaboration; Complexity & Systems; Tools & Making. These are explained below, with Functional, Perceptual and Adaptive examples within each domain.

The Design Descriptor has also been refined iteratively. Project team members used the 'families' of Persuasion, Collaboration, Complexity & Systems, Tools & Making, in the analysis of three data sets: an industry roundtable specifically for Design; an educator survey for different disciplines including Creative Arts; and a learning and teaching intervention in a Master of Design subject (the Interaction and Service Design Studio) at University of Technology Sydney. From discussion with the subject coordinator for that intervention, Collaboration was the best domain to focus on in this study for digital work practices and capabilities.

Again, the Functional, Perceptual and Adaptive capabilities are hierarchical but integrated. Adaptive capabilities are underpinned by some Functional knowledge/skills and Perceptual experience.

Table 2: A digital capabilities descriptor for design (4 pages)

## 1: Persuasion

Persuasion relates to recognising the inherent rhetorical value embedded in a design and communicating its story to a variety of audiences through a variety of techniques. Designers need to choose and use appropriate media, technology and tone to persuade effectively.

### Functional capabilities

**Storytelling:**

Name and define narrative approaches; visualisation, interface design, using software to illustrate/present/argue.

**Presentation:**

Present individually and as a team; present online and in person; use sound, light, images and demonstrations to present online; record and archive live presentations; notetaking, sharing; copywriting skills.

### Perceptual capabilities

**Storytelling:**

Develop content using techniques appropriate to a range of media; analyse data to tell stories; critically evaluate stories.

**Presentation:**

Interpret the power of visual, audio, text and atmospheric dimensions from an audience perspective; present the same ideas in different ways and multiple locations to suit the audience, context and purpose.

### Adaptive capabilities

**Storytelling:**

Tell the right stories to the right audiences; bring future histories and futures into stories about the present; use complex visual language to tell stories in multisensory ways; translate and adapt transmedia storytelling; make worlds and ecologies of stories; shape futures using stories of future scenarios; work with generative systems, AI and machine learning to tell stories, developing new tools and platforms (or new uses) to tell and disseminate stories.

**Presentation:**

Synthesise the tonal needs of different contexts and show how different exchanges matter in the context of a bigger picture (eg. pitching a part of a bigger project); present experience to audiences, and explore multiple potential outcomes (using clickable prototypes or virtual reality).

Table 2: A digital capabilities descriptor for design (cont.)

## 2: Collaboration

Designers need to be able to work effectively in teams with diverse skill sets, learning needs and communication styles. Effective collaboration involves being aware of this diversity and knowing how to best operate within a team, both in terms of personal involvement and how others are working. Contingencies to do with time constraints and work life balance also ought to be factored in.

### Functional capabilities

**Project management:**

Share documents, Gantt charts, spreadsheets, calendars; schedule meetings and projects; organise files using agreed naming conventions; implement version control systems; archive conversations.

**Working with different specialists:**

Discuss disciplinary knowhow with various strata of tech and business, engineering, science etc.; name and define different roles in production processes; use communication etiquette.

### Perceptual capabilities

**Project management:**

Make decisions collaboratively; manage workflow (including production); use a variety of tools (sometimes simultaneously); use differing levels of file security; write and edit collaboratively; theme conversation streams and pick them up at different project stages.

**Working with different specialists:**

Negotiate; determine where design fits in production processes; record key details of specialists (name, company, specialities).

### Adaptive capabilities

**Project management:**

Define and develop relationships, taking account of cross-cultural dynamics, professional and disciplinary differences, socio/economic and political context of project; combine different tools in response to the collaboration; determine when text or audio visual communication is appropriate and productive (telepresence); create new types of projects and new types of project management (try projects in different contexts with different combinations of people); assemble project fragments and iterations; self-initiate projects; work out new forms of design collaboration rather than follow a set methodology; acknowledge the impact of design work (accountability).

**Working with different specialists:**

Advocate for design within productions; communicate the big picture; integrate different disciplinary knowledge and learning and communications styles for better outcomes; connect your team to relevant expert knowledge in response to design iterations ( e.g. using online platforms); create cohesion from diversity; expand the scope of design collaborations (e.g. researching Indigenous designers in Australia); learn to collaborate with machines and data (machine learning, artificial intelligence).

Table 2: A digital capabilities descriptor for design (cont.)

## 3: Complexity and Systems

Designers ought to be able to understand the implications of their work in a broader social, environmental, political and economic context. This involves an appreciation for the amount, range and relationality of variables that are relevant to a design brief and the opportunities and limitations of design with regard to systematic and enduring changes in this context.

### Functional capabilities

**Making sense:**

Visualise (graphs, diagrams, pictures, soundscapes); describe how data is generated and by whom.

**Rich pictures:**

Describe a rich picture including its elements.

**Business Empathy:**

Identify aspects to be considered in design such as accounting, business planning, data analytics, marketing, sales, branding.

### Perceptual capabilities

**Making sense:**

Use data/visualisation to tell stories to communicate; scrape data from various sources.

**Rich pictures:**

Make a rich picture; explain when making a rich picture is appropriate and who to consult.

**Business Empathy:**

Reflect on how design work sits in the context of different kinds of business and relates to commercial imperatives more broadly.

### Adaptive capabilities

**Making sense:**

Generate new insights; link user interfaces with data; bring unconventional data sets into contact; facilitate interaction within the system; use predictive analytics; translate quantitative data to stories in new ways.

**Rich pictures:**

Make a rich picture that has impact; articulate impact in diverse ways and new contexts.

**Business Empathy:**

Advocate for design led business strategy; see and pursue possibilities; adapt design for business imperatives in relation to broader social, political and cultural imperatives.

Table 2: A digital capabilities descriptor for design (cont.)

## 4: Tools and Making

Making is core to a designer's work. Changes in technology have increased the diversity of tools available and designers need to be able to adapt their skills and knowledge of making in this always changing context. This will involve knowing what new tools they will be best advantaged in being able to use, the levels of proficiency required, and how to successfully map enduring design capabilities onto this new context.

| Functional capabilities | Perceptual capabilities | Adaptive capabilities |
|---|---|---|
| **Using software:** | **Using software:** | **Using software:** |
| Demonstrate technical capability in various types of industry relevant software. | Explain who decides what software to use and why; interpret limitations of tools; match tools to project priorities and resources. | Respond to life spans of digital files/tools; anticipate future tools; hack; adapt software to alternative uses; open closed files, tools and systems; scrape data; repair tools and files. |

## Focused Example for Design

Table 3: Detailed interpretation of design collaboration domain, project management focus

| DIGITAL CAPABILITIES AND WORK PRACTICES | | |
|---|---|---|
| Design: Collaboration Domain, Project Management Focus (Using SLACK as a case study) | | |
| **Functional** | **Perceptual** | **Adaptive** |
| Set up, use and maintain systems for sharing documents; set up meetings online; archive conversations, use naming conventions.<br><br>**SLACK:** set up account, connect with others, share calendars, files, add people to conversation channels. | Manage project workflow (including production), make decisions in online platforms, manage version control using naming conventions; define roles and relationships with a team, knowing when text or audiovisual communication is appropriate and productive (understanding telepresence);<br><br>**SLACK**: combine with other tools, theme conversation streams, make decisions as a group; know when to add people and when not to add people. | 1. Manage cross-cultural dynamics including multi-lingual collaboration; identify and manage professional/disciplinary differences to extend project outcomes.<br><br>2. Apply and adapt systems thinking to develop naming conventions appropriate to the project.<br><br>3. Adapt to and manage the socio/economic/political context of project; combine different tools in response to the collaboration.<br><br>4. Self-initiate projects; manage elements of projects that are off-shoots, extensions, fragments or iterations.<br><br>5. Propose and work out new forms of design collaboration rather than following a set methodology; recommend security measures.<br><br>6. Create new types of projects and new types of project management (trying projects and tools in different environments, contexts, configurations).<br><br>7. Generate data insights and critically reflect on them to demonstrate the impact of design work (accountability).<br><br>**SLACK:** connect multiple projects over time; customise tool for group's purposes; use multiple languages; use data generated within SLACK in creative ways (e.g. to demonstrate a group's decision making, make an argument, pitch an idea - text-based conversations could be visualised). |

# SECTION 2: TEACHING STRATEGY

## Learning model in action

The Digital Capabilities Descriptors are at the heart of the learning model. These Descriptors interpret digital practice domains (e.g. collaboration) and associated capabilities through Functional, Perceptual and Adaptive affordance lenses.

The practice domains then need to be mapped to the curriculum with assessment and learning activities planned.

Implementing the teaching strategy includes iterative reflection cycles on the Functional, Perceptual and Adaptive digital capabilities the students are developing.

Experiencing the learning model in iterative cycles over the term of the degree program supports the student in digital work readiness. In turn, graduates can continue their professional learning and career development using the same affordance lenses, with reflection-on-action but especially reflection-in action by now second nature.

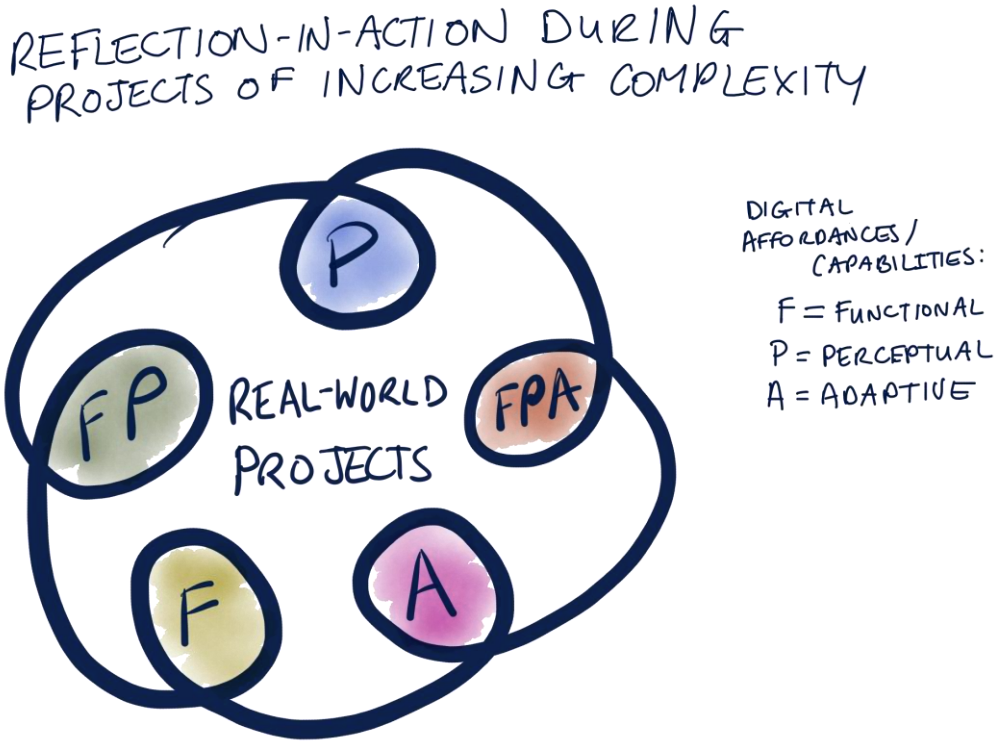


Figure 5: Reflection-in-action on affordances

## Pilot interventions

Multiple steps were involved in developing and reflecting upon teaching strategies for the pilot interventions trialling the learning model with small groups of students (n=100).

In **Journalism**, for example, these steps involved choosing one part of the Digital Capabilities Descriptor that had been drafted four months earlier, then attempting to map that part of the Descriptor to a specified learning outcome in an existing subject/unit guide. This involved scanning several subject guides for the most likely match and taking account of staff availability.

Evaluation questions were then drafted, with a view to creating a 'before' and 'after' short survey for students to gauge their learning. The next step was to design learning activities and then invite students to respond to the first survey questions. After the learning period, students were invited to complete the second survey. The surveys were not for formal assessment and the teacher did not see the responses until after the formal subject/unit results were published.

In **Design**, the evaluation questions drafted were different. A diagnostic approach was taken for the first survey administered. The teacher reviewed those responses to inform the teaching strategy used. However, the responses to the second survey were not seen by the teacher until after subject/unit results were published. Neither survey was used for formal assessment.

The final step in the process was teacher reflections on the experience to inform future teaching strategies. As part of this, the Digital Capabilities Descriptors were reviewed again to identify any further refinement needed.

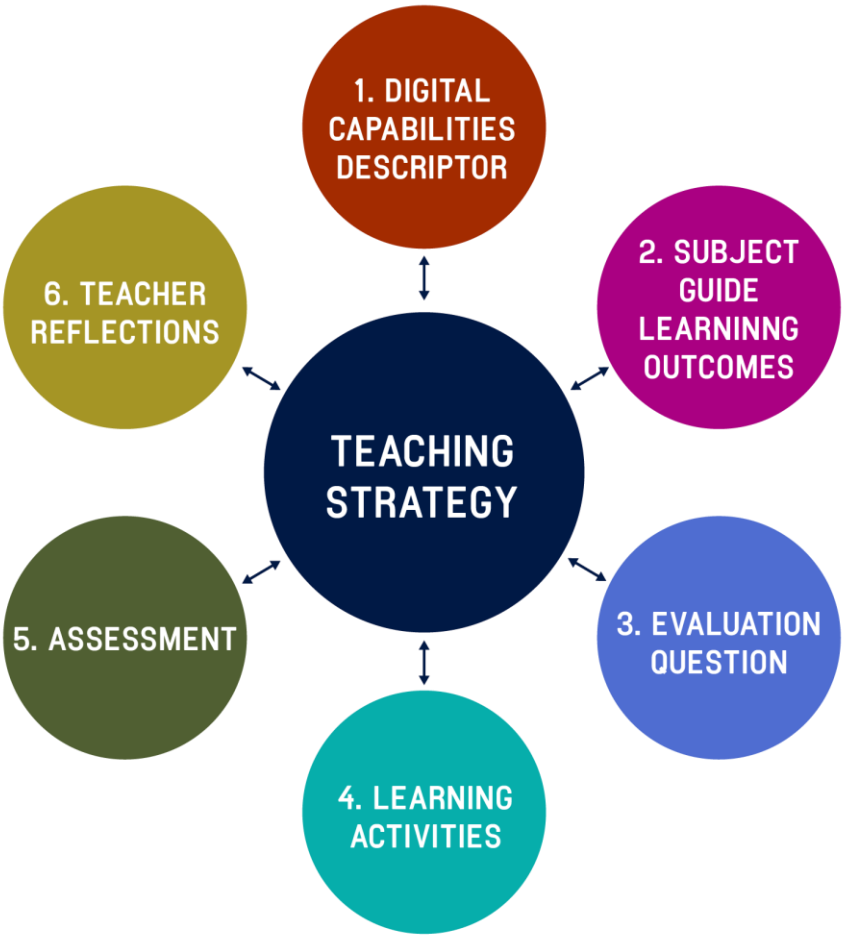


**Figure 6: Developing teaching strategy**

## Teacher reflections

Written reflections are presented next from teachers involved in two of the pilots of applying the learning model. *Recorded reflections of teachers* are also available in the project website. The reflections below highlight the realities of teaching practice and the associated challenges of attempting to introduce different models for learning 'on the fly', but also positive suggestions for building on the pilot experiences in future. As members of the project team, these teachers were grappling with our emerging ideas on the learning model at the same time as they were preparing to teach in new subjects/units or new studios.

# TEACHER 1: JOURNALISM

## Context (16 students)

The intervention took place during the Spring 2017 session of Entrepreneurial Journalism, a Master of Advanced Journalism subject at the University of Technology Sydney. The aim of the subject was to equip students with the skills to develop and launch their own journalism start-up and, more broadly, the entrepreneurial skills to navigate the profound disruption of journalism as an industry. The subject was delivered in a weekly two hour class on Friday evenings. Over twelve weeks, the class of 16 students worked individually to research consumer and community needs, ideate and test solutions, and develop a plan to bring their offers to market.

It was the first time that the subject had been offered in the degree, so while there was a teaching plan, the curriculum was unfolding and adapting to students' needs and responses. The teaching of Entrepreneurial Journalism is relatively new, as is teaching of entrepreneurship more generally in universities, thus good practice in teaching in this area is also unfolding.

I taught the course with Professor Peter Fray. Prior to teaching this subject, I had taught adult education, digital media, innovation and entrepreneurship in multiple faculties and units across the university.

### Approaches and resources

The intervention was scheduled for Weeks 9-10 with a pre-test survey in Weeks 7-8 and a matched survey post-intervention that was available after the Week 10 class. We had some limitations on what we could focus on for the intervention as we needed to have enough time to design and test the survey instruments. Hence, we needed to choose a topic that occurred later in the semester. We also had to choose a topic that could be taught discretely so that we could administer a pre-test prior to the intervention. We ended up choosing "project management" as the topic focus for the intervention, which mapped onto the digital capability of "internal communication". This topic had been planned for late in the subject to support students when they were ready to start planning implementation.

We used the digital capability framework based on affordance theory to design the intervention, with the aim of supporting the development of functional, perceptual and adaptive capabilities. We developed a scaffold for:

- Communication and management principles
- Collaboration and project management tools
- Practices
- Security tools.

We then made a list of concepts, actions and tools for the descriptors. We chose a small number of key tools that were currently leading industry practice to focus on: Trello for workflow management, Slack for chat and Google Drive for document collaboration.

The plan was to deliver the intervention spread over two weeks. The first week (Week 9) was to have about 30 minutes allocated at the end to give an overview of project management and useful tools in lecture format. Students would then be asked to create accounts on Trello, Slack and Google Drive after class and try using these three tools before the next class. Then the following week's class (Week 10) would focus on project management, with students being asked to bring their laptops or tablets (if they had them) so they could complete exercises using the tools in class. If students weren't able to bring in a suitable device, they would be paired with another student with a device. The planned format of the second class would be a mix of slides to introduce concepts and tools, with discussion of concepts and applications, followed by a practical exercise and then reflective discussion.

**What happened: implementation**

The intervention took place over one week, instead of the intended two, due to unforeseen changes in the course schedule, so the introduction to project management was delivered in the same session as the practical exercises. The other topics covered in the task included workflow tools, goal setting, reflective practice, communication tools, specialist workflow tools such as editorial calendar tools, integrations and automations, security tools, and an evaluation of the strengths and weaknesses of common tools. This was then applied back to creating their individual project roadmap and considering what tools and workflows they would use to manage the implementation of their projects.

Categories of tools would be introduced first with a list of common tools, then a small selection of the most common tools would receive a little more time, then one tool would be chosen to walkthrough and practice using. For example, for project management, seven common tools were listed on one slide and then the three most popular tools had a slide each, and then we looked at Trello in much more depth.

Students were emailed prior to the class a reminder to bring in their devices (if they had something suitable), with less than a third of them doing so. This made it more difficult to run practical exercises than if we had the pairs we had anticipated, so I had to improvise. Instead, I walked through the set up and use of the tools on the projected computer so that all the class could see. Instead of doing the perceptual capability exercises in pairs as we had planned, we did it as a class discussion. We walked through a number of example scenarios and the class discussed what they would use and how, along with the strengths, weaknesses and alternatives of each workflow. Critique of the tools was encouraged. They then had to consider their own projects and identify what might be their most important workflows to deliver their offering. The class discussed a few volunteered examples, with the rest of the class being set the homework to choose their most important workflow and set up a Trello board for it.

### Reflection and recommendations

It took some time (and practice) to be able to understand the framework and feel comfortable using it. I found some of the labels a little confusing – so while "functional" is clear enough, I found "perceptual" and "contextual" were not particularly intuitive to how they were intended to be used. [Others agreed and we changed the third label to "adaptive" instead of "contextual".] Instead it was more helpful to focus on the short explanations provided that described what was involved in each capability and develop my own working understanding based on that. Unsurprisingly, I found it easier to understand the terms once I had actually applied them a few times in practice to working with the descriptors, the pre- and post- survey tests, the plan of the intervention and implementation of the intervention. Thus my resulting understanding of these layers as applied to learning new tools in this case was that functional capability was being able to understand how the tool functions, the perceptual layer was being able to appropriately apply the tool and the adaptive layer was being able to adapt and merge the use of the tool with other tools.

Once better understood, the framework of functional, perceptual and adaptive levels provided a helpful conceptual structure for how to scaffold the development of digital capabilities. It served as a checklist to systemise the considerations of the different levels and order in which to scaffold the teaching. I could also see that it would be helpful for assessment design. Although we did not use the framework for the formal assessment of

the course, it was used for designing the intervention testing and provided a structure to test more than knowledge repetition but instead allowed a more authentic test of real life use. It is a framework that I would use again, especially when looking at supporting the teaching of tools.

The intervention itself was less than ideal. There was a lot to cover in a short period of time, which could be overwhelming, and while there was time for discussion, there was no substantial opportunity for the students to use the tools and play with them. The intervention felt 'bolted on', when a much better approach would be to have interwoven the tools into the students' emerging practice. It would have been better to have introduced the tools at the beginning and to have it embedded in how we delivered the course (for example, using Slack to communicate) so students could spend time using the tools and be able to experiment with them. We could then have time to share the different ways students were using the tools, encouraged "hacking" them to create new uses, and critically reflected on those uses. As such, we didn't really get to the adaptive level of capability development – and having this framework made this realisation explicit.

## Key take-away

My key take-away is to recognise the levels of capability development and that they should not all be delivered – or can be – at once. It's overwhelming and there needs to be sufficient opportunity to practice, play, feedback and for reflection to develop the perceptual and adaptive layers. Because this takes time, the more that this teaching can be embedded across the curriculum rather than isolated in discrete topics taught, the better.

# TEACHER 2: DESIGN

## Context (12 students)

The Interaction and Service Design Studio is part of the Master of Design program at UTS. Students in the Service and Interaction Design majors do three different iterations of this studio over their Masters degree (1.5 semesters for full time students, 3 years for part time), in combination with six electives. The cohort is typically a diverse combination of students who have recently come through the undergraduate program, students who have been working for 3-7 years and students who have been in the workforce for a significant amount of time and are looking to refresh or pivot to another design speciality.

The aim of this studio is to give students experience in thinking at a strategic level and position work within a wider social, economic and cultural context. Student will learn to adjust to design problems that continually morph as projects develop, negotiate how design can work collaboratively with other disciplines, engage with committed external stakeholders and have confidence managing projects. The studio is structured according to the following principles: design briefs present wicked problems with conflicting considerations; briefs have many points of entry, allowing students to propose their own approach; external briefs and stakeholders make the projects real and provide specialised knowledge; project length, group size and discipline mix defined according to project briefs; educators and external stakeholders provide regular, targeted guidance rather than students following a set methodology.

### Approaches and resources

The subject typically runs for 3 hours per week over 11 weeks, with x 3-4 full day workshops. However, class time only accounts for a segment of learning activity. The nature of the assessment tasks and the expectations set by the studio culture mean that students typically work extensively outside class: organising interviews with relevant stakeholders, undertaking field trips and various group meetings and workshops.

The relationship between the expected workload, the limited class time and the complex work and life commitments of masters students outside of university mean that remote communication is a key part of the learning experience. The university email service and the online learning platform typically encourage a low level of compliance among students due most significantly to poor user experience and interaction design. As a result, I have trialled a variety of other, third party digital tools, including Skype, Zoom, Facebook and Slack. For the purpose of this intervention Slack was used as the exclusive software for communication between the teaching team and students. I had used Slack before in a

previous studio, but on this occasion, it was used alongside the university email software. As a result of previous student feedback, I decided to focus exclusively on one channel for communication with students. Ideally this would prevent students having to check multiple channels or missing information if they chose to focus on one channel themselves.

**What happened: implementation**

In the first class a Slack channel was created with students invited through email. The class was made aware of the planned exclusive use of Slack and given the chance to offer further recommendations for designing practices around the use of the software. One important suggestion was to create a different channel within Slack focused on important announcements relating to the class, such as assessment details. One of the features of Slack is that it allows users to create and theme different 'channels' based on different content. The standard channels are 'random' and 'general' which encourage the sharing of information based on those titles: random usually involves the sharing of diverse content, with indirect or non-existent relationship to work, whereas 'general' is used to communicate relevant, day-to-day information for projects. The standard titles are imperfect, particularly for a university learning context, which differs from typical office work in the limited contact team members and studios leaders have together on a day-to-day basis. As a result, students rely more heavily on remotely accessible documents like subject outlines than workers, who have the opportunity to check-in with colleagues on a day-to-day basis. The title 'general' can imply relevant but not crucial information, and as such things like assessment details can get lost in the abundance of links and comments that are also shared on the channel. This identification of this problem led to the creation of a new channel titled 'key details', where information about assessment tasks and other important information was shared.

Focusing exclusively on Slack changed the dynamic of the class in a number of key ways. Time spent together remotely, or outside of class, is a crucial part of coursework masters degrees, which typically lack the immersive, day-to-day rhythms that allow for cohort building in the undergraduate context. Existing university email services lack the user experience that creates an adequate sense of being together in a digital space. Exchanges through email are typically either peer-to-peer or peer-to-group. The email server does not facilitate a sense of togetherness as a class or as group that captures the spontaneity and cross class interaction that exists in ideal learning contexts. By contrast, the interaction and user experience design of Slack makes it easy for students to view class activity as a whole. It allows for the ongoing sharing of digital files and links in an online space that is designed to capture the best of synchronous and asynchronous conversation. It gives sense of the class being together in the one space remotely, such that content and views might be more willingly shared.

Over the course of the semester an average of roughly 300 messages in private and public exchanges were sent each week. This is a staggeringly high amount of messaging traffic for a class of twelve and far surpasses anything I have witnessed in my five years of teaching using the online platforms and email used by the university. It demonstrates a vibrant virtual learning space, with students sharing and engaging with content and autonomously managing projects.

Students experienced challenges and success using other remote communications software, such as Zoom and Skype, which are both used to have group video meetings. While some geographically disparate students found that video calls became a foundational part of their weekly group work activities, other groups expressed frustration when relying on remote video communication due to a lack of etiquette and familiarity with the medium. For example, one group member initially was required to conduct Skype meetings on the train journey home from work, as this was the time that best suited the diverse schedules of group members. However, due to existing English language difficulties, poor reception on the train line and background noise, this communicative context was found to be inadequate for the purposes of group communications, particularly during early stages of the project when high-level conceptual discussions require optimal levels of conversational fluidity and shared semantic certainty, across a range of verbal and graphic media.

### Reflection and recommendations

In the future it would be beneficial for educators to work with students more closely and in a target fashion to establish a set of expectations and ambitions for online communications to minimise such difficulties and engage students in the process of creating an optimal communicative context. A specific document, in the form of an adaptable user guide for the tools available, outlining the best contexts for use and likely limitations would be ideal in this regard. This could also be useful for educators who are seeking contributions from guest speakers who participate remotely in delivering material or on review panels.

For future iterations of this subject I will continue to use Slack and emphasise that it is the central channel on which to rely for class communications. I will dedicate class time not only to programmatically raising the likely difficulties and advantages of communicating remotely in a group work context, but also to active, imaginative working out of new practices for using digital communication and to encourage a general attitude of experiment in using such technology.

**Key take-aways**

Students will benefit from:

- Being given the resources that allow them to take a reflective, analytical and evaluative approach to the tools they use as part of the collaborative process
- Being encouraged to develop a general attitude of experiment in using such technology and challenged to be imaginative in working out new practices for digital communication and collaboration

# SECTION 3: ASSESSMENT

Students were invited to complete survey questions related to the teaching intervention they experienced, which focused on one aspect of the discipline-specific Digital Capabilities Descriptor developed by the project team. The survey questions were intended to provide an indicative baseline of digital capabilities in different disciplinary groups, with a subsequent survey to gauge any changes following the teaching intervention.

Different approaches were trialled for designing the student surveys, which illustrate diagnostic, formative and summative assessment possibilities. The resources developed can be used for assessment or as prompts for learning activities.

The approaches used in the Journalism and Design pilots are now described.

## Journalism Pilot

*Appendix 1* includes two sets of Web-based survey questions that Journalism students were invited to respond to around the digital practice domain of 'Internal Communication' (specifically focused on project management). These two similar surveys were designed for administering 'before and after' a teaching intervention. Questions were divided into three sections and were explicitly labelled in line with the three layers of technology affordances.

For example, questions for Journalism included:

Section 2 (perceptual use of technology):

Building a database of potential statements to be fact-checked by journalists involves several key players including researchers (who will find the statements), audience members (who may suggest statements to be checked), reporters (to do the actual fact-checking), non-reporting outside sources (who may assist in proving or disproving the facts), production editors (who check the fact checks and question the reporter over any perceived inconsistencies), a graphics specialist (who may build related data visualisations), an editorial or reporting board (which may review the facts checks) and an editor (who will have the final say on whether the fact check is published).

You use a Slack team to discuss workflow with your colleagues and run a channel through which you share statements.

Q1. Would you use the same platform to collect statements from audience members? Please explain your answer, using the space below:

**You need to make sure that statements are fact-checked efficiently and in a timely manner.**

Q2. What tool would you use to share statements with journalists and why would you use that tool? Please write your best answer, using the space below:

**Each day the editor and production staff must meet to discuss the day's reporting agenda, but the editor and production staff are frequently in different locations.**

Q3. What would be the best tool to run these meetings? Please explain your decision, using the space below:

*Appendix 2* is the ***full bank of survey questions*** devised to support the Journalism Digital Capabilities Descriptor, Internal Communication domain.

For each student survey in Journalism, the teacher selected seven questions from the full bank as the 'best fit' with the learning objectives of the subject in which the pilot was undertaken.

The full bank of questions illustrates how project team members have interpreted the Descriptor practice domains in developing assessment and/or learning activities. Many of the questions are scenario-based (such as the example above) and can be used to guide ***learning activities*** OR in designing ***formative or summative assessment.***

Categorising questions explicitly in line with digital affordances and capabilities (Functional, Perceptual, Adaptive) was intentional, to reinforce the importance of encouraging students to see and express their digital capabilities through these affordance lenses when talking to prospective employers.

## Design pilot

In Design, students were invited to respond to two sets of paper-based survey questions around the digital practice domain of 'collaboration'. The first set of questions was administered in July 2017 at the start of a semester-long teaching intervention (12 weeks). The second set of questions was administered when the teaching intervention finished. These questions were used as **diagnostic/formative** assessment, but could also be adapted for **summative assessment,** in relation to a domain of digital practice.

### Questions in the first paper-based survey for Design included:

Q1. Describe one or a number of particularly challenging group work experiences, at university or at work. (5-10 min)

Q2. How did you try and adapt? What were some of the things you could have done in hindsight to make the situation better? (5-10 min)

Q3. What role did digital technology play in the process? Describe its role even if it had an indirect influence. (5-10 min)

### Questions in the second survey for Design included:

Q1. Describe the role that Slack played in your group work during this semester.

Q2. Did you use any other digital communication technologies (Skype, email, etc.), if so briefly describe their role in your group work.

Q3. Did you develop any practices (routines, rituals, rules etc.) that were used with the specific digital technologies? Explain why these were necessary.

Q4. Briefly evaluate the usefulness of the digital technologies used this semester in comparison to others you have used in the past. How have they changed your group work practices and learning experience more generally?

## Measurement

A companion paper is under development, outlining the research methodology which was applied by a project team member to measuring the survey responses in Design (both surveys) and Journalism (first survey). This methodology included use of the QUEST evaluation tools (variable map, fit map and item analysis table) (Adams & Khoo 1996). Although the small sample size was a significant limitation, the overall results revealed that the majority of participating students were at a Functional knowledge level for their digital capability development. Over the three surveys analysed (two for Design and one for Journalism) and total of 14 questions, 46 percent of participant answers were at the Functional level. There were 21.5 percent participant answers at the Perceptual knowledge level, and only 3.5 percent at the Adaptive level.

This finding of a tendency for Functional capability among students was consistent with the findings from the project's Educator Survey, Educator Workshops and Industry Roundtables. There appears to be a shortfall in Perceptual and Adaptive digital capabilities and this is significant, given that:

> *"...by 2030, 75 million to 375 million workers (3 to 14 percent of the global workforce) will need to switch occupational categories. Moreover, all workers will need to adapt, as their occupations evolve alongside increasingly capable machines. Some of that adaptation will require higher educational attainment, or spending more time on activities that require social and emotional skills, creativity, high-level cognitive capabilities and other skills relatively hard to automate."*
>
> (Manyika et al., p.1)

The pilots were experimental and the survey questions outlined above were trialled only with small groups of students. Although the number of responses was small (n=21) for the first two pilots in development of the rapid prototype, the exercise was useful for the project team to test out designing different approaches to assessment in relation to sample domains in the Digital Capabilities Descriptors. The survey responses also yielded a first indication of the baseline digital capabilities of the students who participated.

### Journalism

A formative approach had been taken for the 2-week intervention. As only one student responded to the 'after' survey, this was discounted; only the results of the 'before' survey have been considered.

Journalism students at both RMIT University and UTS were invited to complete the first survey. The teaching intervention was only planned and implemented at UTS, but offering the first survey to both institutional cohorts was intended to gain wider preliminary insights to the digital capabilities of students in this discipline.

The Journalism first survey (9 respondents, including 6 from UTS and 3 from RMIT University) comprised seven questions; the second survey (UTS, 1 respondent) also comprised seven similar types of question. The aim of the teaching intervention had been to introduce affordance thinking (for the students and the teacher involved) and to improve Perceptual capability in particular.

For Journalism, two different project team members scored the first survey. They awarded points for the responses depending on their fit with the affordance spectrum. Most responses were scored at the Functional end.

The responses to the survey questions tended to be very short, making it challenging to score them. The project team realised that the online survey provided expandable space for responses and students had not been alerted to the approximate length of responses sought, as was achieved in paper-based surveys. Nevertheless, review and scoring of responses to the first Journalism survey suggested a 'Functional' level of digital capability among students. It was unfortunate that only one student responded to the second survey, which could not be counted.

The baseline indication of student capability tending to be more Functional was consistent with other project findings based on an Educator Survey, Educator Workshops and Industry Roundtables.

### Design

As mentioned, a diagnostic approach had been taken in the 'before' survey (prior to the teaching intervention) to gauge students' familiarity with digital collaboration, which informed the teaching strategy used for the 12-week intervention centred on the Design domain of collaboration. A formative approach was also involved in gauging progress (or not) in the capability levels evident in student responses to the first and second surveys.

The Design 'before' survey (9 respondents) comprised three questions; the 'after' survey (12 respondents) comprised four questions.

Two members of the research team (not including the teacher) agreed on the scoring system to be used for the two Design surveys. Responses were scored according to whether they suggested Functional, Perceptual or Adaptive capability. Each researcher scored the responses independently, then compared scores and discussed a small number of differences to moderate the final score for each question for each student. The two Design surveys were scored in this way at the same time (after the teaching intervention).

According to this method, there were 60 percent Functional responses and 30 percent Perceptual responses before the Design teaching intervention; but there were 50 percent Functional responses and 43% Perceptual responses after the intervention.

The aim of the Design teaching intervention had been to improve especially Perceptual capability, so it appears that the pilot may have assisted students. While this would need to be tested in scaled-up teaching interventions, it is an indication of the efficacy of the learning model and suggests a basis for further research.

# SECTION 4: RESOURCES

## Functional resources for learning and teaching

The project website (*https://sites.rmit.edu.au/digitalworkpractices/*) includes a range of resources for educators and students. With support from the RMIT Library, *resources were collated* for use by staff to support Functional level capability development (the 'what and how-to' of using technology) and frequently focus on non-digital principles and practices as a first building block. This is because a student needs to know the broad principles of collaboration and teamwork before overlaying this with added complexity such as working in the digital realm.

Resource formats include basic principles, checklists and examples such as videos with short and engaging how-to's, as well as scholarly articles. For accessibility, the focus was on open educational resources and this is noted as 'OER'. Where Library licensed resources are included, a note is added that login is required. For relevance in this project, the search for resources focused on the project's fields of Journalism, Design, Engineering, and Music Industry; however, many have wide applicability. Resources are annotated as generic, or discipline specific, where relevant.

## Program team workshop resources

The project website (*https://sites.rmit.edu.au/digitalworkpractices/*) also includes resources such as downloadable pdfs for program teams reviewing opportunities to embed digital capabilities in the curriculum. Cards have been designed to present the sample Digital Capabilities Descriptors visually. These will act as prompts for educators to develop descriptors for their own disciplines, map them across existing curriculum, and consider changes to curriculum. Each set will contain 3 domain cards and 15 affordance cards. The website URL is on the cards

**DOMAIN CARDS:** 3 cards with a space to fill in.

Instructions printed on the back: Think of 3 domains of digital capability for your graduates. What digital capabilities are most important in your program/subject? These are families that can be used to group specific capabilities.

**AFFORDANCE CARDS:** 3 x 5 cards with definitions and larger space to fill in Functional, Perceptual and Adaptive capabilities within each domain.

Instructions printed on the back: Taking one domain at a time, think of specific digital capabilities your graduates should have. List them on the cards and group them around the domain cards. Especially for Adaptive, frame thinking around high-level verbs (e.g. 'adapt', 'extend', 'propose', 'create') and try to focus on the capability in emergent contexts rather than a specific tool.

## Adapting an existing subject/unit

As a further resource that other Educators may wish to refer to, a Design team member in the project explains her current work in planning ways to apply the learning model to existing consecutive subjects. This includes how the digital capabilities could be incorporated explicitly as students move from first, to second, to third year in their degree. It also builds on the project team's learning from the Design teaching intervention in 2017 discussed earlier.

The planning underway focuses on what parts of the objectives and assessments could be changed to reflect the learning model, as explained below. If the proposed changes are approved, the next step would be designing appropriate learning activities.

### Context

We have a suite of four Interdisciplinary design subjects, shared between six design degrees: two in first year, with one in each of second and third years. The subjects have been in existence for several years and use collaboration and the application of theory into practice at their core. This project has provided an opportunity to refresh the subject outlines, mapping with greater clarity the progression of digital capabilities over the subjects.

The existing subject learning objectives are provided below, followed by the proposed learning objectives. Diagrams also illustrate the intended progression in the Design practice 'families' or domains (Persuasion, Collaboration, Systems & Complexity, Tools & Making).

While digital capability development would be encouraged through integrating Functional, Perceptual and Adaptive thinking, the diagrams show the different emphasis on Functional, Perceptual and Adaptive in each year level and the direction of the learning trajectory. Adaptive capability requires some Functional knowledge/skills and Perceptual experience.

## First Year

The two first year subjects work very much at a functional level of all skills including the digital. Currently digital capabilities are not explicit and are only incorporated primarily through the submission requirements of the assessment task. The rewording of the subject learning objectives would address this.

### EXISTING - Subject learning objectives (SLOs)

On successful completion of this subject, students should be able to:

1. **Communicate verbally and visually with technical and conceptual competence.**
2. **Understand the complexity of key historical events important to design.**
3. **Describe and analyse perceptual experience, including an awareness of the relationship between form, style, material and idea.**
4. **Develop group work capabilities.**
5. **Develop professional research practice to an introductory level**

### REVISED - Subject Learning Objectives (SLOs)

On successful completion of this subject, students should be able to:

1. **Discuss the significance of key historical events important to design (Persuasion)**
2. **Describe and analyse the relationship between form, style, material and idea, in diverse contexts (Persuasion)**
3. **Collaborate in digital group work activities (Collaboration)**
4. **Access and analyse data from a range of sources (analogue and digital) (Complexity & Systems)**
5. **Communicate verbally and visually according to specifications in the creation and size management of digital files of original work (Tools & Making)**

Figure 7 illustrates the mapping across the capabilities and the expectation of engagement in the Design Digital Capabilities Descriptor domains of practice 'families' (Persuasion, Collaboration, Complexity & Systems, Tools & Making), which would be used when briefing the teaching staff. The integration of Functional, Perceptual and Adaptive thinking would be encouraged, but emphasised differently according to the stage of learning.

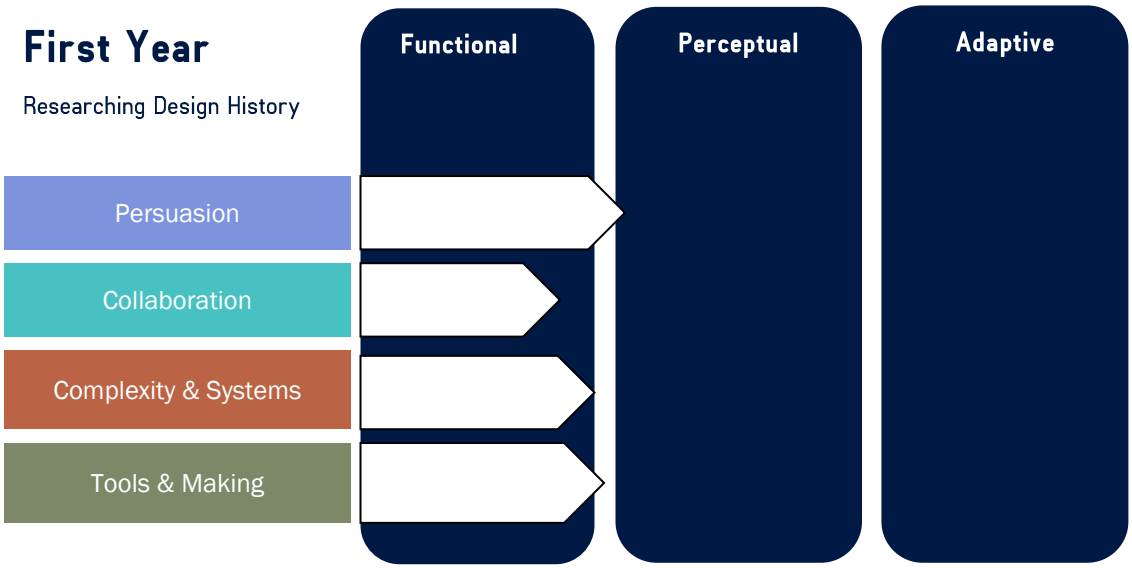


Figure 7: Mapping of capabilities across first year

**Assessment criteria samples:**

- Evidence of an analytical approach to historical and contemporary issues related to design and the designed (Persuasion)
- Evidence of a collaborative approach to digital group-work, resulting in a well organised, effective and engaging verbal presentation (Collaboration)
- Evidence of connection between existing research and the student's own analysis (Complexity & Systems)
- Careful presentation and editing, with the correct treatment of reference material, paragraph structure, formatting, spelling and grammar (Tools & Making)

**Assessment task samples:**

**Task 1: Briefing the boss, week to week summaries – weeks 1-3 (20%)**

You will submit an edited document that encapsulates what you have taken away from the learning focus of the first three weeks. Each entry ought to include evidence that you are attempting to understand material taken from the readings and lectures for that week, and reflections on visual sources. Each entry will be between 300-500 words in length. You may include images and drawings of your own choosing where appropriate. Submitted digitally through UTSonline (Blackboard)

**Task 2: Group presentation, design artefact analysis and presentation (30%)**

To research, prepare and present a group presentation

In class presentation

**Task 3: Two 'deep dives' (50%)**

Research and write two 'deep dive' essays

Select TWO modules and take TWO 'deep dives'. Each 'deep dive' should focus on a design artefact of your choosing. Your task is to situate and analyse each artefact within the context of your chosen study modules.

Your TWO 'deep dives' should demonstrate breadth and depth with regard to course content. Each should include explicit references to readings, draw on your artefact analysis skills, and demonstrate that your thinking has developed in relation to lectures, tutorials and independent further research. Each 'deep dive' essay will be 1000-1200 words in length and must include at least ONE correctly referenced image of your chosen design artefact that you need to discuss explicitly in your writing.

Submission saved as single PDF to be uploaded to Turnitin.

## Second Year

The second-year subject relies on students bringing core discipline skills to a collaborative and speculative space. The subject layers new digital functional skills with perceptual expectations and increasing awareness of adaptive capabilities. The new subject learning objectives make digital capabilities more explicit within the design capability themes.

### EXISTING - Subject learning objectives (SLOs)

On successful completion of this subject students will have achieved the following:

1. To be able to communicate an introductory understanding of the fields of philosophy of technology, sociology of technology and critical and speculative design.
2. To be able to collaborate on the visualisation of future-orientated scenarios that will further an understanding of interdisciplinary design contexts.
3. To be able to communicate an understanding of the relationship between theory and the design of objects, communications and environments.
4. To be able to research, write and present an online research portfolio that includes developed arguments and rationales for design practice.
5. To be able to use design research methods such as interviewing, collaborative scenario design and prototyping.

### REVISED - Subject Learning Objectives (SLOs)

On successful completion of this subject, students should be able to:

1. Use appropriate media to communicate developed arguments about the fields of philosophy of technology, sociology of technology and critical and speculative design (Persuasion)
2. Design and communicate digital stories to an identified audience, synthesising data gathered through interviewing, collaborative scenario design and rapid prototyping (Persuasion)
3. Compare and contrast the visual, text and atmospheric dimensions of design from the audience perspective (Persuasion)
4. Collaborate on the visualisation of future-orientated scenarios and justify using a variety of project management and communication tools (Collaboration)
5. Explain the relationships between theory and the design of digital objects, communication and environments (Complexity & Systems)
6. Select and use desk top analogue/paper rapid prototyping methods to communicate future technologies (Tools & Making)

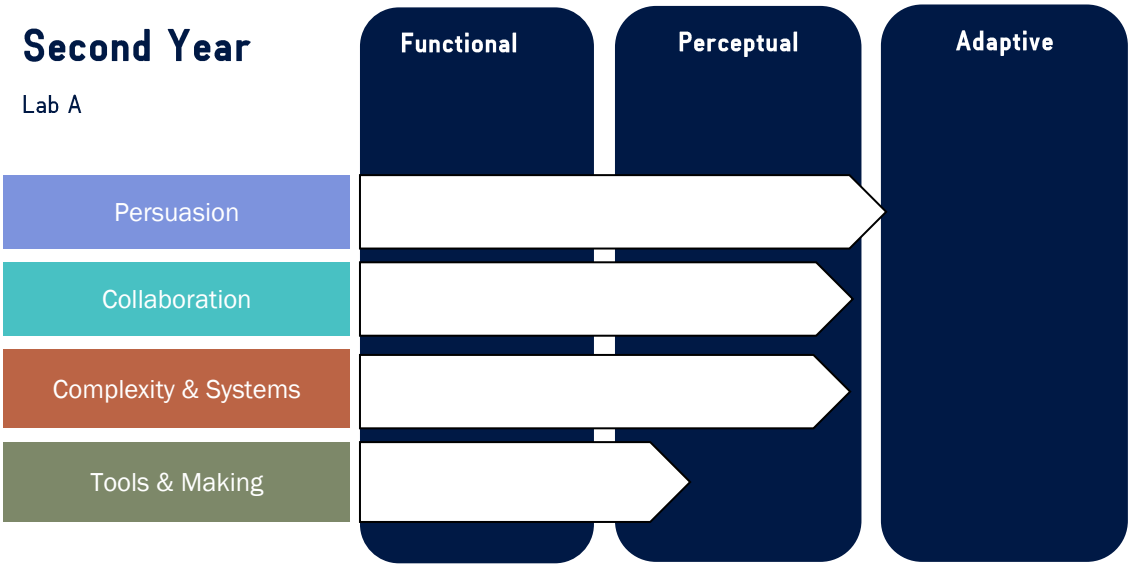


**Figure 8: Mapping of capabilities for second year**

**Assessment criteria samples:**

- Ability to apply a range of futuring methods to generate scenarios (double variable method, back-casting, STEEP analysis, cultural probes, personas etc.) (Persuasion)
- Appropriate and creative use of additional material (including original imagery as well as correctly referenced images, videos and hyperlinks) to illustrate arguments and extend discussion of weekly topics (Persuasion).
- Ability to work collaboratively including digital environments and communicate a cohesive project as demonstrated in presentation and scenario submission (Collaboration)
- Ability to synthesise qualitative and quantitative data in a design context (Complexity & Systems)
- Professional and ethical approach to conducting research and making results public. This includes providing completed consent forms for interviews (Complexity & Systems)
- Ability to produce a thought-provoking prototype that critically connects to the group's scenario from Task 2 (Tools & Making)

**Assessment task samples:**

### Task 1: Online Research Portfolio (50%)

To engage critically with the concepts of the anthropocene; big data; and social technologies and to develop skills in logical and persuasive argumentation using textual, visual and design-based media. In interdisciplinary groups (4-5), set up a wordpress blog with each of you as users. Within your group blog, each of you are to post at least 4 times (500 words each).

### Task 2: Future Scenario (30%)

To analyse and critique literature on emerging issues and developments in human-technology relations and to apply design-led methods such as quadrants, scenarios and back-casting to the research findings. To creatively engage with the research and produce well-reasoned future scenarios that communicate complexity and possibility affectively. To participate successfully in group research work.

In class group presentation 8 – 10 minutes in length. A future-orientated scenario for 2050. Scenarios can take the form of a film, animation (up to 4 minutes), graphic poster (A2), story board, or comic (up to 15 cell). Your scenario should make specific reference to objects, bodies and environments within which the future is set. It should not be in the format of a report. Your scenario should be located in a place, e.g. a city or a farm.

### Task 3: Prototype (20%)

To develop and communicate a prototype that emerges from a collaboratively generated future scenario. In this task you will bring together everything you have learned about the potential for designers to creatively intervene in the future of human-technology relations with a "speculative object". You will design a speculative object, service or process that relates critically and imaginatively to the scenario you developed in Assessment 2. Your final submission is a physical exhibition of your prototype. It should be possible to experience the prototype within 3 minutes. The audience should get a sense of how your design would exist socially, and how it relates to the human body, how it would be used, by whom, as well as the context of its production, who owns it, who makes it etc.

## Third Year

In the third-year subject there is an expectation that formal addressing of functional skills is not required, that students be experienced sufficiently that even if they do not have specific skills they know how to self-teach. The students are often working in intensive mode, off-shore with live briefs from local clients in Indonesia, China, Hong Kong and Berlin. The subject outline works as a scaffold for more contextualised learning guides developed by the individual tutors. The third-year subject is grounded in the perceptual with an expectation of moving further to the adaptive.

### EXISTING - Subject learning objectives (SLOs)

On successful completion of this subject students will have achieved the following:

1. to understand the nature and demands of live design briefs
2. to be able to collaborate in an interdisciplinary design context
3. to use design to effect change in complex situations
4. be able to plan and execute research in a professional manner
5. to connect design research to design generation and development and to be able to explain this
6. to undertake advanced reflective practice
7. to identify and appreciate different team roles
8. to use design arguments and rationales to work with complex and open briefs

### REVISED - Subject Learning Objectives (SLOs)

On successful completion of this subject, students should be able to:

1. Explain the nature and demands of complex live design briefs through design arguments and rationales and recommend ideas for new approaches (Persuasion)
2. Plan and execute research synthesising different contexts presenting to an identified audience in a professional manner (Persuasion)
3. Use appropriate media to connect design research to design generation and development and propose new technology solutions (Persuasion)
4. Collaborate in an interdisciplinary design context justifying use of project management and communication tools appropriate for client and culture (Collaboration)
5. Critically reflect on individual and group practice (Collaboration)
6. Design and communicate using various data sources to generate new insights to effect change in complex situations (Complexity & Systems)
7. Select and use appropriate technologies for prototyping matching client or audience situation (Tools & Making)

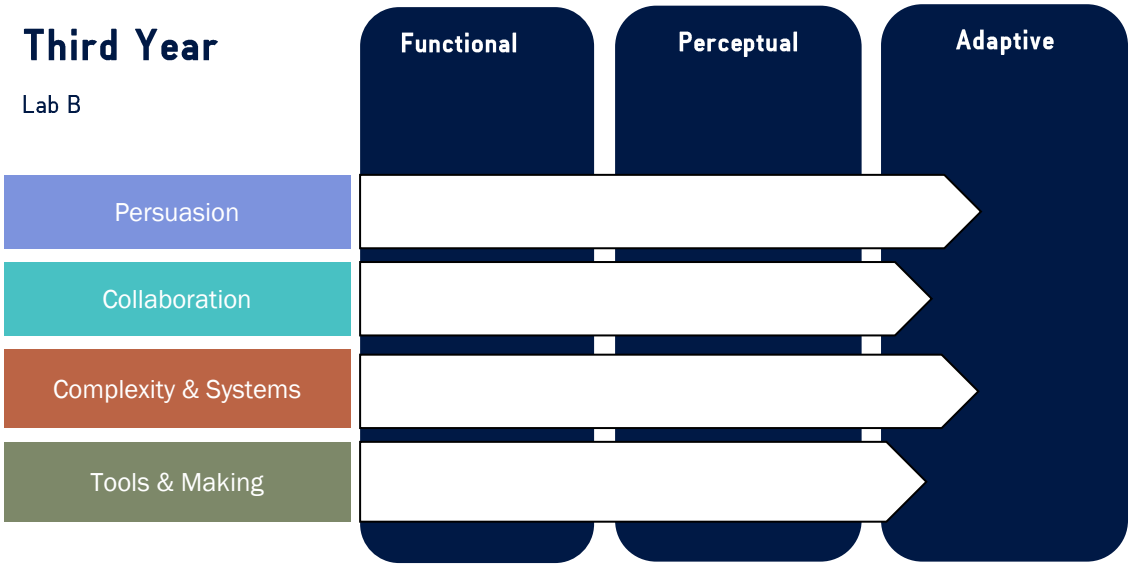


**Figure 9: Mapping of capabilities for third year**

### Assessment criteria samples:

- Depth of engagement with research topic through design arguments and rationales (Persuasion)
- Quality of synthesis of relevant data in presentation of content, including written expression and referencing (Complexity & Systems)
- Quality of analysis using appropriate media to connect research to design generation (Persuasion)
- Planning and Management of group process through use of tools and methods (Collaboration)
- Quality and creativity of design ideas (Persuasion)

### Assessment task samples:

Task 1: Research Document (30%)

Task 2: Group Presentation (10%) Design Project (40%)

Task 3: Critical Reflection Paper (20%)

# SECTION 5: OVERALL REFLECTION ON THE MODEL

## Development cycles for Digital Capabilities Descriptors

The Digital Capabilities Descriptors have been refined iteratively through the pilot teaching interventions described above, together with the project's industry engagement and reflection upon employment trend data and educator survey data. Reflection on this holistic and integrated process is provided next for Journalism, as an example of the Descriptor refinement journey.

## Reflection: Journalism

There are no easy, sure-footed answers in a period of rapid transformation. The disruption wrought upon journalism and related media industries is ongoing and ever-demanding.

Industry seeks rescue, salvation; it grasps out to the new, as if believing that one idea or product might unlock the future and clear the way to profitability or, at the very least, to regaining the trust now lacking between journalism and its audience.

If it were only that simple.

A few short years ago, tablets were going to save the news game. They didn't. Google glass? No. Snapchat? Nope, not yet. Voice activated 'home' devices? Who knows?

But most practitioners do know that yelling, slow down, is futile, as tempting as it might be. Many if not most are also confused about what to do next, what tools to pick up, what platform to invest in.

As one industry participant put it, "every time you get a handle on one thing another thing comes out":

It is really hard to know where to prioritize because it changes really quickly. It can change in 18 months, two years, which makes it really hard.

It is then no surprise to unearth from both educator and industry a lengthy and diverse wish list of required digital capabilities of graduates. Nor it is a shock to find a mixture on the lists of what are foundational (eternal?) and transformational (emergent?) capabilities. On an industry level, there remains if anything a preference for journalism graduates to possess a super serve of the basics: the ability to write and research, interview and produce – and be curious. It is about aptitude and attitude.

As one news executive told the UTS journalism industry roundtable: I've never had a graduate come in where I'm concerned by their digital skills. But it's the curiosity. It's about being able to find the yarn, ask questions, get on the phone, write the lead, turn up on time.

This executive — as with all the others we spoke to — was not drowning in sentiment, lamenting the 'old days'. Forward is the only way ahead. All things equal, these would-be employers will take the graduate with the transformational skills and the foundational ones: the graduate able to use and prosecute data to uncover

and tell stories (and use data analytics to understand audiences), the self-starter in short-form mobile video, the ready-made expert in social media. As I say, it is a wish list.

There is an explicit acknowledgement by both industry and educators involved in our ATN project that being able to use and understand the way news is or could be created and distributed — and the communication/ project management backend that enables the news media to get to that point – is an essential capability.

Social media features heavily on both the specialist and generalized list of required digital capabilities, as does the ability to produce, manipulate, edit and publish (on social media) images, both still and moving. Hence, abilities with design, Photoshop and video editing software are prized by both groups.

As an executive also told the roundtable:

> *We need people who can translate an idea and go, well, how would/could I tell that in video and why? Or what new thing could we could try?*

There is a sense from both industry and the educators that the coding revolution – and the artificial intelligence coming fast on its heels — has not yet translated into a huge demand for journalists with actual coding skills. If universities could produce such graduates they would be in some demand – and be something of a rare bird in the newsroom. Right now, the halfway house would be a more understandable spot for employers: yes, give us graduates who can sit with the coders and data people and know their language. They don't actually have to do the coding themselves. This is a prime example of a debate – and sector – in flux. New skills and new wants are emerging, the shape of the future is forming, but there is a haze that obscures many if not most of the solid lines. The flipside: being flexible, agile and nimble are prized attributes of any graduate.

Against this backdrop, there is much to be made of the scaffolding approach embedded, explored and refined in this project. Multiple functions are expected from graduates into the news industry. There is in fact a broad acceptance that digital natives will be across much of the what and how-to (the functional level)— and ideally, these graduates and their immediate supervisors will have solid ideas about the 'why and when' of using these capabilities (the perceptual). But beyond this level, the picture for the digital affordances we've seen both educators and industry nominate as required becomes a little cloudier. To be more precise, the challenge of adapting and extending graduate capabilities crashes into the sector's tendency to say it wants everything — because it doesn't really know what it wants. But it certainly knows that the silos that once kept, say, 'content' people (reporters) from 'product' people (developers) are breaking down. Even more controversially, the silos that once separated the money making and money spending sides of journalism are also becoming more porous.

The *RMIT Careers report on graduates* offers a degree of guidance about how the future is evolving. It reveals that the jobs market for journalism graduates is becoming more and more diffuse. 'Communications officer/coordinator' emerges as the top job title related to graduates over 2015-2017 across Brisbane, Melbourne and Sydney, though in the Sydney market in 2016 it is actually shaded by the market for 'journalists'. Other notable titles on offer include public relations officer, campaign manager, copywriter and even sales representative. Interestingly, few employers seem to advertise for plain old 'reporter' these days, another indication, perhaps, of how the structure and streams that once held firm have burst their banks and are spreading across the digital plains.

Of even more relevance to this project are the insights from the RMIT's Careers Report data using the labour insights tool Burning Glass, in terms of the software skills highlighted in journalism jobs advertisements: Facebook, Adobe Photoshop, Microsoft Excel, Microsoft Office and the generic, social media platforms, consistently feature in the top five in each city. If it were possible to go back in time a decade, it is fair to say that a list of software skills needed by journalists would bear no resemblance to these contemporary lists. In fact, it is hard to imagine such a list a decade ago being able to nominate ten specific skills at all.

One of the key aims of this project is to engage with industry to co-develop criteria for strengthening digital work readiness. But being co-developed does not mean this project will trend to the status quo or place an excessive premium on conformity. Our task is best served by challenging industry and educators. First, we must challenge ourselves.

In journalism, we focused on students in a new masters subject, Entrepreneurial Journalism. Our rationale: the subject lent itself to harnessing digital technologies to a very specific purpose – the creation of new journalism products and content ideas. And the class itself, anticipated at about 20 students (actually 16), was quite small and therefore a fertile place for new ideas and intensive teaching.

Over three months, the tutor and myself developed a keen sense of individual students, their needs, ideas and knowledge and skill levels. We also discovered that for several students understanding the basic concepts around entrepreneurship and innovation were a challenge: many soon realized that this was no ordinary journalism subject, dedicated to either the production of content (stories) or reflection on journalistic practice or theory. The first half of the semester in particular proved to be a steep learning curve for several students.

This created its own challenge when it came to our ATN project intervention: our students were already very busy mastering new skills and thought processes, such as user-centred design; we asked even more of them to think of and 'learn' the affordances involved in the internal communication domain. Having said that, I would say that several students grasped and could articulate the different levels of affordances. With more thought on how best to scaffold these affordances inside a subject (in terms of preparation and timing), I have no doubt many more of them would have actively engaged in the intervention.

It might be worth noting that the 'mother lode' for this UTS subject – the entrepreneurial journalism fellowship at City University New York — runs for four months, three days a week. Mastering new technical skills takes time especially when students are in the process of learning whole new and slightly alien concepts, such as making money from journalism.

That said, the affordances we explored in terms of internal communication are aligned and relevant to an industry which, as outlined above, increasingly puts a premium on collaboration.

Graduates with an appreciation of the tools that can underpin such work practices are probably rare but when found valued. One roundtable participant cited an example of a recent hire, a journalist who had a good working knowledge of the project management tool, Trello. What impressed her, the editor, most was not only did the new employee know about Trello, she could explain when and when not to use it. She had perceptual capabilities. She had, in short, excellent organizational skills, indicator to this editor at least, that she would be able to constantly deliver in high pressure situations.

Being able to understand different systems or have access to those and be able to say, we don't want to use that for this reason. . . for this particular project, would it be best if we just stuck with Google sheets. That is helpful.

There is a clear shift happening in newsrooms across the country. Part of this is the view, though not often articulated, that graduates from our schools and colleges will be doing much of the in-house 'teaching' of more experienced media professionals. This dynamic puts a potential premium on the digital capabilities we have been working with in this project and in turn, the educators who will teach these capabilities.

These links — between industry, educator and student — are not always as clear or as linear as they could be. This is not necessarily anyone's fault. As discussed, this is a time of great change in journalism. Keeping up with what the industry needs, even if it could articulate it as an industry, is near-on impossible. But there are certainly plenty of potential rewards for the institutions and individuals who attempt to do so.

# CONCLUSION AND RECOMMENDATIONS

The learning model is underpinned by developmental learning and technology affordance theory. Building on and adapting the work of Best (2009) and Evans et al. (2017), the concept of the model is to make the most of technology by learning to integrate three types of digital affordance/capability: Functional (what, how-to of using technology), Perceptual (when and why, in known contexts) and Adaptive (extending, imagining - in unexplored and emerging contexts).

Over time, the learner ideally develops digital capabilities across these three areas. Adaptive capability requires some Functional knowledge/skills and Perceptual experience; this may involve knowing enough to work with specialists, rather than having well developed Functional skills oneself. Reflection-in-action (Schon 1983) is integral to this learning process.

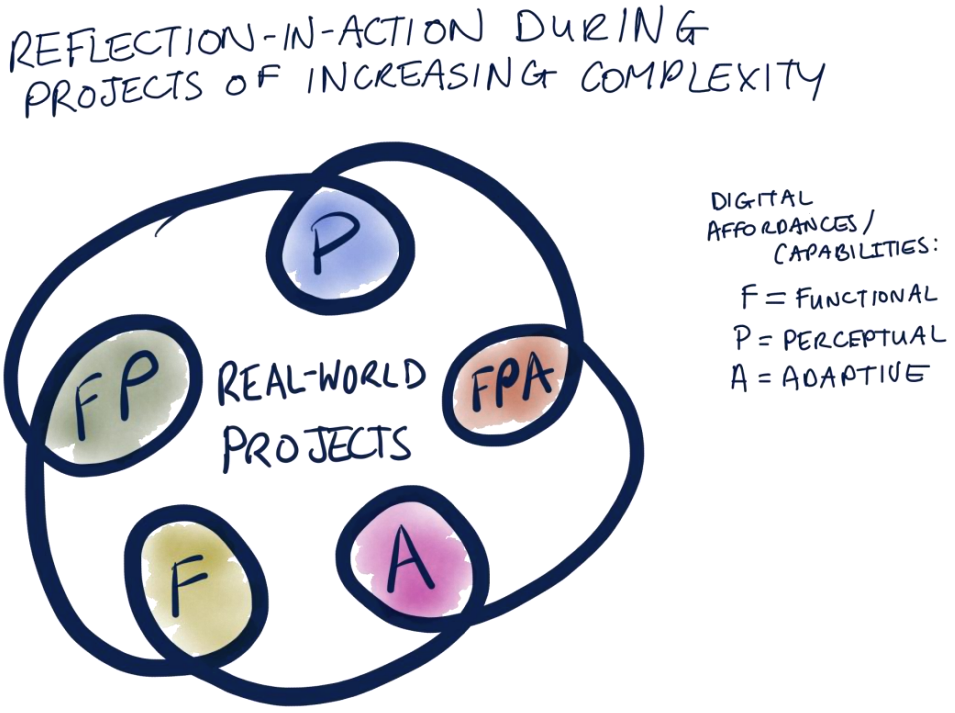


**Figure 10: Reflection-in-action on affordances**

Action research cycles have underpinned the iterative development of the learning model rapid prototype, with the four discipline-specific Digital Capabilities Descriptors at its heart. Starting in the disciplines was a key driver in this project, because encouraging 'ownership' of the learning model at the local program level was seen as paramount in addition to senior leadership support. Cycles of industry, educator and student input have been integral to the rapid prototype process, as well as teachers' practice and reflections.

Ongoing industry collaboration is vital, to ensure that the Descriptor domains remain relevant and that students have opportunities to develop their digital capabilities in real-world situations.

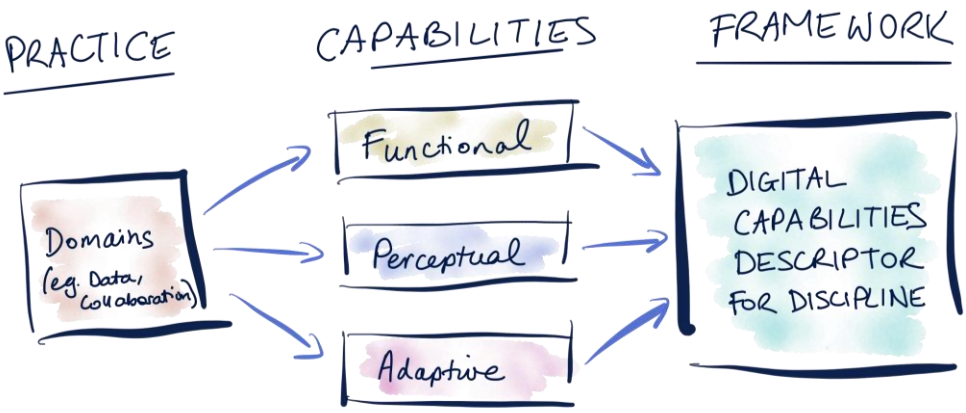


**Figure 11: Using an affordance lens to develop digital capabilities descriptors**

The insights of teachers involved in the pilots pointed particularly to the need for **sustained and broad implementation** of the model, as was also recommended by many participants in the project's Educator Workshops – i.e., whole-of-program approaches to implementing the learning model as opposed to say 2-week isolated interventions. The teachers involved in the pilots also highlighted the importance of supporting students to adopt reflective, analytical and evaluative approaches to the uses of technology – i.e., students able to position and discuss their work as demonstrating Functional, Perceptual and (ideally) Adaptive digital capabilities, with insights into further growth needed.

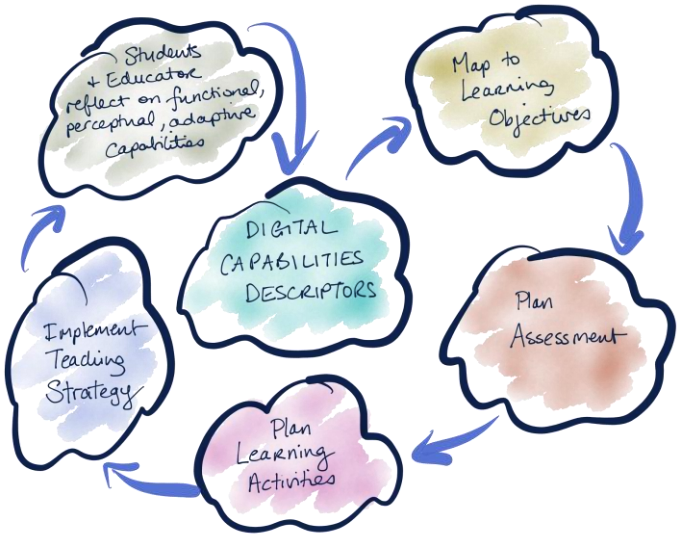


**Figure 12: The learning model in action**

The project's Educator Workshops highlighted that ***professional development and resources*** are needed to support change in teaching practice: there was a strong call for disciplinary examples and stories of implementing the learning model. The project website has been structured for easy access to what an Educator might need to make a start, including the current Digital Capabilities Descriptors, recorded reflections, planning for translation of the model to further subjects/units, and other workshop resources that might be useful for program teams. The website has been designed for further additions and updates to be made.

The pilots with students provided a starting point for ways in which we might design and measure ***assessment*** activities related to the development of digital capabilities. The project's Educator Workshop participants made strong requests for professional development especially in assessment for Perceptual and Adaptive digital capabilities. The student survey questions trialled were useful in signalling to the project team that more support for students is needed in developing their Perceptual and Adaptive digital capabilities, because Functional level responses from students were predominant in the first surveys administered in the pilots.

This current emphasis on Functional capabilities, as opposed to a broader emphasis on Functional, Perceptual and Adaptive digital capabilities, is consistent with the findings of all the project's reports:

- *Digital educators teaching digital natives? The challenges of developing digital capabilities in a Higher Education context* (Educator Survey Report)
- *Translating digital capabilities: using affordance theory for a developmental learning model across disciplines* (Educator Workshops Report)
- *Digital futures: what employers want from graduates* (Industry Roundtables 1-4 Report)
- *Employment trend data: where are the jobs?* (Employment/Labour Insights Data Report)
- *'Connecting the dots' between industry and higher education: the evolving landscape of digital work* (Industry Roundtables 1-5 and Employment/Labour Insights Data Report)
- *Positioning graduates for digital work futures* (Learning Model and Student Pilots Report)

## In summary,

The message is clear from industry – they want Perceptual and especially Adaptive digital capabilities, but these may not be forthcoming in graduates: it is not enough to have Functional digital capabilities. It is therefore encouraging that the second survey administered to the Design pilot student group, after the 12-week teaching intervention intended to move beyond the Functional level, indicated an increase in the number of Perceptual level responses from that student group.

The rapid prototype learning model shows promise for supporting the digital work readiness of graduates, particularly in focusing on discipline-relevant Perceptual and Adaptive capability development for emerging jobs and roles. The model is in line with advice and positive feedback from participants in the project's Industry Roundtables. The model also resonated with most participants at the Educator Workshops, who readily understood and liked the concept but called for professional development including more examples. Developed examples are available in the project website; and guidance is suggested in the recommendations in the project's Educator Workshops Report *Translating digital capabilities: using affordance theory for a developmental learning model across disciplines*.

The rapid prototype learning model is intended as a springboard for further research involving industry practitioners and the academic community, to continue translating the model to the real-world learning experience for students.

Scaling up the mapping of capability development to the curriculum, devising an assessment strategy and verifying the achievement of associated learning outcomes is a longer-term endeavour, which we believe is essential to advance contemporary pedagogy. Similarly, tracking the employment outcomes over time for graduates who engage with digital affordances would help to shape pedagogy futures and potentially industry practice including professional learning.

**Key recommendations are to plan professional development for Educators, with scale-up of the learning model and longer-term evaluation**

Many of those who participated in the project's Educator Survey and Educator Workshops made a strong call for professional development, in order that they can support students in developing digital capabilities.

According to the project's Industry Roundtables feedback, and evaluation of the rapid prototype with sample students, we are encouraged that the digital affordance/developmental learning model appears to be promising in positioning graduates for digital work futures. Its success needs to be evaluated on a larger scale, over time, in terms of students achieving learning objectives/outcomes and improving graduate employment outcomes.

**1. Professional development and scaled-up implementation**

Further work is needed to support Educators in interpreting and applying the affordance lenses (Functional, Perceptual, Adaptive) for their existing learning objectives/outcomes, assessments and related learning activities for their students. This could be a first step in encouraging ownership and motivation through professional development. It could also include Functional level skills that some Educators told us they need (in the context of implementing the learning model for students to engage in complex and uncertain problem solving). The suite of resources could be expanded over time, including more stories of those who have applied the learning model and what they learned in the process.

Further work is needed to test the Digital Capabilities Descriptors in action with larger groups of students at different institutions – mapped to existing curriculum and used in program renewal. This could be a more complex step in professional development of educators in adopting whole-of-program approaches to translate the learning model. It is also vital to develop ways for supporting students to express and explain their digital capabilities through Functional, Perceptual and Adaptive lenses.

**2. Further evaluation of learning objectives/outcomes achieved**

Further work is needed in designing and implementing assessment strategies with larger groups of students in future, and in measuring their progression in Perceptual and Adaptive capability development. This could involve quantitative research, such as use of:

- Human-computer interaction (HCI) leading edge knowledge, to explain the interactive relationship between the technical side of the digital environment, known as the machine-dimension, and the social/experiential environment (human-dimension) described in McKay (2008)

- Instructional systems design (ISD), to develop the performance assessment instrument used to measure digital capabilities development
- Learning analytics, drawing on the Rasch Item Response Theory (IRT) described by Bond and Fox (2015) to provide the quantitative data analysis

### 3. Evaluation of employment outcomes achieved

Further work is needed in the longer term to evaluate the success of those students who engage in the learning model, in relation to graduate employment. Investigation of actual employment outcomes could involve institutional analysis of employment data, using LinkedIn data for alumni (shorter term results), and/or along the lines of the methods trialled by RMIT University Careers & Employment as cited in this report (longer term results). Evaluation of employment outcomes achieved by graduates should also involve ongoing collaboration with industry partners, as well as the individual stories of graduates themselves in their first 1-2 years after graduating.

## FUTURE DIRECTIONS OF THE RESEARCH

The findings presented within this report focus on the work with students and their teachers in the development, implementation and evaluation of a rapid prototype learning model, in the project Digital work practices: where are the jobs, what are they, and how prepared are graduates? The developmental learning model supports the teaching of digital capabilities in diverse disciplines.

At the completion of the project in May 2018, key findings and resources will be published online at https://sites.rmit.edu.au/digitalworkpractices/. Additional publications authored by project team members will also be listed in the website.

Building on this project, future directions of the research include the continuum of professional learning for students, graduates/employees and leaders. The focus would be adapting the learning model for transforming approaches to digital work practices within organisations. Professional development for educators can also be embedded in scaled-up implementation of the learning model.

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