Translating digital capabilities: using affordance theory for a developmental learning model across disciplines

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RMIT UNIVERSITY   QUT   UTS

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ABOUT THE PROJECT

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.

PROJECT TEAM

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

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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 (see Industry Roundtables 1-4 Report). 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. Another report (*'Connecting the dots'*) combined analysis of all five industry roundtables with graduate employment data.

Work with **Students** comprised iterative teaching interventions as pilots of translating the learning model for existing curriculum (see Learning Model and Student Pilots Report).

Input was invited from **Educators** at all five ATN universities through a survey in September-October 2017 (see Educator Survey Report), followed by workshops six months later. The online survey took approximately 15 minutes to complete, while the face-to-face workshops were for two hours. In the survey, Educators were asked to reflect on the digital capabilities they believe industry requires of graduates and how their University develops those capabilities. In the subsequent workshops, Educators were asked to provide feedback and further input on the learning model prototype developed by the research team.

This report focuses on the findings of the data obtained through the Educator Workshops held at all five ATN universities during March 2018.

INTRODUCTION

A common format was used by facilitators for the Educator Workshop presentation and activities. Educators were introduced to the research, including findings from the Educator Survey. Workshop activities and discussion followed around staff/student capabilities and applying the digital affordance concept, which underpins the developmental learning model proposed by the research team. Participants were then invited to provide individual written responses to the same questions around industry roundtable key themes, possible strengths and challenges of the learning model, and ideas for its implementation (see Handout, Appendix 1).

Project team members collaborated in designing and facilitating the Educator Workshops. Underpinned by the team's different disciplinary perspectives from Education, Creative Arts, Communication, Business & Management, and Engineering, facilitation was shared as follows:

Table 1: Educator Workshop Facilitation

Five workshops: facilitators				
UTS Workshop: UTS Creative Arts (Design team) + Partner Lead (Communication/ Journalism) + Project Leader (Education, Communication, Creative Arts, RMIT)	**QUT Workshop:** QUT Business team including Partner Lead + Project Leader with RMIT Communication	**RMIT Workshop:** Project Leader + QUT Partner Lead with RMIT Engineering + Communication	**UniSA Workshop:** RMIT Engineering + pre-work by Project Leader	**Curtin Workshop:** Project Leader + UTS Partner Lead

Workshops were attended by 66 staff from Creative Arts (19), Business & Management (15), Education (11), Communication (3), Engineering (3), Science/Health (3), and Information Management (2). Ten participants did not identify their discipline.

Table 2: Educator Workshop Participants

Five workshops: participants by discipline				
UTS	**QUT**	**RMIT**	**UniSA**	**Curtin**
3 x Creative Arts 1 x Business	3 x Creative Arts 3 x Business 6 x Education	5 x Creative Arts 1 x Communication 1 x Information Management 1 x Science 1 x Education 2 x no discipline identified	1 x Creative Arts 7 x Business 3 x Engineering 1 x Education 7 x no discipline identified	7 x Creative Arts 2 x Communication 4 x Business 1 x Information Management 3 x Education 2 x Health/Science 1 x no discipline identified

In contrast to the Educator Survey (n=91), where most participants were from the project partners RMIT University, QUT and UTS, the Educator Workshops (n=66) had greater take-up from the other two ATN universities: Curtin University and UniSA.

Overall, approximately 150 Educators from all five ATN institutions (in Melbourne, Brisbane, Sydney, Perth and Adelaide) have contributed ideas, insights and feedback on the learning model prototype at different stages of its development.

INSIGHTS FROM WORKSHOPS

This report focuses on the key themes emerging collectively from written responses at all the Educator Workshops. Key questions asked of participants were focused on three areas:

1. What industry had told us about the key digital capabilities needed
2. Strengths and challenges of the developmental learning model
3. Ideas for teaching practice.

Participants were asked to respond to seven questions, which yielded 320 written responses overall.

Responses were grouped under each of the above three areas, which were explored in Parts 1-3 of the workshops. Insights from these groupings are provided below, with sample responses (in italics) to illustrate the breadth of input. The sample responses from participants are identified only by discipline.

PART 1: INDUSTRY THEMES

Q1. Any surprises in the key themes identified by industry: Data analysis / sense making / customer experience / engagement; and machine learning / artificial intelligence (AI)

Most respondents indicated they are at least broadly aware of key themes in industry around data and AI, with some respondents noting the significance of sense making rather than simply generating data.

> *I've been reading around employer perspectives on the future of work and these items resonate with the reading I've completed.*
>
> - Business

> *No surprises.*
>
> - Engineering

> *The 'joined up thinking' or sense making was not a surprise, yet in a way it's nice to see that industry participants acknowledge this. This is where university teaching can really excel in teaching current practices as well as critiquing and progressing them to reflect future possibilities.*
>
> - Communication

> *The degree I'm teaching, is IT and data analytics. We are just beginning to develop a sense of the true capabilities and business capacities for these.*
>
> - Business

Several participants noted that this is new territory – with inherent challenges, but also opportunities, for learning and teaching as well as industry practice. There was also a call for universities to take a stronger lead in this new territory. Some participants suggested that more work is needed to grasp the opportunity and help shape practice.

> *I wonder how much actual/practical engagement or value artificial intelligence is currently delivering for industry.*
>
> - Creative Arts

Machine learning and AI are definitely the hot topics however even industry is struggling to understand and apply it. It is difficult for academics to teach the application when the industry is still not very well informed.

- Business

No surprises except that there doesn't seem to be a sense of urgency in some parts of Higher Education to respond and adapt to these emerging themes.

- Education

Q2. Ideas for addressing these themes with your students?

Many respondents indicated again that the industry themes around AI or data sense making and customer experience/engagement might be 'new territory' and offer scope for further development in their teaching practice. Others mentioned their practical approaches to learning activities.

Have already run a machine learning workshop with students – this was a big picture scenario about them speculating on how a designer might work with AI.

- Creative Arts, Design

As a discipline [planning] we already look at data analysis but keen on addressing other themes such as customer experience/engagement and others.

- Creative Arts, Design

Personally, I teach the basics of these themes in digital marketing. I think there is a strong need to show student what is possible with these technologies – increasing digital literacy but not increasing knowledge of a specific application.

- Business

We have a brand new "UX" subject this year in product design. Data analysis is covered in a subject called "Smart Design". Machine learning/Artificial Intelligence also covered in "Smart Design" in the lecture series. These concepts are covered for context as well as use in projects 'physical representations' of data. Also looking at trends, google trends.

- Creative Arts, Design

Given that employability and work-integrated learning are strategic priorities among the ATN Universities, it is not surprising that many respondents reflected on ways they might extend industry connections and real-world learning experiences to focus on the many aspects of using data.

More embedding of data collection / analysis, Research into industry requirements.

- Business

Direct engagement with industry problems and projects. Industry analysis and reporting activities.

- Education

Engagement data, creating significance and understanding how the creative production is received is a crucial part of the discipline now. These may be addressed whole of course through iteration.

- Creative Arts

Integrate real world learning (authentic) problems/challenges e.g. providing opportunities for students to use data sets to analyse data and make recommendations. E.g. getting students to conduct interviews with customers and their experiences of a product/service and then make recommendations for a solution.

- Education

Work with current employers' perspectives and practice. Perspective (desire for innovation) – to identify creative solutions. Practice – to be aware of current practices and challenges.

- Business

Some suggested ideas underpinned by self-directed professional learning at university and beyond.

Teaching collaboration and experimentation in deeper ways.

- Communication

Create assessment that encourages a deeper involvement in understanding these emerging themes and provide practice that allows students to develop their own capabilities in response to these.

- Education

Design activities with each theme in mind and show students the difference so they can strive for adaptive affordances.

- Communication

Foster critical awareness of dynamics between employers and employees regarding skills, retraining and engagement with emerging technologies. Foster abilities to help yourself – learn where to look when you need help/are stumped.

- Creative Arts, Design

PART 2 LEARNING MODEL

The learning model proposed by the project team is explained in detail in the *Learning Model and Student Pilots Report.*

The model integrates technology affordance theory and developmental learning theory. 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 have been adapted in this project and re-named as Functional, Perceptual and Adaptive, to reflect the fact that contextual application does not constitute a separate affordance. 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, environment, outcomes and increasing complexity; and highlighting the importance of reflection-**in**-action for professional learning and practice in unpredictable and new circumstances (e.g., Piaget 1936; Bloom 1956; Biggs and Collis 1982; Schön 1983; Gagné 1984; Anderson et al. 2001; Scott 2016).

Several respondents made connections to the affordance concept underpinning the learning model. They encouraged educators and students to be brave, in both university and professional learning contexts, and suggested ways in which applying the affordance concept could be useful in addressing the digital capabilities highlighted by industry.

I've not heard of digital affordance theory until today. Its definitely worth exploring particularly as students seem to want to know what will give then the "edge" in the job market.

- Business

Work on own (and students') fears in regard to functional/perceptual skills. Move from functional pure focus to integrated focus between the affordances (functional, perceptual, adaptive)

- Creative Arts, Architecture

There are lots of ways to bring these themes into teaching – it just requires a creative mindset on the part of the teacher, and willingness to try out new activities, exercises, assessments, and evaluate them. There is sometimes a tension between student expectations of wanting the focus to be on content, and my focus (as the lecturer) on these other skills (e.g. soft skills) and trying to get the right balance. Perhaps there is a need to explain more clearly to students why we are focussing on developing the skills (digital engagement, communication, problem solving etc) more than stuffing content down their throats – that it's more about learning how to learn.

- Information Management

Q3. Strengths of learning model approach – using Functional, Perceptual and Adaptive lenses for using technology – for your teaching practice?

The affordance concept was introduced in the Workshops and most respondents were very positive about the learning model and its strengths:

Identifying the need for adaptive affordances in graduates to aspire to in learning outcomes.

- Creative Arts, Design

Practical and simplistic approach.

- Communication

I like this model and the examples that were provided were useful.

- Business

Highlights deficit in teaching when not incorporating or heading towards adaptive approach.

- Science

Helps identify any present 'gaps' or opportunities to implement new things into teaching practice.

- Creative Arts

Connections were also made with ways to address industry developments such as artificial intelligence and the interpretation of data for customer experience, or application for social benefit.

Data analysis in Internet of Things is key – so in fact people learning about Internet of Things will learn (hopefully) to understand different types of data, communication of data, data processing, data storage, data services, data visualisation…in other words it's a good carriage for understanding things like data, also machine learning, and even customer experience because it drives you to think about it in an adaptive way.

- Communication

Students as co-creators of engaging assessments; using coding skills to build models that explain physiological processes like insulin's actions, action potential generation

- Health

There was wide support for the usefulness of the model, in terms of providing a framework for mapping curriculum and learning and teaching practice at the program/course and subject/unit levels. Some saw the model as a way to emphasise the Functional, Perceptual and Adaptive capabilities more at different levels within programs/courses; and there were suggestions to connect the model to the Australian Qualifications Framework and Bloom's Taxonomy.

Provides a framework for embedding at course level.

- Business

Helps to organise (frame) my thinking about both learning activities and assessment (of, for and as learning).

- Education

Allows staff to better understand how digital capabilities can be mapped to Levels of Thinking - AQF Standards L6 Creativity, L5 Evaluation imply adaptive capacity for digital discipline specific capabilities.

- Creative Arts

Assessment was raised by respondents as both a strength and challenge of the model. As a strength, some indicated that the model provides a useful way of thinking about scaffolded learning for capability development and assessment.

Could be scaffolded over several assessments. Helps us move beyond functional, which is where it mainly sits at the moment. Develops digital fluency, rather than mere skills.

- Information Management

It is simple and clear but offers sophisticated levels of depth and discussion. It is a good self assessment lens.

- Creative Arts, Design

I like this model – I think we can use these terms to explain to students where they currently sit on the digital capability spectrum and where they need to be to be employable in 5-10 years; the adaptive affordance can be used to develop creative approaches to problem solving i.e. how can big data be harnessed to map disease prevalence or public health program take up.

- Health

Several respondents highlighted the usefulness of the model, in terms of constructive alignment (learning outcomes, learning activities, assessment).

> *I like the fact that they allow you to think about different levels and force you to consider how you would assess at these levels.*
>
> - Education

> *Well-structured approach to categorise learning outcomes. Allows alignment of assessment and content. Allows scaffolding across different units.*
>
> - Business

> *Useful for stretching perceptions and conceptions of what needs to be taught, practiced and assessed.*
>
> - Education

The significance of motivation and positive feelings about learning and teaching in a supportive environment – for students and educators – were also evident in several responses.

> *It makes it easy to cater to students at all levels of passion. The best students will love the challenge to do adaptive practices.*
>
> - Communication

> *Scaffolding from functional to adaptive. Self-driven experimentation problem solving and collaborative oriented creative process/activity.*
>
> - Creative Arts, Architecture

> *Ability to categorise digital technologies. Provides a workable language to think about this space. Shared approach. Can move away from the purely functional – push more into the perceptual/adaptive. Challenges me to do more.*
>
> - Education

Q4. Challenges of learning model approach for your teaching practice?

It was suggested by one respondent that there would be no challenges, given that the ideas had already been implemented in their own practice. Discipline-specific comments were also raised. One respondent suggested that Adaptive affordance/capability is more relevant in STEM disciplines than in humanities; another respondent saw most relevance to specific areas within disciplines.

> *Science students probably need more adaptive affordance than humanities, in the digital technologies. Creators/Adaptors rather than functional (solely) for most STEM disciplines.*
>
> - Science

> *The learning model is perhaps better suited to design areas of Architecture but the critical thinking skills can equally be used to contribute to the reflective practice that is an essential part of the adaptive process/step.*
>
> - Creative Arts, Architecture

However, the responses viewed collectively indicated that a number of challenges and likely tensions may be relevant across disciplines.

Assessment proved to be a challenge identified by several Workshop respondents, especially in terms of Adaptive capabilities.

> *No challenges with the model, but possibly challenges with needing to re-do assessment tasks.*
>
> - Information Management

> *Designing activities to challenge and assess students.*
>
> - Communication

> *Requires time, thought, creativity to develop activities that achieve this. Need to develop ways to evaluate the effectiveness of the developed activities - are they achieving the outcomes we want?*
>
> - Information Management

Assessment is discussed in more depth in the project's *Learning Model and Student Pilots Report.*

A likely tension was raised between students as 'digital natives' vs lacking digital proficiency.

We assume that all our students have functional affordance of digital literacy. This is not the case. To a great extent the teaching of digital literacy is invisible. We need to make this a visible element of the curriculum by explicitly acknowledging the level and extent of the digital literacy skills that will be required/used in the T&L process.

- Education

Likely tensions were also raised between formally approved curriculum (where digital capabilities are not mentioned) and aspirations to foster learning environments and experiences to equip students for contemporary work and work futures (where digital capabilities are needed).

Explaining to students why this approach (these learning activities) are important and what they gain from it.

- Information Management

Some areas/disciplines are less reliant of DATA digital currency. These may be less easily mapped through iterations and more of a one or two unit/course approach.

- Creative Arts

Workshop respondents lamented the time needed and the possible complexity in mapping the model alongside existing (and more) frameworks mapped to the curriculum in their institutions. The 'crowded curriculum' was also raised as a challenge.

Resource limitations, structural limitations as the curriculum and what you can do is very much governed by university T&L directions - very prescriptive.

- Education

More generally, cultural mindset and allocation of time for creative development. Non-outcome based (difficult to assess).

- Creative Arts

The application/embedding of this at the 'right' levels across the 'right' courses to build capability across program; design/development/coordination of activities, monitoring and evaluation.

- Business

Echoing the findings of the project's Educator Survey, where staff capability and workload were raised as issues, Workshop respondents also said that staff capability and workload would be key challenges in implementing the learning model based on digital affordances.

Lack of support, lack of knowledge, workload, time??

- Business

Workload to learn new technologies - both students and staff.

- Communication

Scaffolding throughout programs as well as staff integration.

- Creative Arts

Time and effort, staff capability, student acceptance and ability to learn especially adaptive affordance.

- Business

Translating the model concept to local practice was seen as interesting and worthwhile, but may not be easy.

The challenges associated with adaptive lenses with large cohorts

- Creative Arts

Reaching and demonstrating (both myself and students) the Adaptive stage.

- Education

Overlap between levels (need clarity using clear examples to articulate to students)

- Business

The issue of some students preferring to focus on Functional capabilities, based on perceptions of programs/courses or work practices, was also highlighted as a challenge in implementing the model.

Student perception of what they are here to learn.

- Creative Arts

Students' resistance to move away from conventional 'job readiness' definition based on mastering of functional skills.

- Creative Arts

Sophisticated students will 'get it' and adopt it and use it easily. The 'reluctant learners' want 'functional' because it is clear and concise. The more abstract (Adaptive) sometimes exceeds their capacity.

- Creative Arts

Nevertheless, there was wide discussion on the importance of adopting a whole-of-program/course approach in implementing the model, albeit this could be challenging.

It does require some heaving thinking (!) and therefore time. Would be best applied holistically i.e. into the whole course, not just one or two units.

- Creative Arts

It needs a whole program strategy that focuses on results and collaboration. universities can prove to be a challenging place to practice what we preach, especially when academics don't want to collaborate.

- Communication

Challenging to incorporate these concepts in the whole of my program. My courses are 'on the way' but not sure of the others.

- Science

While the model was seen as a strength to support graduate work readiness, one respondent noted that accrediting bodies may need to be persuaded to accommodate the model within their guidelines.

Given such rigid accreditations, there is little room for additional learning outcomes to be addressed.

- Creative Arts, Architecture

There was also a concern from some that the affordance concept may necessitate a prescriptive or linear approach.

I think the affordance model is a great tool to start thinking about this but to a certain extent it is still linear. This is a great starting point.

- Education

Such comments, although not widespread, have underlined for the project team that clarification is essential, in terms of the affordances being hierarchical but integrated.

PART 3 EDUCATORS' RECOMMENDATIONS

Q5. Aspects we should focus on most for student learning?

There was a call for focusing on data analysis/interpretation and particularly on Perceptual and Adaptive affordance/capability development. Several ideas were put forward by respondents to support student learning and capability development.

Bringing in 'real world' situations or scenarios as much as possible, so students are dealing with realistic problems – this presents the need for students to have to be adaptable and flexible e.g. in regard to which digital tool is more appropriate for a particular scenario.

- Information Management

Adaptive and problem solving. We probably do a lot of 'functional' affordance teaching but need to ensure that digital tech features in our problem solving exercises, such as my capstone project.

- Science

Perceptual focus – 1. Lifts the bar. 2. It segues into Adaptive. 3. It demands a Functional understanding. But we need a 'Functional' bootcamp.

- Creative Arts, Design

Collaborative environment/approach; Any creative skills can be nurtured more effectively in such environment regardless of digital/physical context. Collaboration facilitates adaptation.

- Creative Arts, Architecture

Addressing process issues was raised, with perspectives on the importance of communicating with students about their digital capability development. Furthermore, the importance of graduates being able to discuss their capabilities was highlighted.

Provide students with the vocabulary to talk about and reflect upon their own capabilities.

- Education

Opportunities to practice. Connect digital capabilities to job outcomes.

- Business

Building on soft skills, although this needs to be explained to students so they understand importance. And reiterated because same message will be taken differently at different stages of their learning journey.

- Creative Arts, Architecture

Ideas on student/educator interconnections were suggested, together with promoting attributes such as lifelong learning and resilience. Risk-taking – for students and educators – was seen as an important consideration in implementing the model.

How adaptive affordances and the willingness to engage in this intellectual risk taking to adapt digital capabilities can be fostered.

- Creative Arts

Adaptability. Becoming comfortable with discomfort. Lifelong learning disposition.

- Education

Adaptability for future resilience in disciplines.

- Creative Arts

Ensuring that students are rewarded when they want to experiment.

- Communication

Overall, the needs of people are at the centre of implementing the model, which acknowledges:

The range of skills that students come in with.

- Education

Improving staff capabilities.

- Business

Q6. What is the first thing you would need to do, to make the model work for you with your students?

Many advocated again for a whole-of-program action plan. Many respondents said they would be looking at their curriculum for possible links to the model. Some said they would discuss with discipline and industry contacts for contextualisation. Practical process ideas included:

Embedding into learning activities across whole of course.

- Education

Review unit and program design. Identify core technologies for discipline.

- Business

Take to industry and revisit unit outcomes / assessment.

- Creative Arts

Create a matrix to cross check the functional, perceptual, adaptive across subject learning objectives. Ensure they understand the slightly different meaning of affordance in this situation.

- Creative Arts, Design

Review of units/programs; consistency across staff information/training, and acceptance of this as a norm not an 'add-on'.

- Business

The significance of time for reflection emerged from ideas raised:

Have time to rethink current approaches.

- Education

Interrogate my assumption about students' existing capabilities and understandings.

- Creative Arts, Design

Time and support from school.

- Business

Developing confidence among educators is clearly a priority for respondents, with practical examples needed. Students as co-creators; and developing confidence in students is also a priority:

Bring them along on the value of their understanding, and deploying of these affordances e.g. How will these affordances make me more employable?

- Creative Arts

Evolve it, i.e. using an action learning context, giving the power to the class/students. Have them as a student-centred approach to digital literacies and competencies - run an evolving development, self-generated learning environment.

- Business

Incorporating more choice/options for choosing technology to complete assessment tasks. Equipping students with the confidence to explore digital tools to complete tasks and problem solve.

- Information Management

Work out ways to assess initial status of my students, related to the subject/field. Develop activities to promote development from F-P-A.

- Creative Arts

Q7. How could we build on and improve the model, to help graduates prepare for work and meet industry needs? What should happen next?

Some respondents said they were unsure, which may be because affordance theory was unfamiliar to them. On the other hand, several underlined the importance of broad take-up of the model. The importance of both professional development and adopting a whole-of-program or whole-of-school/institution approach was often raised here.

> *Acceptance as a norm, not another 'fad'.*
>
> - Business

> *Adaptive affordance area is enormous task. Need whole school approach to teaching. All staff need to know how to incorporate these skills.*
>
> - Science

> *Make the model more widely available and hands on workshop on how to change uses of the technology in curriculum to move beyond functional use of technology.*
>
> - Education

> *More professional development for staff to have confidence to deliver.*
>
> - Creative Arts, Design

A disciplinary context was advocated for relevance and resonance with educators and students and there was a clear call for discipline-specific examples of applying the model. This proved to be a common theme in the workshop discussions and responses.

> *Practical example of each i.e. functional, perceptual and adaptive in different disciplines and how assessment is applied.*
>
> - Communication

The project team had anticipated such a call and has developed Design, Journalism, Music Industry and Engineering examples during the project and showcased in the project website resources. The samples include Digital Capabilities Descriptors and documentation of planning, learning activity/assessment ideas, and teacher reflections from pilot interventions undertaken with students, when elements of the Descriptors were aligned with actual curriculum in action. We believe that these samples of disciplinary contextualisation will provide a starting point for colleagues to

debate, adopt or adapt in their own teaching practice. Further work will be needed to build on the pilots.

There were renewed calls for closer connections and collaboration between education and industry. There was also encouragement for engagement with institutional decision-makers and secondary school digital initiatives, to help 'connect the dots'.

For specific disciplines, show where digital work practices are in the curriculum e.g. count the number of WIL projects as a baseline. How many WIL projects relate to the digital future?

- Education

Find a way to collaborate among academics, students and industry participants that goes beyond current practices. In other words: reward new, daring projects.

- Communication

More collaboration between universities and industry i.e. learn about their needs; develop units on data e.g. Design and Big Data

- Business

What's happening in primary and high schools? This is where students first learn their digital skills. Get industry to articulate what they want for their disciplines and to put up projects that students can take on.

- Health

Educate the universities and the decision makers that 'technology' and Digital Technologies in many fields are not just limited to computers but also include production/industrial aspects.

- Creative Arts, Design

CONCLUSION AND RECOMMENDATIONS

Industry had told us about the key digital capabilities needed in relation to data analysis / sense making / customer experience / engagement; and machine learning / artificial intelligence (AI). Most workshop participants responded that they were aware of these trends. There were examples of early adopters, but it appeared that not all participants are addressing the trends in their teaching practice. Ideas for addressing the trends included industry projects based on speculative scenarios.

In response to the learning model, which integrates affordance theory and developmental learning, there was mainly positive support from Workshop participants across disciplines, such as:

I think that this is a very clear and accessible model. It certainly gives you a new lens for looking at technology in classroom and allows you to move beyond simply the functional level of technology.

- Education

Useful in qualifying expectations of students and for students.

- Engineering

The affordances framework and the way it was presented was rather interesting. Using technology for data interpretation re usability of spaces, frequency etc in design – the model can be used to successfully integrate different levels of information and interpret in innovate ways in design.

- Creative Arts

Useful framework to check elements are in learning design.

- Communication

This model is uncomplicated, straightforward to apply to different disciplines (adaptable) and different levels of study.

- Information Management

Really great and simple method which is easy to understand, easy to map and understand current practices.

- Creative Arts

Simple; understandable for students, staff and industry.

- Business

The scaffolded learning framework appealed to many participants as a strength of the model, although there were some concerns about the model being linear or prescriptive. It is therefore vital to make clear to educators and students that the model provides different lenses to ways of thinking about the use of technology, but in holistic and integrated ways.

Workshop participants highlighted the importance of motivation for students (and educators) in a safe environment, where experimentation is rewarded and industry collaboration is encouraged. Ideas for teaching practice ranged from introducing a functional bootcamp, to 'ramping up' perceptual and adaptive digital capabilities through collaborative 'messy' problem-solving projects related to data, and work-integrated learning projects specifically related to digital work futures. Creating 'self-generated learning and development environments' for students was advocated by some participants. Helping students to learn and use the vocabulary of affordances, including their industry relevance, was also seen by participants as being important to strengthen professional learning and to counter any student perception of all jobs requiring only functional skills.

Capacity for educators to adapt current curriculum and teaching practice often came down to time and support needed. Workload and resources were raised as issues by some respondents. However, others cited challenges including assessment of adaptive affordance/capabilities, or mapping of multiple frameworks to curriculum. Some Workshop participants were early adopters of digital learning models. However, the majority of participants made strong calls for professional development needed. This should include examples contextualised for the disciplines, with clarification on ways in which the affordances are integrated (not linear, not prescriptive) and how this could be translated for learning and teaching practice. Several times, participants advocated whole-of-school or whole-of-program/course implementation of the model for maximum effect, rather than relying on individuals to adopt the model in isolation.

The ideas put forward by Workshop participants are invaluable, to inform collaborative and ongoing contextualisation of the learning model. The Educator Workshop participant comments create a springboard for further work, in potentially scaled-up implementation of the model across disciplines.

In summary,

The results from the Educator Workshops are remarkably similar to those from the Educator Survey, although each method used different prompts to triangulate data and avoid bias. The Survey drew upon the JISC Digital Capabilities Framework in the UK to elicit educators' views on whether digital capabilities are taught, practiced by students, and/or assessed. The Workshops drew upon the Educator Survey findings (which had highlighted a strong emphasis on Functional capabilities in current practice), as well as introducing the key themes from industry roundtables and the digital affordance theory/developmental learning model concept. The Workshops elicited educators' views on translating such a model to their curriculum, learning activities and assessment.

Results from the Survey and Workshops suggest there is more that needs to be done in preparing university educators to support students in developing digital capabilities. Although there were some early adopters at the Workshops, there was a clear sense from many participants that they see the need to focus more on Perceptual and Adaptive affordances/capabilities than they have previously; AND they need professional development to achieve this, particularly assessment strategies.

The challenge is making implementation of this model a high priority in a 'sea' of competing priorities for busy academics, including ongoing requests for implementation of frameworks and change to current practice. The 'winning' combination is likely to be leadership support at university, faculty/college and school/program level; industry evidence and support; and educators' motivation to enhance their students' learning and career prospects.

Key recommendations are to confirm institutional senior leadership support for the model at the ATN universities; and plan professional development for educators

1. INSTITUTIONAL SUPPORT

Adopting the learning model needs to be seen as a leadership and industry priority. Scaled-up implementation and evaluation of the learning model would ideally include all five ATN universities. In addition to the disciplines involved in the project's pilot interventions with students (Journalism, Design, Engineering and Music Industry), it would also be beneficial to include more disciplines.

Institutional leadership support for the model, encouraging ownership of Educators through action learning as professional development, would also be vital for take-up in an environment where Educators may feel 'framework fatigue'.

2. PROFESSIONAL DEVELOPMENT WOULD BE GUIDED BY THE FOLLOWING RECOMMENDATIONS:

New program/course development:

Learning objectives/outcomes are written explicitly to reflect the digital affordance theory/developmental learning model (where appropriate).

Existing programs/courses and subjects/units:

Scoping is undertaken by program teams for opportunities to interpret the stated learning objectives/outcomes, in relation to the digital affordance theory/developmental learning model. While it would be advantageous if individuals adopt the model in their teaching practice, it is anticipated that student learning will be significantly enhanced through a whole-of-program approach.

Assessment:

Constructive alignment warrants close attention, in terms of designing assessment and appropriate learning activities for the stated learning objectives/outcomes. Assessment emerged as a key area for professional development especially for Adaptive capabilities.

Peer learning and resources:

A supportive and collegial environment is essential where "it is OK to fail" and learn together.

Some educators may find it more useful and realistic to 'start small' with implementing the model in one part of one existing subject/unit and then build on this.

The project website (*https://sites.rmit.edu.au/digitalworkpractices/*) includes discipline-specific examples of interpreting the affordance concept documented by the project team for Journalism, Design, Engineering, and Music Industry. Activity prompts for peer learning by educators are also provided. Reflections of teachers involved in the pilots and another case study of how the model is being applied to curriculum and assessment in future, building on the pilots undertaken, are included in the website.

The project Learning Model and Student Pilots Report *Positioning graduates for digital work futures* discusses the work with students in depth, including explanation and illustration of different assessment approaches.

Translating capabilities:

It is strongly recommended that professional development activities incorporate clarification that the **affordances are hierarchical but integrated**, although different levels may be emphasised at different times depending on the learner, the stage of learning, the context and outcomes, etc. Adaptive capabilities, which are the most challenging - and are what industry want - require some level of Functional knowledge/skills and Perceptual experience. At the same time, it may be more a question of ability to work with other specialists rather than requiring a high level of Functional skill oneself.

The project's definitions of affordances (adapted from Best 2009; Evans et al. 2017; Fray et al. 2017) are a guide for 'unpacking' by educators as well as students:

- **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 some functional knowledge/skills and perceptual experience.

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

Above all - in integrating the learning model with existing as well as new curriculum - it is highly recommended that there is a strong focus on encouraging students to use the **language of affordances** (Functional, Perceptual and Adaptive) in critically reflecting on and discussing their digital capabilities and aspects for further development and growth.

FUTURE DIRECTIONS OF THE RESEARCH

The findings presented within this report focus on the workshops with educators 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.

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APPENDIX 1: HANDOUT FROM EDUCATOR WORKSHOP

See following pages.

DIGITAL WORK PRACTICES: WHERE ARE THE JOBS, WHAT ARE THEY, AND HOW PREPARED ARE GRADUATES?

Australian Technology Network of Universities: Innovation Project for Learning & Teaching

This project is focused on preparing graduates for digital work and how to embed this in the curriculum. It has involved rapid prototyping of a learning model for Creative Arts, Communications, Business & Management, Engineering, and potentially other disciplines.

> "Three skills in particular will be in demand led, of course, by data scientists…The other two critical skills are the ability to translate data insights to a broader business audience and bringing data and insights to life with data visualisation. 'Business translators' [have] deep organisational knowledge or functional expertise to ask the data science team the right questions. They also understand enough analytics to derive the right insights from data scientists' work and convey them back to process owners within the business to be acted upon." (CEDA 2018, p.45)

CEDA (2018). Economic and Political Overview. Annual Report, Committee for Economic Development for Australia. Available online at: ceda.com.au (accessed 21 February 2018).

AGENDA

Welcome, research, learning model, digital capabilities descriptors (30 mins)

Activities and discussion (70 mins)

1. Unpacking key findings from educator survey, implications for educators and students (30 mins)

2. Translating learning model to your subject guide (30 mins)

3. Recommendations for improving the model and realising its full potential (10 mins)

Worksheet (15 mins)

Close, next steps (5 mins)

Digital Capabilities Descriptors:
Development and refinement for sample disciplines
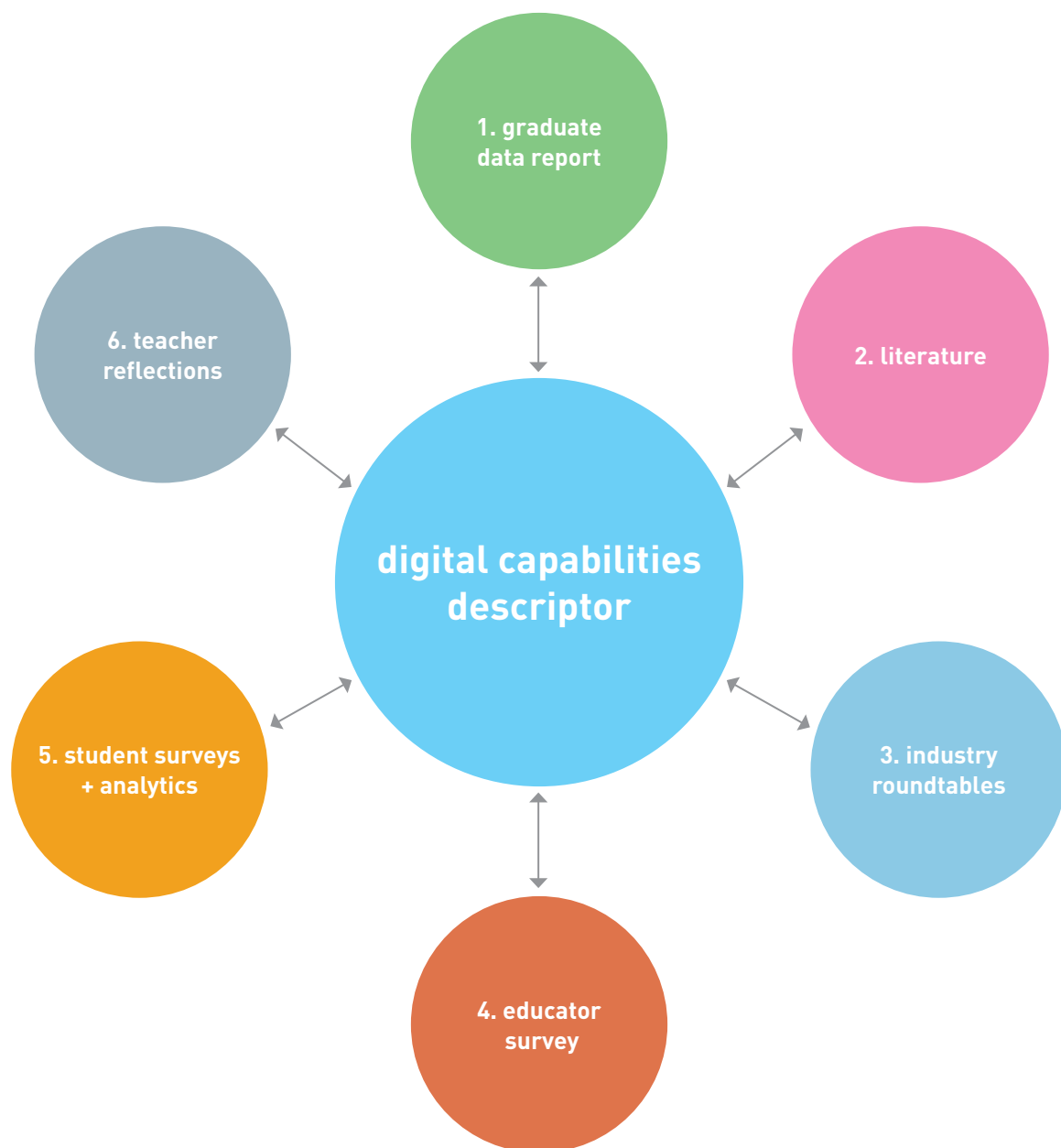
Teaching Strategies:

Mapping digital capabilities descriptors, curriculum and assessment

LEARNING MODEL: INTERPRETING AFFORDANCES OF TECHNOLOGY AS A LENS FOR LEARNING AND PROFESSIONAL PRACTICE

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.

DIGITAL CAPABILITIES DESCRIPTORS

Digital Capabilities Descriptors have been developed for Design, Journalism, Engineering, and Music Industry. These Descriptors interpret affordances in sample domains – categories of practice and related capabilities for particular jobs or roles.

Some capabilities are general and transferrable (e.g. online collaboration); while other capabilities are specialised (or interpreted specifically for specialist contexts). In Journalism, for example, one of the domains is Data and includes a focus on Statistics, which is interpreted for specialist journalism contexts in the table below.

We can translate capabilities in the domains by looking through functional, perceptual and adaptive affordance lenses, for learning and professional practice.

Using Descriptors: affordances could be interpreted as illustrated in the following example, to guide new program development/renewal, OR to guide learning activities and assessment for existing curriculum:

Digital Capabilities and Work Practices		
JOURNALISM: Data Domain, Statistics Focus		
Functional Affordance	**Perceptual Affordance**	**Adaptive Affordance**
Name basic statistical concepts and perform basic statistical calculations	Interpret statistical findings to identify news value; use statistical findings in support of stories	Select appropriate statistical tools to investigate data sources, to identify news value and to illustrate news value in innovative ways

STANDOUT THEME FROM INDUSTRY

Data analysis / sense making / customer experience / engagement

As one Design industry roundtable participant put it, there is a **strong need for joined up thinking when it comes to digital capabilities:**

> "It's not about just can I code. It's about I can understand the technical architecture that consists of 500 systems and be able to think around that and think around the business implications of that…"

The need for 'connectors' has been highlighted by many industry participants from different disciplines. A Journalism roundtable participant explained this capability gap:

> "I think it's **connecting the dots**. We're drowning in data [reports] at work…But the reports don't tell you anything a lot of the time. There's no insight to say, what is the meaning of these? You have to change the way you did that story because it didn't resonate for these reasons. I think that's the missing part of it for us…"

Industry participants in different cities often echo the digital work practices and capabilities needed, such as **translators and sense makers:**

> "know the result you get out of that software is meaningful in the real world…actually **makes sense**" **(Engineering participant, roundtable 1)**

> "you will **translate** business requirements, help the business to understand how to become customer centric, and help IT and the tech guys to design and develop that"
> **(Design participant, roundtable 2)**

> "what works really well are **explainers**…understanding what analytics means"
> **(Communications participant, roundtable 3)**

> "there seems to be a real lack of connectivity between the business requirement and IT solution…you need to have those people **in-between** that…can make that connection"
> **(Business participant, roundtable 4)**

SOME OBSERVATIONS SO FAR

"There were no digital jobs six years ago. Now there's chief digital officer jobs and head of digital. So the titles are actually coming out that didn't even exist before. **(Business participant, industry roundtable 4)**

Drawing on literature and our interactions with industry, educators and students:

1. some educators may be teaching but not assessing digital capabilities

2. some educators may assume that capabilities for digital work practices are being developed in a different part of a degree program

3. some students may be operating more at a FUNCTIONAL level

4. some industry participants and educators appear to interpret "digital capabilities" at a FUNCTIONAL level (describing, using tools), while others talk about a strong need for "deeper understanding" (it's not just about the tools)

5. some industry participants highlight capabilities like complex problem solving as being separate from - and more important than - "digital capabilities"

6. some industry participants highlight the missing fundamentals (e.g. maths)

7. some industry participants highlight the significance of networking and collaborating across specialisations, including knowing enough to work with the specialists (e.g. coding/programming, communication)

8. some industry participants highlight the need to work remotely ("specialists out of the building"), with contract/online work on the rise in the gig economy

9. some educators and students may not be addressing digital identity and presence (personal, professional, organisational) including implications, risks, strategies

10. some educators and students may not be addressing key industry issues of **data and customer/user experience** – especially interpreting data for strategic decision making and storytelling/engagement (inter/transdisciplinary opportunity, joined up thinking, being the 'translater' or 'in-between' role)

11. some educators and students may not be addressing the implications of **machine learning and artificial intelligence,** for new and emerging roles

12. some educators and students may not be addressing business outcomes and digital innovation (emergence, entrepreneurship, business nous, new ideas, possibilities)

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

EDUCATOR WORKSHOPS AT RMIT UNIVERSITY, QUT, UTS, UNISA, CURTIN UNIVERSITY, MARCH 2018

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

Your name:

Your email:

Your gender: female   male   prefer not to say *(please circle)*

Your career experience: >30 years   >15 years   >5 years   <5 years *(please circle)*

Your own discipline/s (e.g. communication / journalism):

Your role (e.g. lecturer, program/course leader):

Your institution: RMIT   QUT   UTS   UniSA   Curtin (*please circle*)

Your school / faculty / division:

Your own teaching area (e.g. animation, marketing):

Program/course you teach (e.g. Bachelor of Engineering, Professional Placement)

Number of students you teach in a year: > 200, >100, > 50, < 50 *(please circle)*

WORKSHEET

1. Industry roundtable themes

Q. Any surprises in the key themes identified?

- Data analysis / sense making / customer experience / engagement

- Machine learning / artificial intelligence

Q. Ideas for addressing these themes with your students?

2. Overview of learning model

Q. Strengths of learning model approach – using Functional, Perceptual and Adaptive lenses for using technology – for your teaching practice?

Q. Challenges of learning model approach – using Functional, Perceptual and Adaptive lenses for using technology – for your teaching practice?

3. Recommendations

Q. Aspects we should focus on most for student learning?

Q. What is the first thing you would need to do, to make the model work for you with your students?

Q. How could we build on and improve the model, to help graduates prepare for work and meet industry needs? What should happen next?