Position Paper:

The teaching of Digital Skills in Queensland needs to be mandatory for all Year 11 & 12 students

Digital Skills in Schools

Employment trends and related research now make it emphatically clear that our children need to be competent in a wide range of digital and related technology skills if they are to be able to find appropriate, worthwhile and engaging careers as adults in the coming decades.

Being a person with digital skills in the current economic climate has never been more lucrative as highlighted in the *Digital Skills & Careers Building Skills today for the jobs of tomorrow*[1] report released by the Australian Information Industry Association (AIIA). This national organisation, representing Information Technology and telecommunications industry, looks at the need for schools to be teaching students to have deep skills as both digital consumers and producers. The AIIA state that "Today the world of networked computing pervades every part of our personal and professional lives. It is expected that digital skills will help future workers manage the disruption in their employment and transition to new jobs".

The three key points shown in the report relate to agendas in current education reforms, not only in Australia but globally, while resonating with the new Digital Technologies curriculum. Digital skills have been identified as:

- core to the productivity and innovative capacity of all economies
- more than using computers and applications
- an ability to design, build and create new things.

In order to deliver the new Digital Technologies curriculum, it is also imperative that our teaching and support staff have a proficient level of digital competency as well.

Digital skills and literacy have become increasingly important in today's workforce. Deloitte suggest that around 2.5 million Australian workers are required to use ICT regularly as part of their jobs. While the *Australia's Digital Pulse*[2] report looks more specifically at ICT related jobs it also strongly suggests that developing the digital skills of both existing ICT workers and the broader Australian workforce will be an important factor in ensuring that there is an adequate supply of ICT skills to support the growing digital economy.

The Organisation for Economic Co-operation and Development (OECD)[3] recognises Digital skill levels in all job profiles and distinguishes between three job categories and levels of digital skills as follows:

1. **ICT specialists**, who have the ability to develop, operate and maintain ICT system where ICTs constitute the main part of their job.
2. **Advanced users**, competent users of advanced and often sector-specific, software tools where ICTs are not the main job but a tool.

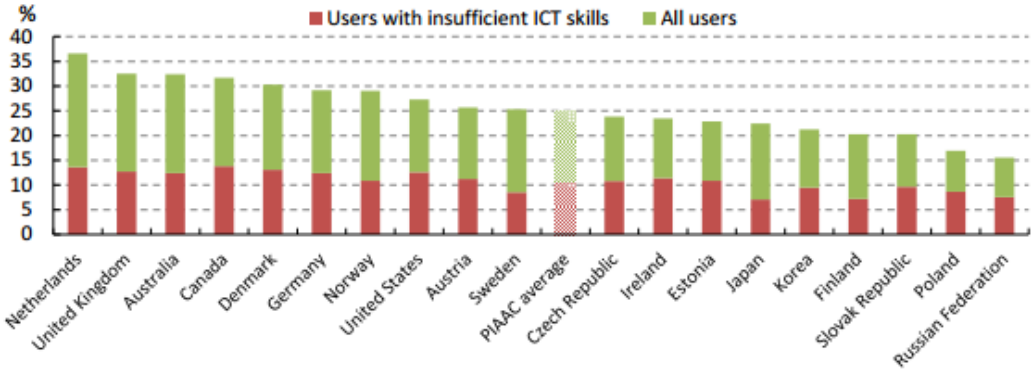
[1] https://aiia.com.au/documents/policy-submissions/policies-and-submissions/2015/A-Digital_Skills_and_Careers_Report.pdf
[2] https://www.acs.org.au/content/dam/acs/acs-documents/PJ52569-Australias-Digital-Pulse-2016_LAYOUT_Final_Web.pdf
[3] http://www.oecd.org/internet/ministerial/meeting/Skills-for-a-Digital-World-discussion-paper.pdf

3. **Basic users**, competent users of generic tools (such as Word, Excel, Outlook, PowerPoint) needed for the information society, e-government and working life where here too, ICTs are not the main job but a tool.

The implications for the teaching of digital skills in schools is highlighted by the table below that shows that nearly half of Australian workers using software have insufficient ICT skills. This gap likely to steadily increase as new technologies continue to emerge.

Figure 1. Workers using office software at work every day

As a percentage of all workers



Source: OECD, (2016) "Skills for a Digital World: 2016 Ministerial Meeting on the Digital Economy Background Report", *OECD Digital Economy Papers*, No. 250, http://dx.doi.org/10.1787/5jlwz83z3wnw-en.

It is also necessary to distinguish between digital literacy and digital skills as these two terms are regularly applied in the same context. Digital Literacy is being able to identify why you are doing something, when and for whom you are doing it. To place this in an educational context it could be a teacher helping a student to select appropriate images, recognising copyright licencing and consequently citing the source or seeking permission to use the image. Whereas Digital Skills focus on what you are doing and how you are going to achieve it. So using the same example of selecting images it would be a teacher showing the student how to get images from the Internet and insert them into a presentation application such as Powerpoint.

Teaching IT in Australia

While it is clear that Australian Federal and State Governments have heard this message to some degree, and have acted pro-actively in creating a Digital Technologies curriculum from Foundation to Year 10, there still remains a serious failure to properly address the issue at Senior Secondary level.

There are now an encouraging number of relatively new initiatives at the Federal and local State level to encourage the STEM domains, as well as IT specifically.

For example, the National Innovation and Science Agenda[6]'s looks to inspire young Australians in digital literacy and STEM. However, when a more detailed view of their agenda is examined, there are some measures present to address 'coding' via competitions, especially in Years 5 & 7; Computer Science Summer schools for Years 9 & 10; and even some initiatives to encourage girls in the STEM area, but no clearly articulated vision and initiatives to enhance and encourage the teaching of IT to Year 11 and 12 students.

Even the associated Professional Development being offered to teachers via the CSER Digital Technologies does not provide any in-depth professional development for Year 11 & 12 IT teachers.

[6] http://innovation.gov.au/

Similarly, when we look at the Queensland based initiatives such as Coding Counts[7] and Curriculum into the Classroom (C2C), and the related STEM strategy[8], we again see no clear references to Year 11 & 12 IT subjects or related IT initiatives.

Thus, outside of existing syllabi and the new proposed Digital Solutions subject offering, there is no clear vision and pathway for students to develop significant IT skills through Year 11 & 12.

For students to go on to further Tertiary study either at University or TAFE, or even to find some other direct entry into the workforce, there is an increasing need for basic 'Digital Literacy' and even perhaps some 'Digital Fluency', if they are to be effective and contributing members of the workforce.

To help identify the issues, we can consider the IT capabilities required in today's workforce as classifiable into three categories requiring varying levels of competency.

They are:

- **Digital Literacy**
- **Digital Fluency**
- **Digital Mastery**

To begin to appreciate the breadth of capability and competency associated with these levels, those familiar with Mathematics will note that the 'New Senior Assessment and Tertiary Entrance Systems'[9], will have at least 4 Mathematics subjects to be offered:

- Mathematics Essentials (Applied);
- Mathematics General (General);
- Mathematics Methods (General) and
- Mathematics Specialist (General).

Under a similar classification from lowest to highest degrees of capability & competency, we could see these as:

- Mathematical Literacy (*Essentials & General*);
- Mathematical Fluency (*Methods*) and
- Mathematical Mastery (*Specialist*).

This clearly caters for the range of skills and aptitudes and even to some degree student interests and future career aspirations.

The distinction between General and Applied[10] is also important to note.

With respect to IT, the existing QCAA offerings in IT, the "Information and Communication Technology" (Authority-registered subject) is being revised and will be offered as an Applied subject along with the proposed 'Digital Solutions' IT subject (General).

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[7] http://advancingeducation.qld.gov.au/SiteCollectionDocuments/Coding-and-robotics-booklet.pdf

[8] http://advancingeducation.qld.gov.au/SiteCollectionDocuments/schools-of-the-future-stem-strategy.pdf

[9] https://www.qcaa.qld.edu.au/senior/new-snr-assessment-te

[10] QTAC will calculate ATARs based on either: a student's best five General (currently Authority) subject results, as is currently the case for the OP system or a student's best results in a combination of four General subject results, plus an applied learning subject* result.
*Eligible applied learning subjects are: a QCAA Applied subject (currently Authority-registered subject or Subject Area Syllabus subject), or Certificate III, or Certificate IV, or Diploma, or Advanced diploma. – from https://www.qcaa.qld.edu.au/senior/new-snr-assessment-te/faqs

There is no General ATAR equivalent though to the 'Mathematics General' and 'Mathematics Methods' which satisfy the broad categories of *Mathematical Literacy* and *Mathematical Fluency* respectively.

We believe that the proposed Digital Solutions course (to be implemented with the Year 11 cohort in 2019) clearly offers a course we can classify as Digital Mastery.

Thus we can see that in very stark contrast to Mathematics, the QCAA will be offering only a Digital Mastery course, and no Digital Literacy or Digital Fluency within the new ATAR (University pre-requisite) set of subjects.

The Applied 'Information and Communication Technology' (ICT) subject certainly fits within the classification of 'Digital Literacy', and can be part of a student's ATAR ranking, but some changes to current student selection preferences appear needed to make this a more attractive and preferred option.

English with 4 General and Science with 7 General subject offerings also cater for the range of skills, and aptitudes, etc.

So we can ask, why in the increasingly technological world, based very strongly on IT are we looking at offering 3 Maths; 4 English and 7 Science 'General' subjects to cater for this range of skill development; aptitudes and interests, but only 1 IT subject[11].

We believe that this is a vital issue both for the future employment prospects of our students as well as the economic prosperity of our State.

An outline of the proposed courses:

Digital Literacy:

For this basic level, along with the revised Applied ICT subject, we would recommend a course based on the IC3 Digital Literacy Certification Global Standard 5[12].

With over three million exams delivered, in 78 countries, the IC3 Digital Literacy certification has become the preferred solution for measuring and validating digital skills of students and employees all around the world.

There is a lot of content alignment between IC3 and the current ICT SAS syllabus (which is likely to become the standard offering as part of the 'Applied Subjects' for the new ATAR based curriculum).

The three IC3 elements merge directly with the ICT SAS core topics thus enabling an easy mapping exercise that could have IC3 resources integrated into units of work (saving teachers lots of time) and reduce duplication of teaching and learning across subjects/year levels for students.

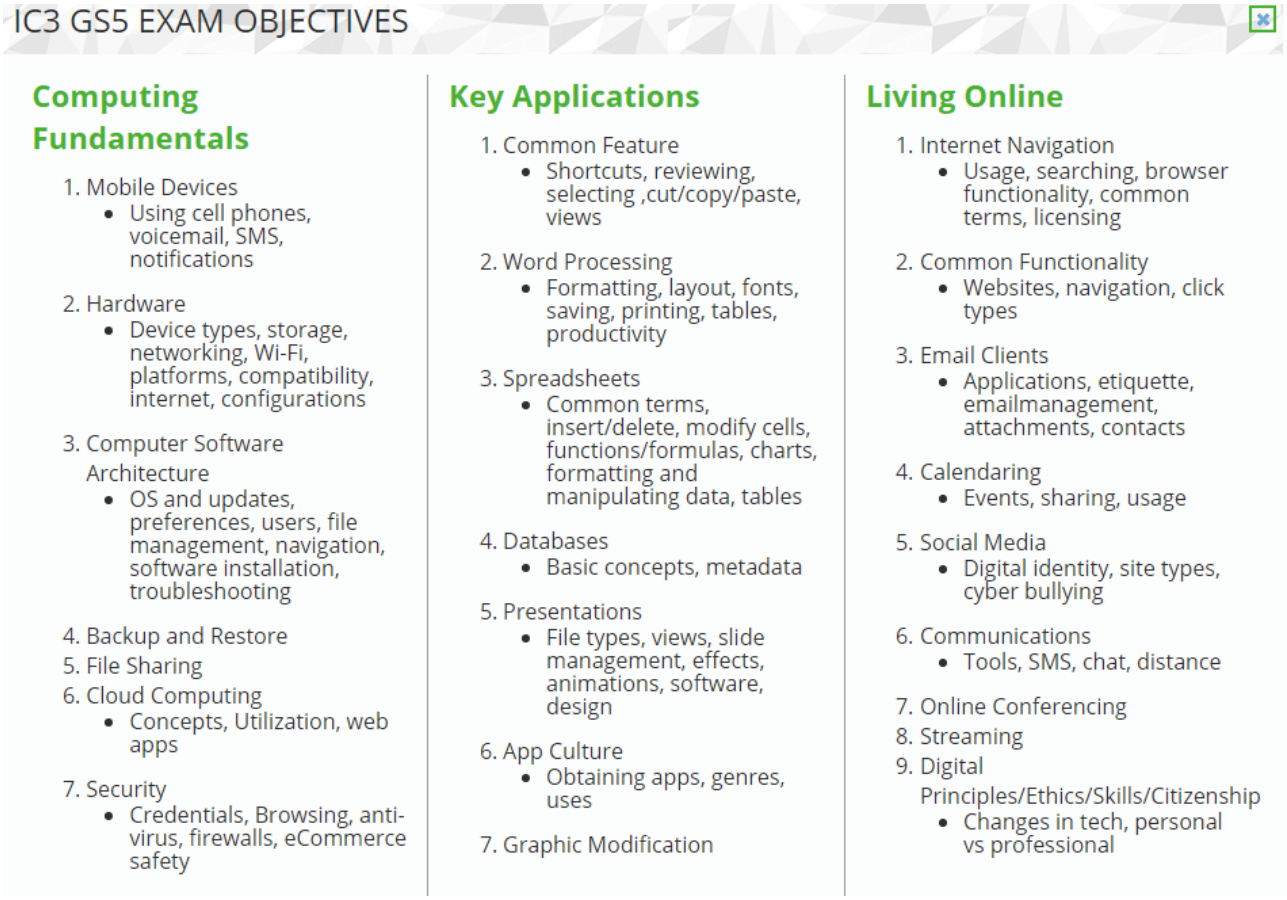
Also a lot of the IC3 Digital Literacy content could be mapped to the Digital Technologies Curriculum for lower secondary to provide a continuum of Digital Literacy learning.

[11] There are also growing questions over the validity of the ATAR approach – see here for example - http://www.theage.com.au/victoria/we-dont-want-this-to-be-a-dirty-little-secret-the-school-ditching-the-atar-20170303-guqjbj.html The same concerns are not evident with respect to the teaching of IT.

[12] http://www.certiport.com/Portal/Common/DocumentLibrary/IC3-GS5-Overview-021016.pdf

A Year 11 & 12 "Digital Literacy" subject would then build on prior learning and focus more on applying understanding through projects for various contexts rather than just developing skills and knowledge.

Below is an outline of the IC3 exam objectives which gives a good indication of the content/skills covered.



IC3 GS5 EXAM OBJECTIVES

Computing Fundamentals

1. Mobile Devices
   - Using cell phones, voicemail, SMS, notifications
2. Hardware
   - Device types, storage, networking, Wi-Fi, platforms, compatibility, internet, configurations
3. Computer Software Architecture
   - OS and updates, preferences, users, file management, navigation, software installation, troubleshooting
4. Backup and Restore
5. File Sharing
6. Cloud Computing
   - Concepts, Utilization, web apps
7. Security
   - Credentials, Browsing, anti-virus, firewalls, eCommerce safety

Key Applications

1. Common Feature
   - Shortcuts, reviewing, selecting ,cut/copy/paste, views
2. Word Processing
   - Formatting, layout, fonts, saving, printing, tables, productivity
3. Spreadsheets
   - Common terms, insert/delete, modify cells, functions/formulas, charts, formatting and manipulating data, tables
4. Databases
   - Basic concepts, metadata
5. Presentations
   - File types, views, slide management, effects, animations, software, design
6. App Culture
   - Obtaining apps, genres, uses
7. Graphic Modification

Living Online

1. Internet Navigation
   - Usage, searching, browser functionality, common terms, licensing
2. Common Functionality
   - Websites, navigation, click types
3. Email Clients
   - Applications, etiquette, emailmanagement, attachments, contacts
4. Calendaring
   - Events, sharing, usage
5. Social Media
   - Digital identity, site types, cyber bullying
6. Communications
   - Tools, SMS, chat, distance
7. Online Conferencing
8. Streaming
9. Digital Principles/Ethics/Skills/Citizenship
   - Changes in tech, personal vs professional

Alternatively, the existing ICT Applied subject could perhaps be promoted to General status, to act as an equivalent 'Literacy' level general subject.

Making the Applied ICT subject (or the IC3 GS5) an ATAR 'General' rather than 'Applied' could have a significant impact of the proportion of students choosing to select this course (if not mandated for all students).

We believe though that either the IC3 Digital Literacy GS5 or the ICT subject should be a mandatory requirement for all students and even perhaps for teaching staff as well.

In Australia, the majority of investment is attributed to STEM and in particular coding initiatives. Unfortunately, this is really only catering for the group of students who would follow the IT Specialist pathway, that is the 'Digital Solutions' (Mastery) subject and this means that some 80% of those who will who use ICT as part of the general workforce population are omitted from these STEM focussed funding initiatives.

With the IC3/ICT Digital Literacy option the QCAA would be offering all students the opportunity to gain industry recognised certifications as part of their school achievement as they are already covering a significant amount of the learning across variety of subjects and VET training packages.

Certifications for Adobe, Autodesk, Cisco, CompTIA and Microsoft are already listed by QCAA as recognised studies[13]. In many instances only a few hours additional learning/practice is required to

[13] https://www.qcaa.qld.edu.au/senior/certificates-qualifications/qce/recognised-studies/lists-recognised-studies

be proficient enough to pass the vendor certification exam. All Qld state schools, hundreds of others across AU and some TAFE/Uni campuses are already registered as Certiport Authorised Testing Centres (and thus able to offer the IC3 examinations).

Qld State Schools have had access to the Microsoft Imagine Academy resource and a pool of exam inventory for the past few years while many others academic organisations have purchased learning and certification resources.

However, the only way we can have a true impact on developing Digital Literacy is for all schools to be provided with resources and a mandate to use them.

Digital Fluency:

This subject would build on the IC3 Digital Literacy subject for those students who have an interest in this domain. It would not need to be mandated.

This subject could be a re-worked version of the existing ITS subject, but again we would like to see it add some related Vendor certifications such as CISCO and CompTIA.

This would enable a student to have a learning pathway that may also include a VET training package so they are selecting subjects and learning for job categories using technologies other than the traditional IT specialist and may not necessarily be articulating into tertiary as approximately 60% of students go straight into the workforce on school completion.

There would be some effort needed to develop this Digital Fluency subject as there is not an equivalent IC3 Certification type course readily available. However, given the very well-refined and effective existing ITS course, with schools very experienced in its implementation, it should not be difficult to create a new version that would fit appropriately into the continuum of Digital Literacy to Digital Fluency to Digital Mastery being proposed.

Digital Mastery:

It is proposed that the new Digital Solutions subject currently in Draft 2 would be appropriate for this level.

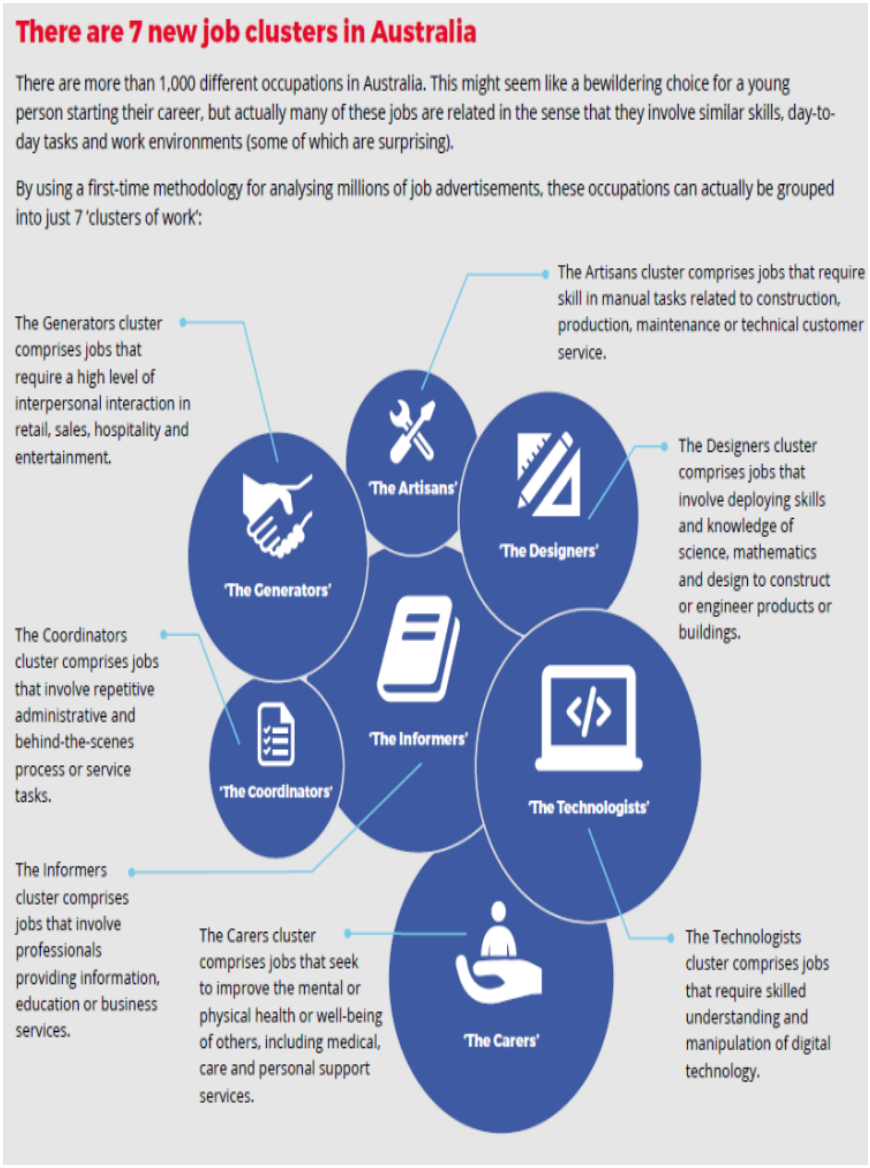
But most significantly of all, the report **"THE NEW WORK MINDSET 7 new job clusters to help young people navigate the new work order"** from the **Foundation for Young Australians**[14] (FYA) indicates a very urgent need to re-assess what we teach and how we teach our young people about to enter the workforce or tertiary education.

To quote from the foreword of the research paper "***There is an urgent need to shift mindsets in our approach to jobs, careers and work.*** *New big data analysis provides us with insights into the patterns of skills young people now require to navigate complex and uncertain working lives. We must act now to ensure young Australians can thrive in the new world of work."*

The 'big data' analysis provided through this report indicates a very serious and urgent need for educators to change what we teach, at least in terms of our focus and priorities, and most especially in the senior secondary years, prior to our students entering further education, training and the work environment.

There is now a great deal of research and evidence that the world of work is changing dramatically and even faster than the leading experts could possibly have predicted. This report found that jobs can now be classified as fitting into one of 7 'clusters'.

[14] https://www.fya.org.au/wp-content/uploads/2016/11/The-New-Work-Mindset.pdf



One of the most revolutionary books on the new world of work, was ***'The Second Machine Age'*** by Erik Brynjolfsson & Andrew McAfee published in 2014. Kevin Kelly, senior maverick for Wired and author of What Technology Wants", wrote of this book that "Technology is overturning the world's economies, and The Second Machine Age is the best explanation of this revolution yet written." [*See an introduction to this book here*]

The co-author, Andrew McAfee was the Keynote Speaker at **ReImagiNation'16**, the ACS's major conference in Sydney recently.

In a brilliant presentation he acknowledged this reality when he spoke about the amazing leap forward in machine learning in 2016 when the program *AlphaGo* beat the brilliant world champion Go player, Lee Sedol, a development that no-one saw coming, and which demonstrates a very significant advancement in AI.

The predictions that at least 40% of existing jobs will be significantly impacted or replaced by 'machine learning' automation over the 10-15 years may prove to be a far too conservative estimate.

So what is the big deal with this ground-breaking research conducted here in Australia?

This research undertaken by FYA, using a special 'clustering algorithm', has found the over 1000 occupations in Australia can be divided into 7 job clusters, where the enterprise skills are very

similar such that someone employed in a specific job in a 'job cluster' can transfer to one of 44 other jobs in that cluster with the addition of only one (1) additional skill!

They discovered that there are some 13 transferable enterprise skills that all the jobs in 1 'cluster' share. ["In fact, on average, when an individual trains or works in 1 job, they acquire skills for 13 other jobs." – page 6]

The data also highlights some rather alarming trends. For example the demand for digital skills is up by 212% over the last 3 years yet over 27% of school leavers have low proficiency in digital literacy (let alone any digital skills that could be classed at the level of fluency or mastery).

Also the demand for critical thinking skills is up 158% (a skill set that can be dramatically improved through the effective use of digital technology).

But most importantly, the data indicates which job clusters have strong potential job growth and which are in serious jeopardy of being negatively impacted in a major way by the revolution in automation, digitalisation and globalisation that Erik Brynjolfsson & Andrew McAfee detail so well in their book.

Below is an overview from the research paper of the relative strength and weakness in terms of future job prospects for each of these 7 job clusters:

Exhibit 6: Which job clusters have the strongest future prospects?

Clusters	Growth and Automation	Future Prospect	Example jobs within the cluster that have strong future prospects (occupations grew 2010-2015 and risk of impact of automation is <70%)
'The Generators'	Job Growth (2010-15) 7.4% Affected by automation 45%	Moderate	ICT sales reps Retail supervisors Café or restaurant managers Call centre team leaders Entertainers & variety artists Hospitality managers Sports instructors Bank managers
'The Artisans'	Job Growth (2010-15) 5.6% Affected by automation 77%	Weak	Carpenters & joiners Landscape gardeners Electrical engineering technicians Mechanics Upholsterers Electricians
'The Carers'	Job Growth (2010-15) 18.0% Affected by automation 26%	Strong	General practitioners Nurses Podiatrists Dental technicians Health promotion officers Pharmacists Veterinarians Radio-graphers Physio-therapists Tour guides Beauty therapists Make-up artists Community health workers Massage therapists Cardiac technicians Anaesthetic technicians Childcare workers Special education teachers Fitness instructors Emergency service workers Psychiatrists Paramedics Surgeons Social workers Occupational therapists
'The Coordinators'	Job Growth (2010-15) 3.0% Affected by automation 71%	Weak	Receptionists Travel attendants Florists ICT support technicians Admissions clerks

Looking at which clusters appear to have strong future potential, they are **The Carers, The Informers**, and **The Technologists.**

With the exception of some of the occupations in The Carers job cluster, there is a very strong and clear emphasis on digital enterprise skills.

Our Proposal:

We believe that a Digital Literacy course needs to be mandated as a core subject for all Year 11 & 12 students in Queensland and that the QCAA needs to offer at least one course that can be classified in each of the three areas of Digital Literacy, Digital Fluency and Digital Mastery.

As a bare minimum undertaking then, we believe that the existing Applied ICT subject should be made a core subject, and that another subject offering is needed to meet the Digital Fluency classification.

It would also appear reasonable that students who choose a Digital Fluency or Digital Mastery subject would not need to enrol in the Digital Literacy course, but be given equivalent credit.

We also believe that all Secondary School teachers should be expected to demonstrate through RPL or some similar mechanisms, competency at the standard of the Digital Literacy level.

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