



The Australian Surveying and Spatial Workforce
A National Roadmap



**THE
SURVEYORS'
TRUST**

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Executive Summary

Workforce shortages for Surveying and Spatial related occupations have been looming for over a decade. Unless action is taken by the industry, the growing shortfall will continue unabated. While in the recent past various recommendations have been developed through workforce gap analysis reports (ACIL Tasman 2013 ¹, BIS Schrapnel 2018 ²), little coordinated and sustained action has been undertaken to progress associated implementation risks.

It is plausible that had a coordinated, structured plan been implemented at the time of the earlier workforce analysis, the current situation may have been avoided. This is not to criticise past decisions but rather to emphasise the **time for action is now**.

This call to action is further heightened by recent initiatives such as the Council of Reciprocating Surveyors Boards of Australia & New Zealand (CRSBANZ) National Standard of Competency for Surveyors being led by Michael Nietschke, the review of cadastral endorsement process by the Surveyors Board of Queensland, a review of the licensing system by the Surveyors Registration Board of Victoria, and the University-Industry Collaboration in Teaching and Learning Review led by Emeritus Professor Martin Bean CBE, former Vice-Chancellor of RMIT, and Emeritus Professor Peter Dawkins AO, former Vice-Chancellor and President of Victoria University. These initiatives and others set out in this paper, provide a platform for the industry to target its engagement and advocacy in taking forward the recommendations.

In recognising a critical need for action, the Surveyors Trust commissioned work to review and collate research of the Australian surveying and spatial sector workforce to have a better understanding of the landscape, issues therein and opportunities to inform a collective industry approach to address the workforce crisis impacting the surveying and spatial industry in Australia.

The objectives of the work include:

- A consolidated summary of industry workforce and skills gap analysis for the surveying industry and associated occupations (nation-wide) including:
 - Recommendations on how the industry should best address identified productivity risks associated with declining workforce and a narrowing of the skills pipeline; and
 - Terms of Reference for an industry group to address key risks.
- The basis for planning for a Workforce Industry Forum to be held in 2022.

To achieve these objectives the work has:

- Reviewed, mapped and analysed existing research relating to workforce and skills gaps associated with surveying occupations and associated occupations;
- Undertaken stakeholder consultations regarding involvement with previous research to better understand motivations and expectations;
- Identified common issues and gaps arising out of the research and feedback from stakeholders;
- Identified risks impacting workforce growth and related influences (including considering impacts and consequences);

¹ *The shortages in surveying, geospatial and technical skills projected for Queensland and Australia will require a very significant increase in domestic supply if dependence on net migration of skills is to be avoided. Extrapolation of our Queensland modelling results indicates that the Australia-wide shortfall of graduate or licensed surveyors would be approximately 1,300 in 2025, while the Australia-wide shortfall of geospatial specialists with University degrees would be approximately 500 in 2017 and 300 in 2025.* - Surveying and Geospatial Workforce Modelling; ACIL Tasman prepared for the CRC Spatial Information, July 2013.

² *The surveying profession is currently experiencing significant workforce gaps in key jurisdictions such as New South Wales, Victoria, Queensland and South Australia which will not be completely met from new supply or shifting employment from other jurisdictions.* - Determining the Future Demand, Supply and Skills Gaps for Surveying and Geospatial Professionals; BIS Oxford Economics for Consulting Surveyors National, 2018.

- Identified opportunities including:
 - current systems to support skills and career development solutions/options;
 - pivot points to change the direction and career pathways to strengthen career choices and upskilling, reskilling and cross skilling options;
 - opportunities to leverage career pathway options with associated industry sectors such as mining, ICT etc; and
 - identify learning and career pathways through cadetships, internships, apprenticeships, work integrated learning etc; and
- Provided recommendations for the development of a Terms of Reference to establish an industry roundtable for The Surveyors Trust to take forward key productivity and skills development initiatives.

The specific outcomes of the work are:

1. A consolidated review of published industry workforce and skills gap analysis for surveying and associated occupations (nationwide);
2. Identified limitations to building the skills pipeline including licencing arrangements etc;
3. Recommendations on how the industry should best address identified productivity risks associated with declining workforce and a narrowing of the skills pipeline;
4. Terms of Reference for an industry group to address key risks; and
5. Commencement of planning for a Workforce Industry Forum to be held during 2022 calendar year.

This paper advocates for the industry **to adopt a sustainable, holistic approach** to workforce planning and implementation underpinned by collaboration of a wide range of industry sectors and representative bodies. To fully address workforce capacity and capability needs, it is recommended that planning and program design be informed by long-term workforce development strategies and implementation building on evidence-based decisions relating to policy and regulatory frameworks, education and training pathways, workforce structure and economic development influenced by technology adoption, investment and global competition for talent. This paper recognises and commends previous efforts to address workforce issues³ and seeks to communicate the value of sustaining the momentum to realise long-term transformation.

The potential for the industry is immense and demands thinking and acting differently to current and old ways. The global workforce is highly competitive with increasing demand for data and technology skills across multiple sectors. In addition, the lack of access to cross border skills (interstate and international) due to COVID-19 border restrictions has meant a reset of how industry can access, develop and retain talent and the value of developing local talent.

³ There have been several workforce analyses and workforce recommendations presented to the sector that have either not been adopted across the sector or have not been maintained as programs (SEAC 2007,2008, ACIL Tasman 2013, BIS Oxford Economics 2017, Agenda2026, Space+Spatial 2030 Roadmap).

Guiding principles to address the workforce shortfall through planning processes and program design through:

1. Knowing what the problem is and forecasting possible impacts on the supply of skills;
2. Understanding clearly the factors impacting the workforce such as narrow pipeline of students, competition for skills across multiple sectors, decline in educational institutions delivering courses, profile of the sector and relationship with other sectors etc;
3. Designing a sector-wide and cross-industry workforce strategy comprising programs to attract and retain workers across the sector;
4. Developing a consolidated careers pathway that promotes the broad range of skills applied across the sector such as those commonly found in aligned sectors to enable cross-sector transition (into and out of);
5. Anticipating trigger points for when market conditions change, and programs need to be re-set; and
6. Supporting greater workforce participation by ensuring the workforce is diverse in terms of age, gender, culture, abilities, religion, location etc.

A key goal for the industry is to have **access to the right skills when and where needed**.

Understanding the pathways individuals take to make informed decisions to be part of the industry whether through traditional pathways via the educational and training path or experience-based from other related sectors, the approach needs to be inclusive to understanding the nature of the surveying and spatial workforce today and where it is likely to go into the future across technical and non-technical functional areas. It needs to re-frame the definition of occupations to incorporate the whole workforce and have in place an accompanying occupation taxonomy aligned to a national competency framework to which all stakeholders can refer.

Taking learnings from other industry sectors to understand professional development will assist in valuing diverse skills sitting outside the sector's current definition of occupations and will ultimately provide context needed to build talent pipelines in a non-linear way. Other sectors such as Cyber Security and Health Care have creatively explored ways to define their workforce which informed workforce development models⁴.

Ensuring there is a competent and experienced profession drives confidence from the public in the cadastre. The Surveying and Spatial industry are key contributors to supporting this level of confidence recognised by all levels of the profession from entry level to the highest ranks of the profession as a Licensed Surveyor. Keeping focus on evaluating and improving (continuous improvement) the education, training and accreditation system to meet the needs of industry and society is becoming more prevalent as the composition of modern workplaces change as well as the legislation impacting not only the cadastre but technology, big data and industrial relations.

As previously noted, this paper is a synthesis of other work conducted on skills development and workforce analysis presenting a national way forward.

This paper refers to associated occupations as "Spatial" and is to represent Geospatial and other terms used across the sector. There are references throughout the paper that use the term "Geospatial" which is reflected based on the source. This is to be interpreted as relating to "Spatial.

⁴ Thinking Across Stovepipes: Using a Holistic Development Strategy to Build the Cybersecurity Workforce, The George Washington University, 2011

A coordinated and structured roadmap for action is recommended (see diagrams 1 to 3) with the following initiatives to be taken forward within an evaluation framework to measure impact linked specifically to the Terms of Reference for the Taskforce and planning for The Surveyors' Trust planned Workforce Industry Forum.

Recommendations

1. Led by the industry, formalise a national **Surveying & Spatial Industry Workforce Taskforce** to shape workforce development programs, influence skills investment, evaluate impact and ensure continuity. The Taskforce should represent the ecosystem of stakeholder groups underpinning skills development, employment and licensing of professionals across the workforce. It needs to drive a program of work that aims to achieve goals and report back to industry its performance. Its primary focus should be on workforce capacity and capability issues not industrial issues. Ensure the Taskforce is aligned with all industry-related workforce development initiatives including Space+Spatial 2030 Roadmap.
2. Led by the Taskforce and supported by Industry (including associations), conduct biennial **Environmental Scans** to understand the problem, forecast peaks and troughs in workforce demand, evaluate the skills pipeline and anticipate changing market conditions that will impact productivity and access to skills. Importantly this is to enable evidence-based decision making and must inform programs and support industry in its planning, provide information to better inform government advocacy and profile the breadth and depth of the industry.
3. Led by the Taskforce, develop a national **Surveying & Spatial Competency Framework** integrating jurisdictional requirements and mapped to CRSBANZ national surveying framework (in development) and jurisdictional frameworks to support greater harmonisation and clarity around skills needed throughout the workforce.
4. In consultation with Industry develop a **Taxonomy of Occupations** to give definition to job families, functions and tasks across the surveying and spatial workforce aligned to the competency framework. Incorporate ANZSCO and industry defined occupations.
5. Led by the Taskforce, develop a **National Skills and Career Pathway** to help inform and influence career choices and provide greater visibility with education and training pathways into the industry. Undertake a national audit of courses offered across School, Vocational Education and Training (VET), University, and Industry certifications (peer review, micro credentialing etc).

Wherever possible it is recommended that all program design and delivery within the framework is undertaken by existing organisations. This is to support a **rationalisation** of representative bodies and to avoid confusion resulting in disaggregation of effort and dilution of funds better used to support skills development programs.

This paper is working off the hypothesis that the industry has and continues to experience skills shortages and in the absence of addressing the problem differently, the problem will remain unchanged.

In most consultations conducted in raising this paper, the vast majority of stakeholders identified there was a problem but could not articulate the solution apart from the need to diversify the workforce and drive more students into University programs. Indeed, in some cases, there were some disputes around the perception of the skills shortage “problem”.

The five (5) recommendations listed above that form the basis of the roadmap aim to provide the industry with a framework to better inform workforce development program design, to drive greater confidence in the sector, greater transparency around resolving the problem and, hopefully, greater and better-informed, sector-wide workforce funding decisions aimed to invest in the current and future workforces.

These take forward the outcomes from previous research and reports and are consistent with emerging reviews and reports identified through the raising of this paper.

Recommendations

A National Workforce Roadmap

Developing a skilled and innovative workforce is key to a national Surveying and Spatial strategy to develop skills to meet the needs of industry and the community. This Roadmap provides a framework for workforce planning and program design that aims to encourage collaboration and consultation across the sector to **attract – train – retrain** the right workforce for the future.

The roadmap is based on a key set of underpinning tenets identified through consultation with stakeholders.

The tenets to guide the development and implementation of a workforce strategy are:

1. Digital advancement is increasingly informing how surveying and spatial industry function – adapt or die.
2. Have in place a national workforce strategy with jurisdictional context where relevant.
3. Competition for talent presents an opportunity to explore non-traditional skills pipelines.
4. Harmonised and aligned support will lead to increased inputs at school level.
5. Enhanced teacher training and professional development has a positive impact on learning.
6. Consolidation and collaboration are a means to an end and needs to be adopted across the industry.
7. Identify and align funding priorities to workforce needs over organisational requirements to create the greatest impact.
8. Workforce development is an ongoing priority to always receive full attention.
9. Industry needs to advise on skills needed in the workplace, which must be current and continually reviewed and reported against.

The below presents a high-level strategy for a national call to action to address workforce challenges being faced today and in the future.

Fundamentally, it aims to bring the industry together and remove silos to focus collectively on attracting, developing and retaining a current workforce and supporting career advancement.

What the industry needs to achieve a cohesive approach to workforce development is a new approach to planning to support education and training to meet the needs of industry, to build a work ready talent pipeline and to build confidence in the education and training system.

The below is the Roadmap which comprises:

Diagram 1: Five recommended programs that underpin the National Workforce Roadmap

Diagram 2: A Theory of Change map presenting a comprehensive description and illustration of the core issue, desired aim and how change can take effect driving a systemic change

Diagram 3: High-level overview on the recommended programs⁵

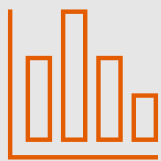
⁵ Detailed plans with budgets need to be developed for each of the recommended programs should there be agreement to proceed

SURVEYING & SPATIAL WORKFORCE ROADMAP

KEY PROGRAMS TO UNDERPIN A NATIONAL EFFORT TO INCREASE SUPPLY OF SKILLS INTO THE WORKFORCE

1. National Workforce Taskforce

Establish an Industry-led National Workforce Taskforce to lead a national strategy and evaluate impact.



2. Environmental Scan

Deliver biennial research on the state of the industry including analysis on elements impacting the workforce such as legislation, funding, technology, pathways.

3. National Competency Framework

Develop a national competency framework from entry level to executive. Map to relevant frameworks. Represent the whole workforce.



4. Taxonomy of Occupations

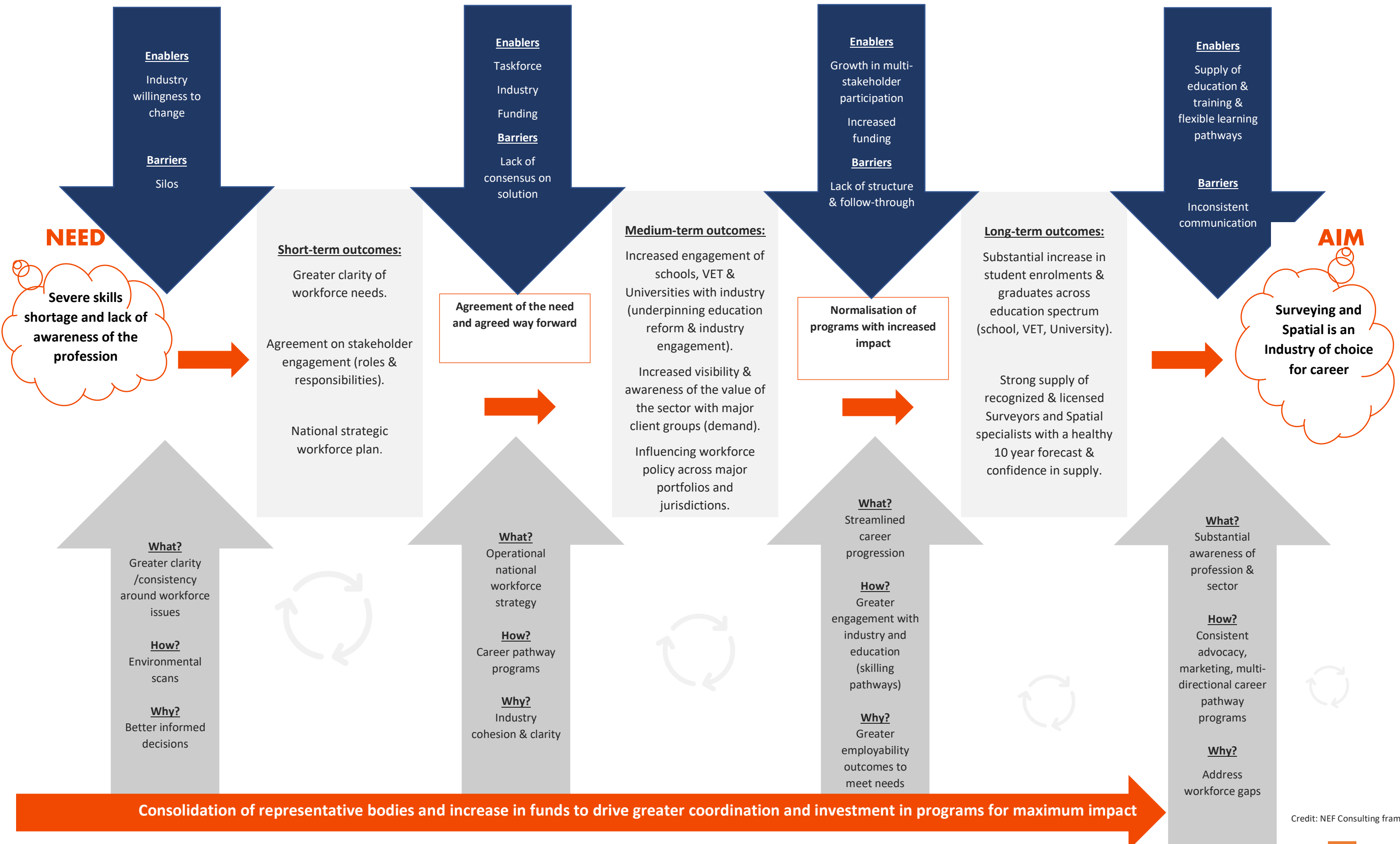
Develop a taxonomy of occupations across the surveying and spatial workforce. Include ANZSCO and industry defined occupations.

5. National Career Pathway

Develop a national career pathway which brings together multi-dimensional pathways. Map to the Competency Framework and Taxonomy of Occupations for relevance.



Diagram 2: A Theory of Change map highlighting outcomes from the current situation identified as skills shortage (Need) to where the industry needs to be with the Surveying and Spatial profession as a career of choice (Aim). This diagram is designed to present a consolidation of enablers, barriers and outcomes aligned to the five (5) programs presented in the **Workforce Roadmap**.



Credit: NEF Consulting framework

Diagram 3: **Surveying & Spatial National Workforce Development Roadmap – program of work**

INPUTS 1 Influences	INPUTS 2 Funding Sources	INPUTS 3 Stakeholder groups	OUTPUTS Programs	IMPACTS	OUTCOMES	EXAMPLES OF INTENDED AUDIENCES
<p>Surveying Legal Frameworks:</p> <ul style="list-style-type: none"> Legislation (State & Territory Surveyors' Acts) Regulation Policies <p>Intergovernmental Organisations (policies, standards, programs & use of location data/tech):</p> <ul style="list-style-type: none"> Australia New Zealand Land Information Council ANZLIC Intergovernmental Committee on Surveying and Mapping ISCM Council of Reciprocating Surveyors Boards of Australia & New Zealand CRSBANZ (mutual recognition) Geoscience Australia <p>Education & Training (legislation, policy, funding, frameworks, accreditation, standards):</p> <ul style="list-style-type: none"> National Skills Commission (NSC) Australian Skills Quality Authority (ASQA) Victorian Registration & Qualifications Authority (VRQA)* Training Accreditation Council (TAC, Western Australia)* Tertiary Education Quality Standards Agency (TEQSA) Australian Curriculum Assessment and Reporting Authority (ACARA) <p>State & Territory Education & Training Legislation & Standards (funding, accreditation, qualifications, curriculum)</p>	<p>Governments:</p> <ul style="list-style-type: none"> Federal/State & Territory Government Departments of Education & Training Industry specific departments Economic Development (trade and investment) Industry Development (Space, Infrastructure etc) Program Delivery <ul style="list-style-type: none"> School to work STEM Diversity inclusion <p>The Surveyor's Trust:</p> <ul style="list-style-type: none"> Program funding <p>Industry sponsorship of programs:</p> <ul style="list-style-type: none"> Career pathways School skills pathway programs STEM programs Diversity programs <p>Industry representative bodies (20):</p> <ul style="list-style-type: none"> Associations Institutes Societies 	<p>Employers</p> <p>Employees</p> <p>Students & Graduates</p> <p>Intergovernmental Organisations:</p> <ul style="list-style-type: none"> ANZLIC ICSM CRSBANZ <p>State/Territory Regulators & Statutory Authorities:</p> <ul style="list-style-type: none"> Surveyor-Generals Surveyor Boards <p>Industry Associations & Professional Institutes</p> <p>Funding bodies such as:</p> <ul style="list-style-type: none"> The Surveyors' Trust <p>Skills and career pathway organisations including:</p> <ul style="list-style-type: none"> A Life Without Limits Destination Spatial Queensland SheMaps Get Kids into Survey Government Departments <p>Education & Training providers & Curriculum developers & Assessors including:</p> <ul style="list-style-type: none"> Schools Vocational Education & Training Universities Industry Training (CPD/training) SSSI CSN 	<ol style="list-style-type: none"> Establish an industry-led National Workforce Taskforce with representatives from key stakeholder groups (Input 3). Key deliverable is to implement the national Surveying & Spatial workforce strategy incorporating advocacy and undertake evaluation. Conduct biennial national environmental scans on the state of the industry. A point in time analysis of the surveying and spatial market, its ability to deliver on expected demand, status of the workforce, anticipated supply of skills with a 10-year rolling forecast, risks and recommendations/actions the Industry and the Taskforce can report against. Develop an industry relevant National Competency Framework from entry level (school) to PhD and licensed professionals aligned to the Australian Qualifications Framework (AQF), jurisdictional surveying competency frameworks, CRSBANZ Surveying Competency Framework and any relevant international Frameworks to support mutual recognition associated with skills migration. Wherever possible map the Framework to Government skills initiatives to support greater adoption of standards. Develop a Taxonomy of Occupations aligned to the industry occupational definition, the National Competency Framework, ANZSCO and the Australian Skills Classification, reflecting the whole workforce from entry to executive level. Develop a National Skills and Career Pathway bringing together all pathway programs (industry, schools, education & training, government, etc). The Pathways map should align to the National Competency Framework and Taxonomy to deliver consistent information to the market. 	<p>Clear leadership providing strategic direction. The Taskforce would oversee national initiatives (Outputs 2 to 5) and ensure relevance to sector growth, relevant legislation/policy and promotion of the sector and its professions.</p> <p>Truer understanding of the workforce to make informed decisions relating to program design, investment, policy and advocacy, industry focus.</p> <p>Clearer understanding of competencies required across the workforce to support all stakeholders from employers, employees, students and education, and training providers to develop skills relevant for the workforce.</p> <p>Clearer awareness of job types, functions and occupational definitions and position descriptors across the workforce.</p> <p>Greater access and transparency around multi-dimensional pathways into the surveying and spatial workforce.</p>	<p>Present a unified voice representing the industry. Clearer understanding of the value of the sector and its workforce. Creating greater visibility of the sector.</p> <p>Greater recognition of the industry, its value to the economy and society and opportunity for career development.</p> <p>Defined pathways, sector-wide workforce and occupational definition, greater visibility of professions and breadth of skills needed for the workforce.</p> <p>Increase the profile of the sector to attract and retain more skilled workers throughout their working life.</p> <p>Evidence-based workforce planning and program design bringing together all 5 outputs.</p>	<ul style="list-style-type: none"> Employers Intergovernmental organisations Regulators National & State/Territory Industry Associations Professional Institutions Education & Training providers State and Federal Government agencies <ul style="list-style-type: none"> Employers Intergovernmental organisations Regulators National & State/Territory Industry Associations Education & Training providers State and Federal Government agencies Research and Development <ul style="list-style-type: none"> Employers Recruitment organisations Education & training providers Curriculum developers Parents Career advisors National & State/Territory Industry Associations Professional Institutions Students Career changers Government agencies <ul style="list-style-type: none"> Students Parents Career advisors Education & training providers Employers Career changers <ul style="list-style-type: none"> Employers National & State/Territory Industry associations Professional Institutions Education & Training providers Government policy

* Victoria & Western Australia did not cede their powers to the Commonwealth and retained their regional registration and accreditation powers

Background

The Surveyors' Trust recognises it is critical to address workforce shortages for Surveying and Spatial related occupations. Unless action is taken by the industry, a continuing and significant shortfall will be entrenched. The Trust therefore commissioned work to review and collate research on the Australian Surveying and Spatial sector workforce. This work is intended to provide a better understanding of the landscape, issues and opportunities to inform a collective industry approach to address the workforce crisis impacting the surveying and spatial industry in Australia.

The Australian surveying and spatial industry is experiencing significant growth underpinned by the growth in demand for location data across most industry sectors of the economy including emergency response, infrastructure, government, defence, health, agriculture, environment, building and construction.

Forecasting suggests the industry's high number of mature-aged workers (cadastral surveyors) are approaching retirement with a narrow pipeline of professionals on track to be licensed. This comes at a time of unprecedented investment in infrastructure with the Australian Government investing \$110 billion over ten (10) years from 2021-22 in land transport across Australia through its rolling infrastructure pipeline, \$1.8 billion South East Queensland City Deal along with a further forecast \$8.1 billion quantifiable economic and social benefits for Queensland and \$17.61 billion for Australia due to the 2032 Olympic Games⁶.

(U.S.) The National Geospatial Advisory Committee in its workforce development paper, 2012 recommended the following that could apply today in the Australian market:

Advancing the Nation's geospatial workforce will result in a set of benefits where⁷:

1. Public awareness of geospatial technologies and their applications are raised, and better connections are built between the geospatial industry and diverse populations of potential workers;
2. Public and private organisations can build partnerships with educational institutions at all levels to create effective and efficient geospatial training and education, and recruitment programs;
3. Commercial, academic, non-profit organisations, and all levels of government use a complementary set of geospatial competencies to support systemic geospatial learning and development of training and education programs and curricula;
4. Effective and compelling public outreach programs and informational materials about the geospatial profession are distributed through geospatial professional organisations and existing education and information channels; and
5. A set of skills standards describe the kinds of workers needed to support the industry, improve employee recruitment and selection, and advance of geospatial technology.

The nature of the industry as it relates to Cadastral Surveying, a regulated occupation, does present certain considerations to ensure the integrity of the professional adheres to relevant jurisdictional Acts where work is undertaken. Ensuring the regulatory environment reflects emerging technology

⁶ KPMG June 2021 Brisbane 2032 Olympic and Paralympic Games, Preliminary economic, social and environmental analysis Summary Report

⁷ NGAC Geospatial Workforce Development – a compendium of whitepapers focused on advancing geospatial workforce development. National Geospatial Advisory Committee, 2012

impacting the modern workplace will be a critical element to open up the workforce, maintain relevance and present in an engaging and accessible way to those seeking to build and or change careers.

The consistent message throughout decades of workforce analysis relating to the Surveying and Spatial sector is that a workforce or skills crisis is imminent. This is evident not only in Australian-based papers but can be found in workforce papers produced in the United States and Europe that relate to local environments.

As highlighted by the International Federation of Surveyors (FIG) Commission 2, there is a growing trend in recent years, particularly in English speaking countries, of a declining population of surveyors and the need to attract promising young surveyors into surveying (Frank, 2010)⁸. FIG goes further to recognise that with the rapidly changing surveying profession, it is a continuous challenge to maintain a system of standardisation with regards to education and training.

It is recognised that the Surveyors Board's primary function across Australia is to oversee the licensing and registration of surveyors. The registration of surveyors includes the assessment of competence of the applicants for registration across a range of surveying disciplines including Land/Cadastral, Engineering and Mining. Hydrographic surveying certification is administered by the Surveying & Spatial Sciences Institute (SSSI) through an internationally recognised certification.

The time for evaluation of the system is ripe for change with various initiatives underway including three Surveyors Board' (Surveyors Board Queensland, Surveyors Registration Board of Victoria and ACT Office of the Surveyor-General and Land Information) undertaking a review of licensing arrangements to increase the number of candidates progressing through the system to full licensing.

Has the regulatory environment kept pace with the change of adoption of technology? How will digital transformation impact accreditation and what measures are in place to ensure currency in curriculum and learning pathways to reflect modern workforces? Is the education and training system able to meet future demand in a changing environment? Certainly, the challenges associated with skills gaps is being experienced across the economy and will only squeeze the market as competition for talent increases. Specific to the Surveying sector is the need to be agile to compete for skills whilst balancing the compliance requirements associated with regulation, legislation, policy, the need for funding and impacts related to the rapidly changing market conditions resulting in increased pressures on productivity output.

The question for consideration is how far does the industry need to go to open pipelines and recognise valuable skills for the industry? How deep is the appetite to facilitate change by evaluating and addressing the symptoms in a different way?

⁸ https://fig.net/organisation/comm/2/workplan_19-22.asp

Report Outcomes

In addressing The Surveyors' Trust objectives (see pages 5 and 6) the following outcomes are contained within this paper:

1. Provide a consolidated review of published industry workforce and skills gap analysis for surveying and associated occupations (nationwide).
2. Identify limitations to building the skills pipeline including licencing arrangements etc.
3. Provide recommendations on how the industry should best address identified productivity risks associated with declining workforce and a narrowing of the skills pipeline.
4. Provide Terms of Reference for an industry group to address key risks.
5. Commence planning for a Workforce Industry Forum to be held during 2022 calendar year.

Methodology

This paper is informed by an extensive literature review and one-on-one consultations with stakeholders representing public/private, small to large enterprises, industry associations, education and training providers, statutory authorities and intergovernmental bodies.

Consultations were conducted with over forty-five (45) stakeholders from late November 2021 to early March 2022. Feedback was sought on previous workforce analysis, issues confronting business regarding workforce challenges, the perceptions of the profession and industry, identification of issues and possible solutions to address workforce shortages.

The literature review confirmed issues arising from previous research including forecasts of risks impacting the workforce. The outcomes of this literature review supported the findings of previous research.

This paper presents an independent perspective of the situation blending feedback from stakeholders and recommends a strategic roadmap to take forward initiatives to strengthen the workforce. It is presented for consideration and is to be further developed as programs of work are agreed, developed and taken forward.

The Opportunity for the Sector

Determining the size and economic contribution of the Surveying and Spatial sector in Australia is difficult given many of the services and value-add measurements are captured in other segments of the economy.

A study conducted by MarketsandMarkets of the Global Geospatial Analytics sector carried out in 2021 estimated the global geospatial imagery analysis market size is projected to reach USD37.5 billion by 2026 growing at a CAGR of 32.5% during the forecast period⁹.

A 2016 research paper by AlphaBeta for Google on the economic and social impacts of the global geospatial sector reported the following:

- Globally Geospatial services industry generated revenue of approximately USD400 billion;
- Digital maps supported over USD1 trillion of yearly sales for businesses;
- Potential employment directly linked to digital maps of over 4 million jobs direct and 8 million indirect globally; and
- Geo-services helped prepare for natural disasters with emergency response times decreased by 20% resulting in more lives saved¹⁰.

In 2012, Boston Consulting Group estimated that revenues driven by geospatial services were USD1.6 trillion in the US alone¹¹.

The critical need to grow the workforce has been presented in past workforce analysis and has established a profile with industry-led initiatives such as Agenda2026 and Space+Spatial Industry Growth Roadmap 2030¹². The changing nature of the workforce led by digital transformation is at the forefront of many industry sectors. Ensuring that the recognition and licensing of occupations is aligned to such transformation will help in opening up the workforce and recognise the value of technology as being fundamental to productivity outcomes.

Earlier reports identified through the literature review indicated that legislation and regulation informed the structure of required education relating to regulated occupations. **A key role for the industry is to develop its approach to advocacy to guide the regulatory environment in the interests of industry to ensure the availability of skills needed in the numbers needed at the location needed at the time needed.** These skills must be relevant to the economic and technical environments within which they will be practiced. A key impact in terms of the operational environment is the emerging influence of Industry 4.0.

⁹ MarketsandMarkets https://www.marketsandmarkets.com/Market-Reports/geospatial-imagery-analytics-market-221633264.html?gclid=EAlalQobChMIteO5j-yo9glVDZpmAh0LoQetEAYAiAAEgKgivD_BwE

¹⁰ AlphaBeta, The Economic Impact of Geospatial Services: How Consumers, Businesses and Society Benefit from Location-Based Information, 2017

¹¹ Boston Consulting Group (2012), *Putting the U.S. Geospatial Services Industry on the Map* <https://docs.google.com/viewerng/viewer?embedded=true&url=https%3A%2F%2Fmoodle2.units.it%2Fmod%2Fresource%2Fview.php%3Fd%3D34343>

¹² <https://2030spaceandspatial.com/>

The Surveying and Spatial Workforce

The literature review conducted for this paper revealed a consistent trend in analysis that points to a significant risk to the supply of skills should the issues not be addressed. In addition to the literature review, substantial consultation was held with a broad range of stakeholders who provided a breadth of ideas and views on priorities ranging from formalised advocacy arrangements for industry in decision making forums to specific areas of study such as STEM, to alternate views on the value of core and specialisation courses and qualifications for surveyors.

According to the Australian Government, Job Outlook, there were 17,700 Surveyors and Spatial Scientists in 2021¹³ of which 8,500 were Surveyors¹⁴. Five percent (5%) of the Surveying workforce is made up of women and an average workforce age of 39¹⁵. The Spatial sector referred to in Government statistics as “Other Spatial Scientists” reports a female workforce 34% gender share¹⁶. This figure is expected to remain at current numbers until 2025. As reflected by ACIL Tasman 2013, the data represented in Government statistics may not reflect the full size or diversity breakdown of the workforce given it relies on individual identification of occupation represented in the Census data and quarterly Labour-force reports.

In the October to December 2021 period the total Australian workforce experienced a 0.5% increase in employment and a decrease unemployment rate of 4.2%¹⁷. 26% of employers expect to grow their workforce over the next quarter (January - March 2022).

According to Alpha Beta, the tasks within Australian jobs are estimated to be changing by an average 18% every decade. Australians are predicted to spend 33% more time on education and training across their lifetime by 2040¹⁸. The challenge for the nature of learning is adapting to the pace of work and will apply throughout working life rather than post-school, pre-work. The AlphaBeta report goes further to suggest much of the additional learning will occur later in life as workers reskill in response to job changes and upskill in response to changes in the tasks within their jobs. **For most people the extra training will not be all about more years at University or TAFE (institutionalised learning), rather extra learning will occur at work through on-the-job training and short flexible courses**¹⁹.

The Australian labour market has changed significantly with increased focus on high skill level jobs, non-routine, and services. The growth in the demand for Science, Technology, Engineering and Maths (STEM) skills has contributed to further development of innovation applied across many industry sectors. As presented by the National Skills Commission, over the 20-year period to February 2020, before the impact of COVID-19, employment in STEM occupations grew by 85%, more than twice the growth of non-STEM occupations (40.2%)²⁰. Professional, scientific, and technical services (where surveying and spatial occupations are included) rose by 106.2% to 601,500²¹ meaning the

¹³ ABS defined as the number of workers who self-report as their main job

¹⁴ ABS, Labour Force Survey (custom trend) for 4-digit occupations and 2016 Census for 6-digit occupations is presented. As the figures come from different sources, the 6-digit figures may not sum to match the 4-digit totals

¹⁵ <https://joboutlook.gov.au/occupations/surveyors?occupationCode=232212>

¹⁶ <https://joboutlook.gov.au/occupations/other-spatial-scientists?occupationCode=232214>

¹⁷ <https://www.abs.gov.au/statistics/labour/employment-and-unemployment/labour-force-australia/latest-release#data-downloads>

¹⁸ AlphaBeta (2019), Future Skills, pg 5

¹⁹ Ibid

²⁰ National Skills Commission, The state of Australia’s skills 2021: now and into the future pg 5

²¹ Ibid

opportunity for promoting a career within the sector provides optimism. However, competition to access skills will only intensify as demand for science-based, data-driven occupations increase.

The Surveying and Spatial Workforce Gaps

There has been a series of reports that have consistently forecast a skills shortfall for the industry. The **BIS Oxford Economics** Consulting Surveyors National 2018 report, *Determining the Future Demand, Supply and Skills Gap for Surveying and Geospatial Professionals* **forecast that the sector would experience a capability deficit at the national level unlikely to be filled by new supply from the educational system.** The report noted a workforce shortfall of over 600 surveyors and spatial scientists nationally by 2020 with specific concern regarding the anticipated exodus of licensed surveyors reaching retirement age.

ACIL Tasmin forecasted in its 2013 report that its modelling (extrapolating Queensland modelling to national levels) indicated that the **Australia-wide shortfall of graduate or licensed surveyors would be approximately 1,300 in 2025 and a shortfall for geospatial specialists with University Degrees would be approximately 300 in 2025²².** The report goes further to recognise the risks with the ceasing by education and training institutions of the delivery of surveying and geospatial degrees impacting the supply of local skills noting that the gap may need to be addressed by skills migration. However, the warning was clear the reliance on skills importation is not a long-term solution.

The strain of accessing skills is being experienced across the Australian economy, as impacts are felt from moving out of COVID-19 resulting in changes to the way we work, to the proliferation of technology underpinning digital transformation. (See *Attachment A* for a summary of the ACIL Tasmin and BIS Oxford Economics workforce reports scope and recommendations.)

The Surveyors Board Queensland during its 2021 industry consultation presented on the looming crisis of the supply of Cadastral Surveyors. Based on the current age profile of Queensland Cadastral Surveyors it is **anticipated that more than 30% will retire over the next five years.** This comes during a period of unprecedented demand given the 2032 Olympic & Paralympic Games, SEQ City Deal, large-scale infrastructure projects, growth in the housing market and recent impacts related to the floods.

Infrastructure Australia in its report *Infrastructure Workforce and Skills Supply* suggested **some shortages appear to be ongoing across the infrastructure workforce with specific concern to the surveying profession due to an ageing workforce and ill-defined career pathway²³.** Alarming, the Infrastructure Australia report goes further to indicate an increase in competition for skills across aligned sectors to deliver on public works infrastructure projects suggests a likely shortfall of 93,000 workers in early 2023 – a 48% higher than projected supply.

Having acknowledged the industry needed to address diversity in the workforce, representatives from eight (8) peak bodies across Australia and New Zealand collaborated to advance efforts to improve the diversity of the sector. The Space+Spatial Industry Growth Roadmap 2030 reported that in 2020 just 25% of the geospatial workforce was female sitting below the national average for STEM occupations²⁴. Known as the **Space, Spatial and Surveying Diversity Leadership Network**, the group conducted a survey in 2021 receiving over 1,000 responses. The first of its kind for the sector, it aims

²² ACIL Tasman, Surveying and geospatial workforce modelling, 2013

²³ Infrastructure Australia, Infrastructure workforce and skills supply, October 2021, pg 24

²⁴ Space, Spatial and Surveying Diversity Leadership Network, Strategic Plan 2021-2025, pg 2

to address diversity across the workforce referring to differences between how people identify in relation to their Aboriginal and Torres Strait Islander background, age, caring responsibilities, cultural background, disability, gender, sexual orientation, socio-economic background (Social identity) and their profession, education, work experiences, and organisational role (Professional Identity). Whilst the report findings have not yet been released, indications support existing data that female representation is substantially lower than that for the Australian workforce overall.

The competition for skills will only intensify which presents an opportunity and a threat. The opportunity is by way of building cross-industry collaboration to access and build relevant skills. The threat in terms of the competition to access talent will only intensify with industry sectors bidding for top talent. Whilst industry undertakes the strategies to source skills, the industry must reflect this in its strategy and career pathways programs.

The Australian **Information Communications and Technology (ICT) industry** has consistently reported significant skills gaps year on year noting the increased demand of digital technology skills and at time the lumpiness of demand. The Australian Computer Society (ACS) in its annual *Australia's Digital Pulse 2021* produced by Deloitte Access Economics reported the growth of ICT workers in 2020 reached 805,525 workers representing a 4.3% increase²⁵. The report goes further to indicate **key initiatives driving demand include the popularity of smart city initiatives across the country**, indicating that the global market size of the global smart city industry is set to double from USD411 billion in 2020 to USD821 billion by 2025. In Australia this is underpinned by the Standards Australia report *Australia's Smart Cities Standards Roadmap* incorporating at a project level smart cities projects including digital transformation of paper-based processes and a range of 'smarts' that include digital twins²⁶.

Given the anticipated competition for skills, there is a critical need for the surveying and spatial sector to explore **alternative flexible pathways** into the industry rather than traditional siloed approaches. In a paper produced by The Spatial Education Advisory Committee (SEAC) in 2008²⁷, recommendations were presented to tackle the limitations of narrow pathways into the sector. It recognised that the industry needed to address entrants to the sector across all levels rather than focusing on 'entry-level' participants to balance the spread of skills. The paper recognised that skills shortages are not only experienced at entry-level and recognised the looming crisis of mature-aged workers. It goes further to recommend that the industry would benefit from recognising **para-professional qualifications** to fill productivity gaps whilst creating avenues for workers to progress their careers.

It has been recognised that the current education pathways do not attract the numbers of students sufficient to meet the current and emerging needs of the workforce, particularly associated with cadastral surveying. This is a significant issue particularly considering the forecast number of Cadastral Surveyors set to retire over the coming years against the ageing workforce. In addition, the average time it takes for an undergraduate to become a licensed Cadastral Surveyor is on average up to 10 – 12 years which further compounds the issue. This is a significant amount of time during a young person's life which may account for candidates opting to not fulfil full licensing arrangements. As presented by the Consulting Surveyors National report, *"the rate of surveyors successfully obtaining a*

²⁵ Deloitte Access Economics, 2021, ACS Australia's Digital Pulse, Future Directions for Australia's Technology Workforce pg 1

²⁶ Standards Australia August 2020, Smart Cities Standards Roadmap pg 9

²⁷ Performance Growth, Spatial Education Advisory Committee (SEAC) 2008, pg 5

license is insufficient to match the rate at which licensed surveyors are expected to retire or leave the workforce”²⁸.

Currently, some regulators are seeking to address licensing arrangements to open the pipeline of candidates seeking registration. The Surveyors Board Queensland, Council of Reciprocating Surveyors Boards of Australia & New Zealand (CRSBANZ), the Surveyors Registration Board of Victoria and the ACT Surveyor-General and Land Information Environment Planning and Sustainable Development Directorate are currently evaluating licensing arrangements. (See Attachment B for an overview of Regulatory workforce initiatives led by authorities)

²⁸ Determining the Future Demand, Supply and Skills Gap for Surveying and Geospatial Professionals, BIS Oxford Economics for Consulting Surveyors National 2019

Transforming the workforce Industry 4.0

What impact will the Fourth Industrial Revolution have on the future workforce?

The Australian National Skills Commission recently conducted a review into digital skills in Australia compared to some international economies (Canada, New Zealand, Singapore and the United States) based on job listings and found that the fastest growing emerging skills in demand in terms of percentage of all job listings (which request them) are data and digital skills. The report anticipates that skills associated with engaging in the digital economy will continue to grow and be used 15 per cent more of the time within an average person's job in the next five years²⁹.

A study released by McKinsey Global Institute reports that roughly one/fifth of the global workforce will be impacted by the adoption of AI and automation by 2030. The report goes further to suggest that policy makers working with education providers and employers themselves could do more to improve basic STEM skills through the school systems and improved on-the-job training. A new emphasis is needed on creativity, critical and systems thinking and adaptive and life-long learning – there will need to be solutions at scale³⁰.

“These (digital) transformations, if managed wisely, could lead to a new age of good work, good jobs and improved quality of life for all, but if managed poorly, pose the risk of widening skills gaps, greater inequality and broader polarization. In many ways, the time to shape the future of work is now”

*World Economic Forum*³¹

The role of surveyors is changing drastically given the adoption of emerging technology. The International Federation of Surveyors (FIG) definition of Surveyor allows for the convergence of surveyor and spatial and the emergence of technology across the occupations. (See Attachment C for FIG definition of a surveyor.)

Within the Australian context, the National Skills Commission has recognised emerging occupations of which Data Analytics features including sub-categories of Data Analytics, Data Scientists, Data Engineers, Data Architects (see Attachment D). These emerging occupations feature within the newly formed Skills Clusters as a means for the Australian Government to provide clarity around skill definition across industry sectors.

Surveyors have always been strongly associated with the most modern ways of gathering and presenting data. The development of sensors leads to more detailed and accurate measurements providing innovative surveying tools and methods. Automation in workflow across all workforces and occupations allow us to work more effectively and to increased competitiveness.

The proliferation of smart cities across Australia has prompted focus from the ICT industry to take note. This is where the alignment of cross sectoral collaboration provides value in enabling greater

²⁹ National Skills Commission, March 2022, *Digital skills in the Australian and International economies*

³⁰ James Manyika, Kevin Sneider, McKinsey, AI, automation, and the future of work: Ten things to solve

<https://www.mckinsey.com/featured-insights/future-of-work/ai-automation-and-the-future-of-work-ten-things-to-solve-for>

³¹ World Economic Forum, 2018, Future of Jobs

skills transition across sectors. With smart cities, utilisation of advanced technologies such as sensor technologies, artificial intelligence and the IoT the opportunities to collaborate with aligned industry sectors to address workforce gaps will become more pronounced.

Where does the Australian market sit in relation to its global competitors regarding adoption and advances in Industry 4.0. Surveyor 4.0 (FiG) and Geospatial specialists are leading the way Industry 4.0 is being realised across economies. Industry 4.0 builds on the connected environment to deliver automation that transitions from the physical world to the virtual dimension³². This generation of technologies radically changes the way many traditional occupations function. It allows for greater utilisation of data and experiences through the augmented environment powered by artificial intelligence, big data analytics, simulations/digital twins and autonomous robots to name a few. It is giving a new meaning to productivity and therefore the workplace, it is transforming consumer behaviour and providing a level of precision to enable better informed decisions impacting communities and ultimately the services delivered through surveying and geospatial.

The co-dependency of surveying and spatial science (data/tech and its applications) as closely related fields is well established³³. Technology has turned data into an organic entity that breathes life into all segments of the economy and impacts all aspects of society. **The pace at which technology is growing is such that more consideration around how education and training structures keep pace with emerging technology will benefit the sector.** This challenge has been difficult and continues to allude policymakers and institutions on how to best approach curriculum and assessment which are relevant to the modern workplace.

It is increasingly important to understand the landscape where change is and will continue to take place.

As previously established, the Surveying and Spatial sector has interdependencies with other sectors such as digital/technology and the space industry. Significant technical capability is being enabled by these sectors along with the Federal Government's funding commitment into capability development as part of its Digital Economy Strategy 2030³⁴ and \$101.8M for digital skills and the Australian Space Agency's 2030 targets including the creation of an additional 20,000 space-related jobs by 2028³⁵.

The Intergovernmental Committee on Surveying and Mapping (ICSM) has produced a 20-year draft strategic vision for the Australian cadastre 2034³⁶. In its Work Plan, the ICSM outlines how cadastral systems will be further embedded in ***"our social and economic structures – playing a significant role in traditional land tenure, valuation and utility systems, and in the governance frameworks that stipulate how we develop, use and occupy land"***.

Ensuring that the workforce pathways supported by industry-relevant education and training along with industry mentoring and experience, are structured in such a way to enable transition to new technologies is critical to opening up the workforce.

Younger generations have a different relationship with technology. They have a deeper and more intuitive understanding of the value of technology and its applications. Promoting the use of technology is a way to attract younger generations into the sector. Ensuring inclusive approaches are taken to 'attract – train – retain' new generations will be core to building skills pipelines.

³² <https://www.azom.com/news.aspx?newsID=58235>

³³ Geospatial Science (Destination Spatial Queensland) <https://www.geospatialsience.com.au/explore/surveying-and-geospatial-science/>
<https://digitaleconomy.pmc.gov.au/>

³⁴ <https://www.industry.gov.au/data-and-publications/australian-civil-space-strategy-2019-2028>

³⁶ ICSM, Cadastre 2034, Cadastral Reform and Innovation for Australia – A National Strategy 2015

Efforts have been underway for some time to build digital skills across the nation with Commonwealth and State and Territory Government programs supporting skills development. The Information Communications and Technology (ICT) sector is supporting such initiatives fortified by the size of its workforce and user workforce communities such as health, education, public administration, etc. Given the proliferation of technology with the surveying and spatial sector, there is merit in collaborating with the ICT sector to share skills. The ICT industry in 2002/3 comprised 234,700 workers³⁷. In 2021 size of the ICT workforce was reported to be 805,525 according to the Australian Computer Society. Definition of occupations and industry recognised accreditation has played a significant role in building the technology sector workforce which has been planned and developed over two decades.

A recent article published in *Spatial Source*³⁸ on research conducted by Curtin University indicated that there is a need for the GIS profession to be a 'legitimate' field requiring formal recognition through a GIS accreditation. Further, the report indicates that there needs to be a stronger interaction between universities and industry that employ GIS professionals to ensure relevance in curriculum design and assessment.

Exploring alternative pathways as highlighted in the Nous Group *Review of the SRBV Licensing System: Issues paper 2021*, it was noted, *“alternative pathways may enable greater participation in the surveying workforce by professionals who take on surveying later in the career, regional and remote students and/or those who are more interested in a practical style of learning”*³⁹.

Thought leaders concerned with the impacts of a “Second Machine Age” (Brynjolfsson and McAfee 2014) or a “Fourth Industrial Revolution” (Schwab 2017) worry that many of today’s occupations may not be sustainable. In a widely cited research article, economist Carl Benedikt Frey and machine learning researcher Michael Osborne (2017) estimate that 47% of U.S. workers are at risk of “technological unemployment.” Of the 702 occupations Frey and Osborne analysed, *one of the most susceptible was Surveying and Mapping Technicians*. Frey and Osborne calculated a *96% probability that workers in that occupation will be displaced by automation in the coming decade or two*. Although Frey’s and Osborne’s research has its critics, their prognosis is generally consistent with a body of research by economists, tech leaders, and forward-looking historians who anticipate fundamental disruption of traditional employment by increasingly capable machines⁴⁰.

It is increasingly critical for the sector to remain relevant to attract and retain its future workforce. It must *be ahead of the curve by evaluating workforce trends impacted by digital transformation*. It needs to continually define occupations and competencies needed for the workforce of the future and in doing so, promote the sector to future generations as a sector of choice. Underpinning this is ensuring the education and training system from school to life-long learning is relevant, current and meets the needs of the workforce for greater sustainability.

³⁷ Australian Bureau of Statistics, Employment in Information and Communication Technology (ICT) <https://www.abs.gov.au/AUSSTATS/abs@.nsf/Previousproducts/6105.0Feature%20Article5Jan%202005?opendocument&tabname=Summary&prodno=6105.0&issue=Jan%202005&num=&view=>

³⁸ Spatial Source, January 2022, Investigating industry perceptions of GIS professionals <https://www.spatialsource.com.au/investigating-industry-perceptions-of-gis-professionals/>

³⁹ Nous Group, August 2021, Review of SRBV’s Licensing system: Issues Paper

⁴⁰ <https://gistbok.ucgis.org/bok-topics/competence-gist-knowledge-work>

Systemic Issues

The stakeholder consultation process revealed a series of systemic issues that inform the approach the sector takes to develop its workforce. **Key issues identified relate to the recognition of skills and where those skills come from often resulting in the exclusion of vocational educational pathways and recognition of cross-industry skills.**

The review undertaken by the Nous Group for the Surveyors Registration Board of Victoria (2021) presents a series of issues that highlight the limitations of the “system” including the limitation of Board accredited courses, confusion around the competencies graduates should have attained at the time of graduation, the lack of alternative education pathways outside accredited university courses that students can complete, risks associated with Professional Training Agreements (PTAs) and constraints related to supervisors in terms of numbers to meet required number of candidates as well as available time to dedicate to supervision, particularly as time pressures increase given the low numbers of cadastral surveyors ⁴¹.

Further corroboration of issues identified through industry consultation was highlighted in 2008 by The Spatial Education Advisory Committee (SEAC).

The traditional surveying discipline will continue to struggle to attract the number of new entrants it is seeking into university courses where the entry requirement for high level or advanced mathematics is present and fewer students in secondary schools are undertaking these courses. It goes further to recommend that the industry should actively encourage strategies successfully adopted in some other sectors that allow for short courses designed to sharpen specific skills required for various job roles and or tasks rather than full qualifications. Such programs may enable an experienced ‘generalist’ to fast track into and through a surveying course by passing a 4-year degree. This level of graduate would not be eligible for current licensing arrangements but would be productive within the workplace and would have opportunities for further development to attain full licensing.

Identifying and addressing systemic barriers will be needed to create more pathways options for people seeking to enter the industry. Recognising and adapting new pathways for registered surveyors from Vocational Education and Training (VET) to a form of registration will be needed as well as considering broader degree qualifications and flexible arrangements for assessing competence.

Diagram 4: presents the key systemic issues identified through consultation with over 40 stakeholders. More detail can be found in Attachment E.

⁴¹ Nous Group, Review of SRBV’s Licensing System: Issues paper, August 2021



KEY SYSTEMIC ISSUES

IDENTIFIED THROUGH STAKEHOLDER CONSULTATIONS

CONFUSION AROUND THE LANGUAGE

Nomenclature around and within the sector and its professions is confusing and for some stakeholders does not reflect the changing nature of the sector.

LACK OF REGULAR DATA ON THE STATE OF THE WORKFORCE

Generally, there is a lack of understanding of the state of the workforce and where the workforce comes from. Apart from the awareness of a lack of Cadastral Surveyors there was little knowledge of the state of the whole workforce. Previous reports have been excellent however little action was taken to address issues.

NARROW APPROACH TAKEN TO CAREER PATHWAYS

Recognition of career pathways is too narrow. It does not reflect the breadth of skills needed nor provide multi-dimensional pathways which would strengthen talent pipelines.

EARNING POTENTIAL NOT ATTRACTIVE

Salary is generally not commensurate with career progression which may push people out of the profession to sectors such as engineering or ICT.

OVER-REPRESENTATION OF THE SECTOR

There are over 20 industry bodies representing the interests of the sector which causes confusion and is a resource inefficiency.

NOT KEEPING PACE WITH TECHNOLOGIES

Some employers saw graduates as lacking the latest and, in some cases, relevant technology skills adequate to prepare for digital transformation such as the introduction of the digital cadastre (3D/4D).

EXCESSIVE AMOUNT OF TIME TO BE LICENSED

Significant length of time to be a licensed cadastral surveyor with average time of 10 years which is not in step with aligned industries resulting in a potential loss of talent to other sectors.

PRESSURE ON EMPLOYERS

During periods of significant growth, demands on employers to supervise graduates causes productivity strain. This is especially experienced with small to mid-size organisations.

LACK OF AWARENESS OF THE SECTOR

The sector lacks the profile needed to attract and retain the volume of students needed into the learning and career pathways through to completion and work integration.

CURRENCY OF WORKFORCE SKILLS

Recognition of skills for the workforce is not keeping pace with the needs of the workplace due to the linear approach to skills recognition by relevant authorities.

LACK OF NATIONAL COORDINATION FOR DEVELOPING RECOGNISED SKILLS

Interest was expressed in reducing the full-time degree from 4 to 3 years and introducing core and specialised programs validated by micro credentialing and/or shorter specialised credentialed courses to reflect the specific needs of the workplace.

LACK OF IMPACTFUL ADVOCACY

The sector needs coordinated advocacy relating to the workforce including ensuring relevant and recognised training and certification to meet the needs of industry.

As reported in the *Review of University-Industry Collaboration in Teaching and Learning* report (Bean, Dawkins 2021), there has been an increase over the last 15 years in the proportion of school leavers undertaking higher education as their primary pathway and a decrease in pathways directly into work and VET. **Pathways through the education system are not always linear** with many students taking a blended approach incorporating higher education degrees, VET qualifications and micro credentialling.

As steps are underway across the Australian education and training sector to address barriers it is opportune for the Surveying and Spatial sector to consider these policy reviews when considering the recommendations of this paper. This is underpinned by the recent Bean, Dawkins review which noted that Australia needs a more comprehensive, coherent and inter-connected tertiary education sector that makes better use of both VET and higher education⁴².

Whilst it is recognised that formal qualifications lead to a career path (linear), it is also important to communicate the value of skill sets as contributing elements to the profession by definition of job functions. The Space industry recently conducted a skills gap analysis released in 2021. The study established a space-related skills taxonomy specific to Australia aligned to job functions. The study examined current space-related skills and shortages, future skills requirements and potential training providers for those needs through the lens of the details and unique, three-tier **Australian Space Skills Taxonomy (ASST)**⁴³.

The surveying and spatial industry in Australia would benefit from a similarly structured skills or occupation taxonomy comprising job functions, skills sets and qualifications. The Skills Taxonomy will provide definition of workforce skills as quantifiable, tangible characteristics that form a person's ability to perform a task. The Taxonomy can assist in guiding employers, curriculum developers, teachers and trainers/educators on identifying specific and general skills in and for the workplace.

Other industry sectors have developed multi-dimensional career pathways supported by frameworks to guide greater workforce planning outcomes. The United Kingdom ICT industry in the late 1990's developed a single framework designed to support greater alignment of skills development. Launched in 2000, the **Skills For Information Age (SFIA)** has become the globally accepted common language for the skills and competencies for the digital world ⁴⁴ (see Attachment F).

⁴² Bean, Dawkins (2021), *Review of University-Industry Collaboration in Teaching and Learning*, pg 28

⁴³ SmartSat CRC, March 2021, Technical Report No. 5 Space Industry Skills Gap Analysis

⁴⁴ <https://sfia-online.org/en>

Leveraging Australian Education and Training Sector Reforms

It has been widely acknowledged that the current education and training pathways for the Surveying and Spatial sector are too narrow contributing to reduced student numbers able to transition into the workforce to meet the needs of industry. *As such the industry's ability to access the skills it needs, when it needs it and where it needs it is negatively impacted.* The provision of quality education and training needs to be able to meet the emerging needs of the workforce in multi-dimensional, non-linear ways.

Formal integration and recognition of workplace learning is considered a pathway priority and recognised within the Australia's education and training recognition of competence arrangements. Encouraging industry certification and recognised post-nominals and awards for experienced practitioners supports work experience and demonstrates life-long recognition of competence.

Efforts are underway across the Australian education and training system to strengthen the relevance of qualifications to industry needs across the economy.

Below represents some of the ***Federal Government initiatives*** underway designed to strengthen the connection between industry and the education and training sector to ensure workforce relevance such as:

1. Review of Australia's Vocational Education and Training sector (2019)⁴⁵
2. Australian Qualification Framework (AQF) review (2019)⁴⁶
3. National Skills Commission release of Australian Skills Classifications which presents occupational clusters along with core competencies⁴⁷
4. National Skills Commission release of 25 emerging occupations (2021)⁴⁸
5. Federal Government response to University-Industry Collaboration in Teaching and Learning Review (Bean, Dawkins Review, 2021)⁴⁹
6. NCVET Survey of Employers' Use and Views of the VET System (2019)⁵⁰ and subsequent establishment of Industry Clusters currently being established to enhance the role of Industry in the national vocational training system (April 2021)⁵¹

Vocational Education and Training (VET) and higher education must have clear and flexible entry and exit points, as well as pathways within and between, to allow students to mix and match the subjects they study to meet their education requirements as represented in the AQF review and the Bean and Dawkins review.

The World Economic Forum in its report on *Future Jobs 2020* reports that Australia ran 6th for attainment "Business Relevance of Tertiary Education" at 68.4% and "Supply of business-relevant

⁴⁵ The Hon. Steven Joyce, 2019, Strengthening Skills, Expert Review of Australia's Vocational Education and Training System https://www.pmc.gov.au/sites/default/files/publications/strengthening-skills-independent-review-australia-vets_1.pdf

⁴⁶ <https://www.dese.gov.au/higher-education-reviews-and-consultations/resources/review-australian-qualifications-framework-final-report-2019>

⁴⁷ <https://www.nationalskillscommission.gov.au/our-work/australian-skills-classification#occupations~2322>

⁴⁸ <https://www.nationalskillscommission.gov.au/25-emerging-occupations>

⁴⁹ Bean, M., Dawkins, P., University-Industry Collaboration in Teaching and Learning, 2021

⁵⁰ National Centre for Vocational Education Research, 2019. Employers' use and views of the VET system 2019. <https://www.ncver.edu.au/research-and-statistics/collections/employers-use-and-views-of-the-vet-system>

⁵¹ <https://www.skillsreform.gov.au/faqs/industry-engagement-faq/>

skills” at 59.7% for Australia’s relative performance on tertiary educational attainment and business skills⁵².

It is essential that industry is involved in leading and shaping skills and workforce policy and related frameworks to ensure relevance otherwise it risks being required to operate in a generic environment that may not meet the specific needs of the surveying and spatial industry.

Specific to the national Education and Training sector, is the opportunity for the Surveying and Spatial sector to leverage changes reflected in the Australia Governments review and recommendations handed down as part of the Australian Qualifications Framework (AQF) review to ensure it is fit for purpose (2019). These recommendations are to encompass the changing nature of work to ensure changes are reflected in the skills and knowledge that graduates need and the ways that providers deliver education.

The review considered new skills and learning methods to open the market to drive a more agile education and training system to reflect the changing demands of the workforce reflecting the need for reskilling and upskilling of the workforce to keep pace with digital transformation. As reported by the Business Council of Australia report in 2018, *employers prefer shorter, sharper education and training to supplement rather than replace a full qualification like a Certificate IV or a Degree*⁵³.

The review of the Australian Qualifications Framework (AQF) considered the following areas of possible change⁵⁴:

- Shorter form credentials including
 - Inclusion of skill sets
 - Shorter courses
- Inclusion of alternative paths into the AQF system via:
 - Foundation courses that are focussed on university admission or the provision of core skills such as numeracy and literacy
 - Massive Open Online Courses (MOOCS) that provide credit toward AQF qualifications
- Other shorter form credentials that have no specific relationship with the current AQF qualifications including:
 - Short courses (non-curriculum-based higher education and VET short courses)
 - Micro-credentials
 - MOOC’s that do not provide credit to existing qualifications
 - Professional and vendor courses such as ICT and finance courses

These shorter-form credentials provide work specific related discipline topics and would be supported by the industry related to it.

Following the review of the AQF, the Federal Government accepted the recommendations of the review relating to higher education and accepted the aims of the recommendations of the review in

⁵² World Economic Forum, Future of Jobs 2020, pg 69

⁵³ Business Council of Australia, [Future-Proof: Australia’s future post-secondary education and skills system](#), August 2018, pg 6

⁵⁴ Australian Qualifications Framework Review, 2019 <https://www.dese.gov.au/reviews-and-consultations/australian-qualifications-framework-review>

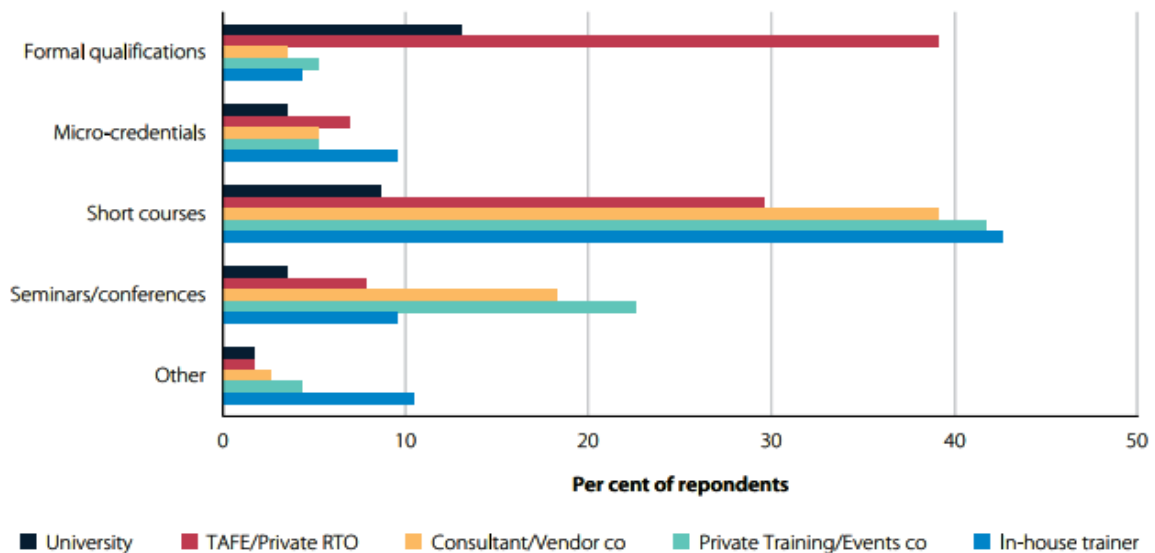
relation to vocational education contingent on further discussions with state and territory governments. The recommendations including the following:

- Senior secondary students can study subjects at school that count towards a vocational training qualification or university degree.
- Recognition of micro credentials to allow providers to offer short, highly targeted courses.
- VET and higher education to have clear and flexible entry and exit points, as well as pathways within and between, to allow students to mix and match the subjects they study to meet their education requirements.

The opportunity to change approaches and leverage current reforms with the reviews being undertaken across the Surveying regulatory bodies provides an ideal opportunity for change.

The below diagram, presented in the Bean, Dawkins report 2021 indicates a **lack of reliance from industry on higher education for upskilling due to a perceived lack of suitability of higher education offerings for use by industry**. The report goes further to say when it comes to reskilling, employers indicate a strong preference for short training durations. Nearly 70 per cent of Australian employers surveyed by the World Economic Forum in 2020 were seeking to reskill workers in less than six months. Therefore, a change of approach is needed to align what higher education provides with the changing needs of industry to create value for lifelong learners beyond the traditional model of a baseline qualification and some postgraduate study⁵⁵.

Diagram 4: The Australian Industry Group (AiGroup) 2021 surveyed responses to types of training and providers that industry intends to use over the next year. [Skills Urgency](#), pg 22



Source: Bean, M, Dawkins, P, 2021

⁵⁵ Bean, M, Dawkins, P, 2021, Review of University-Industry Collaboration in Teaching and Learning

There needs to be a program that endorses life-long learning and recognition of skills attained relevant to the work undertaken. Increasingly employers seek shorter courses for staff to apply their learning in the workplace.

The history of ebbs and flows around review and reforms in education and training strongly indicates industry's leadership is not a once off intervention but needs to be an entrenched, recurrent role including having a determinative capacity. This is an activity related to industry specific needs and the broader responsiveness of the education and training system to industry's current and future skill needs.

The National Workforce Roadmap

5 programs to address workforce shortages

The consolidation of literature review and consultations have led to a series of recommendations on how the sector should approach the issue of workforce development. As presented in Diagram 2 (page 12), given the various systemic roadblocks, adopting a change approach will support restructuring the way skills are developed and importantly, recognised across the workforce.

Should the recommendations be accepted, detailed program design should be undertaken within a monitor and evaluation (M&E) framework to review impact. *It is recommended that The Surveyors' Trust consider these programs as a base to fund initiatives to support the Surveying and Spatial workforce.*

Recommendations

1. Led by the industry, formalise a national **Surveying & Spatial Industry Workforce Taskforce** to shape workforce development programs, influence skills investment, evaluate impact and ensure continuity. The Taskforce should represent the ecosystem of stakeholder groups underpinning skills development, employment and licensing of professionals across the workforce. It needs to drive a program of work that aims to achieve goals and report back to industry its performance. Its primary focus should be on workforce capacity and capability issues not industrial issues. Ensure the Taskforce is aligned with all industry-related workforce development initiatives including Space+Spatial 2030 Roadmap.
2. Led by the Taskforce and supported by Industry (including associations), conduct biennial **Environmental Scans** to understand the problem, forecast peaks and troughs in workforce demand, evaluate the skills pipeline and anticipate changing market conditions that will impact productivity and access to skills. Importantly this is to enable evidence-based decision making and must inform programs and support industry in its planning, provide information to better inform government advocacy and profile the breadth and depth of the industry.
3. Led by the Taskforce, develop a national **Surveying & Spatial Competency Framework** integrating jurisdictional requirements and mapped to CRSBANZ national surveying framework (in development) and jurisdictional frameworks to support greater harmonisation and clarity around skills needed throughout the workforce.
4. In consultation with Industry develop a **Taxonomy of Occupations** to give definition to job families, functions and tasks across the surveying and spatial workforce aligned to the competency framework. Incorporate ANZSCO and industry defined occupations.
5. Led by the Taskforce, develop a **National Skills and Career Pathway** to help inform and influence career choices and provide greater visibility with education and training pathways into the industry. Undertake a national audit of courses offered across School, VET, University and Industry certifications (micro credentialing).

1. Establish a Surveying and Spatial National Workforce Taskforce

Output:

Establish an industry-led national workforce taskforce with representatives from key stakeholder groups. Key deliverable is to implement the national Surveying and Spatial workforce strategy incorporating advocacy and undertake evaluation.

Impact:

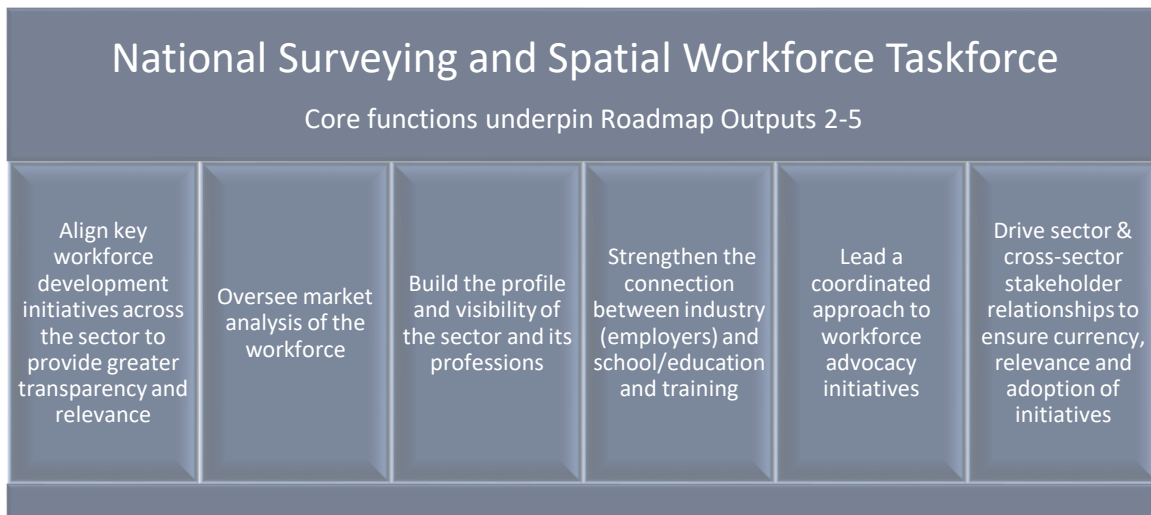
Clear leadership providing strategic direction. The taskforce would oversee national initiatives including biennial Environmental Scans, National Competency Framework, Taxonomy of Occupations and National Skills and Career Pathway. It will ensure relevance to sector growth, relevance to legislation, policy and impactful promotion of the sector and professions.

Establish a **Surveying and Spatial Surveying Workforce Taskforce** led by the leading Industry and Professional Associations (preferably 1-2 co-chairing) with participants from Industry (employers from both private and public sectors), education and training, regulators and governments.

The Taskforce is to take a leadership position on workforce initiatives and report back to Industry and other relevant stakeholders on deliverables, observations, issues and opportunities.

The Taskforce should not compete with initiatives already underway (such as [Agenda2026](#) and [Space+Spatial Industry Growth Roadmap 2030](#)) and wherever possible should collaborate with existing organisations to support consistency of message and aim to prevent duplication.

Diagram 5: The core functions for the National Surveying and Spatial Workforce Taskforce are included in the following diagram:



Suggested Terms of Reference:

The Overarching *aim* of the Taskforce is to drive stronger collaboration and consolidation of effort to support greater impact and value of money investments into workforce development programs and projects nationally.

The *objective* of the Taskforce is to deliver advice to industry, the education and training sector, governments and Surveyor Boards on the following:

- issues and opportunities impacting the Surveying and Spatial workforce
- key government policies that will impact the workforce (all three levels of Government)
- the design and implementation of workforce programs under the delegation of the Taskforce
- solutions to workforce issues impacting the sector
- workforce issues at a national level rather than a jurisdictional level

The *Scope* for the Taskforce is to include the following:

- gather data through nation-wide industry consultation and collect data from various sources including industry bodies on workforce trends (current and emerging), workforce under and over supply of skills
- consult with intergovernmental bodies
- oversee issues and solutions relating to the sector and not individual (person or company matters which would be deemed as a Conflict of Interest)

Membership for the Taskforce is to be diverse and comprise:

- Industry and Professional bodies
- Surveyor Boards
- Education and Training organisations
- Intergovernmental bodies

2. Surveying and Spatial Environmental Scan

Output:

Conduct biennial national environmental scan on the state of the industry. A point in time analysis of the surveying and spatial market, its ability to delivery on expected demand, status of the workforce, anticipated supply of skills with a 10-year rolling forecast, risks and recommendations/actions for the industry to take through the National Workforce Taskforce

Impact:

Truer understanding of the workforce to make informed decisions relating to program design, investment, policy and advocacy and support greater industry focus on issues.

Given recent economic conditions such as the impacts of COVID-19; recently announced large-scale infrastructure investments; rapid demands in building and construction; the availability of the 2021 Census data (to be released throughout 2022); and the consolidation of the provision of education and training across the country, there is value in conducting an updated **environmental scan** of the industry and impacts on the workforce (demand and supply).

The Report should provide a point in time assessment of the structure of the workforce, demands of labour and impacts relating to the supply of skills. It should be designed to be used by Industry as a snapshot on the state of the industry to set goals to prepare for and meet anticipated impacts of economic growth or contraction. There would be value in incorporating elements of previous reports into the scope and evaluate the nature of the workforce including measurements around full workforce attrition; current pathways through which people enter the industry at all levels of skill; and the progression of parts of the workforce from technical to managerial positions.

Such a report will assist in driving awareness of the industry; inform advocacy initiatives; drive greater collaboration between supply to meet the demand for skills to support the workforce coming into balance; and keep the industry informed of opportunities and risks to better prepare for workforce peaks and troughs.

To enable evidence-based decisions on workforce planning and development incorporating school-based entry to licensed professional pathways for the surveying and related occupations for the short, medium and long-term, the analysis should be regular with a medium-term outlook of ten (10) years and delivered every two (2) years to include:

1. *The current and emerging demands of the workforce at the broad with the mix of knowledge and skill required to meet demand including the following:*

- a. The growth of technology across the sector with considerations around the changing role of a surveyor and related occupations (spatial/geospatial).
- b. Required skills associated with technology adoption and skills required for regulated occupations including an evaluation of the shift in skill requirements in the workplace.
- c. Demographic trends and distribution of population, regional analysis, workforce attrition, ageing workforce and diversity.
- d. Analysis of legislation, regulation and policy associated with occupation and technology impacting skills and the workforce.
- e. Evaluate the issue of supply of skills – access to the level of skills when and where the skills are needed in the quantity needed.

2. *The current and emerging supply of skills for the workforce including:*

- a. Demographic, diversity mix and composition of the workforce incorporating regional analysis.
- b. Align supply of workforce to the demands of the industry.
- c. Qualifications and licensing pathways including current pathways, highlighting deficiencies and need for improvement to strengthen supply including the capacity of delivery channels.

3. *The current point in time and emerging structure of the workforce with considerations to efficiencies and effectiveness such as:*

- a. Productivity of the workforce and scope for improvement.
- b. Composition of the current workforce and recommendations to meet the needs of industry.
- c. Recommended mix of skills and pathways to fulfil operational performance with recommendations on how to improve.

4. *Sector-wide workforce planning and development structure for the medium to long-term including:*

- a. Structure of the workforce (current) including occupations with consideration to changing nature of occupations with the increasing use of technology.
- b. Government policies relating to the workforce and supply of adequate education and training to open-up skills pipelines.
- c. Funding for education and training and skills validation at all levels to meet the needs of employers.
- d. Impacts of technology and data related to the sector and its influences with workforce (supply).

The outcome of the environmental scan is to:

1. Provide information on the state-of-play of the workforce in light of economic and market conditions that will inform workforce planning and skills development for industry, education and training providers to prepare for greater coordination around developing workforces for the future.
2. Identify workforce skills needed across the industry and forecast the types of training needs.
3. Provide information on implications of workforce planning nationally and interjurisdictional impacts and risks if sector-wide workforce planning is not undertaken.
4. Identify ways for the sector including all aspects of the demand/supply of skills dynamic, to attract and retain skilled workers.
5. Provide greater context to inform policy and advocacy for the sectors workforce needs.

The report may be used to market the industry to **attract – train – retain** skills in the industry, inform workforce development programs, support the education and training industry to promote courses to increase enrolments and graduates, shape workforce advocacy initiatives and promote the value of the industry to attract more investment.

3. National Surveying and Spatial Competency Framework

Output:

Develop an industry relevant National Competency Framework from entry-level (school) to PhD and licensed professional level aligned to the AQF, jurisdictional surveying competency frameworks, CRSBANZ Surveying Competency Frameworks and any other relevant international frameworks to support mutual recognition associated with skills migration.

Impact:

Clearer understanding of competencies required across the workforce to support all stakeholders from employers, employees, students, education and training providers to develop skills relevant for the workforce.

Develop a **National Surveying and Spatial/Geospatial Competency Framework** along with the development of a taxonomy of occupations (see item 4).

According to the World Economic Forum, a Competency Framework is a collection of skills, knowledge, attitudes and abilities that enable an individual to perform job roles in a competent way. It is designed in tandem with a taxonomy of occupations to present a framework that aligns job classifications with the skills needed to operate competently.

The intrinsic value of having in place a Competency Framework and Taxonomy of Occupations for the sector is the **presentation of definitions and categories of job functions at all levels across the workforce that may be used by multiple stakeholders.**

As presented in the Report to the Institute of Surveyors Tasmania, *Industry Futures Project Review and Recommendations* by Dr Jon Osborn, 2021 and reflected in the recent Issues and Opportunities Paper for the Council of Reciprocating Surveyors Boards of Australia and New Zealand (CRSBANZ), January 2022, “*The importance of comprehensive and agreed competency standards and the importance of their primacy... leads to a clearer picture of how jurisdictional Boards may approach the task of training and assessing the competency of candidates...that will therefore facilitate mobility of candidates and practitioners if and when they move their candidacy from one jurisdiction to another*”.⁵⁶

Benefits of a Competency Framework aligned to job functions and taxonomy of occupations, enables a strategic approach industry workforce development. It provides transparency and presents to broad actors across the sector to enable them to make informed decisions on individual career choices, investments in training and education, recruitment of staff, procurement of services, evaluation of competencies aligned to experience and importantly, relevance to the workplace.

There are various competency models developed and used in international markets such as SFIA. Specific to the Spatial (Geospatial) sector is the U.S. Geospatial Technology Competency Model (GTCM) and competencies, and outputs for the geospatial technology industry (see Attachment G). The GTCM Competency Framework integrates the technical, analytical and interpersonal skills required for the geospatial workplace. One key consideration when designing the framework was the understanding the changing nature of jobs and work, the concept of ‘job’ is becoming obsolete. **In many high-technology industries, cross-functional project teams are common, and employees shift**

⁵⁶ Review of the National Standard of Competency for Licensed or Registered Surveyors affiliated with the Council of Reciprocating Surveyors Boards of Australia and New Zealand. Issues and Opportunities paper, Michael Nietschke, January 2022

from project to project. The cross-functional nature of work and the speed at which technology changes work tasks and responsibilities means a more flexible approach to workforce development should be taken⁵⁷.

Establishing a vibrant surveying and geospatial workforce requires determining the competencies that employers require. In other parts of the world, a competency-based approach for defining skills has been necessary in technology-based occupations such as surveying and spatial. Solving the workforce challenges faced in Australia requires a new approach in definition of occupations and skills, recognition of skills, licensing arrangements, use of technology, partnership between industry, education and government, and profile with the public.

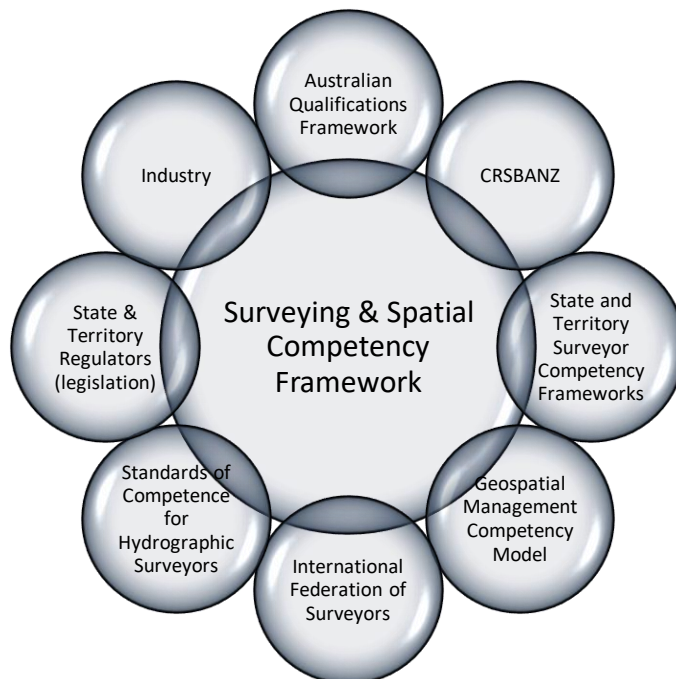
The basis of developing a Competency Framework is well established for the industry with various frameworks in existence but not linked to others. It needs to be mapped to the [Australian Qualifications Framework](#) to ensure relevance for stakeholders seeking regulated and government funded training programs.

As previously mentioned, CRSBANZ is undertaking the development of a Surveying Competency Framework which, when completed, would need to be mapped and incorporated into the broader Framework

This broader Competency Framework should comprise the following:

- Units of Competency which specify the standard of performance required in the workplace
- Assessment and licensing requirements
- Qualifications aligned to the AQF (Certificate I to Postgraduate/Licensed)
- Credit arrangements allowing for greater transparency for student transition from VET into higher education to professional accreditation and licensing

Stakeholder groups that will influence content in the broader Competency Framework is represented below in **Diagram 6**.



The broader Competency Framework may be designed to specify the skills, knowledge and required experience needed to perform effectively in the workplace and should relate to its user audience as follows in terms of influence and use.

⁵⁷ Building the Geospatial Workforce URISA Journal. Vol 15. No 1, 2003

The Competency Framework should be designed to benefit the stakeholder groups (user groups) as follows:

Students (school)	<ul style="list-style-type: none"> ▪ Explore career opportunities by job function, skills and tasks aligned to occupational groups and technology ▪ Select subjects to better prepare for career pathways
Professionals	<ul style="list-style-type: none"> ▪ Assess current skills and competencies ▪ Identify career pathways and set career goals ▪ Identify study pathways, courses, CPD, micro credentials ▪ Identify relevant industry certifications, qualifications and professional licenses etc ▪ Develop professional resumes aligned to profession ▪ Identify opportunities for career transition, exit and re-entry of the workforce
Line Managers	<ul style="list-style-type: none"> ▪ Support resource management and deployment ▪ Develop operational workforce risk management strategies ▪ Informed investment into training and certification (PD) ▪ Shape roles and position descriptions underpinned by defined skills and recognised accreditation where applicable
Industry Leaders	<ul style="list-style-type: none"> ▪ Greater transparency of industry workforce due to alignment of occupations, job functions and competency assessment ▪ Strengthen sector-wide workforce planning to prepare for workforce peaks and troughs by providing structure and meaning to roles and functions ▪ Support with planning for organisational transitions such as expansion, contraction, mergers and acquisitions
Human Resources Managers	<ul style="list-style-type: none"> ▪ Develop job profiles, position descriptions underpinned by consistent skill and skill level definitions ▪ Inform strategic workforce planning and development including talent attraction, retention supported by skilling, reskilling and upskilling ▪ Prepare for workforce attrition through consistent skills attraction strategies ▪ Strengthen employee engagement through career development
Education and Training Providers (internal and external)	<ul style="list-style-type: none"> ▪ Greater alignment of competency and skills profiles aligned to occupations and job functions which will support greater attraction of students and meet expectations of industry with skills attained from graduates ▪ Develop sector-wide recognised and endorsed learning catalogues with relevant delivery modes to meet the current and emerging trends across the workplace ▪ Develop industry recognised qualifications and certifications that meet the needs of industry to encourage greater uptake of students (enrolled and graduates) ▪ Align curriculum to industry/employer needs to improve employability for students
Procurement, supplier management and service providers	<ul style="list-style-type: none"> ▪ Drive greater visibility of professional accreditation associated with procurement of products and services ▪ Provide transparency around describing capabilities and the value thereof
Regulators	<ul style="list-style-type: none"> ▪ Support greater transparency of competencies to underpin workforce mobility and wherever relevant, skills and licensing harmonisation

Professional Associations and Industry Leaders	<ul style="list-style-type: none">▪ Ensure jurisdictional legislation is applied to the Framework▪ Create a framework that aligns standards and supports Codes of Ethics▪ Map competency levels to support membership levels and professional development (and recognition thereof)▪ Support the development of mapping qualifications, accreditations, certifications and career paths (school to licensed professional)▪ Create alignment with volunteering and professional development
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4. Taxonomy of Occupations

Output:

Develop a Taxonomy of Occupations aligned to the industry occupational definition, the National Competency Framework, ANZSCO and the Australian Skills Classification reflecting the whole workforce from entry-level to executive level.

Impact:

Clearer awareness of job types, functions, occupational definitions and position descriptors across the workforce.

Following directly on from the above, the sector would benefit from having a clear definition of occupations. A taxonomy of occupations needs to reflect the current and emerging occupations as well as align to the Australian New Zealand Standard Classification of Occupations (ANZSCO) and importantly reflect occupations defined by industry⁵⁸.

The Space industry embarked on an initiative as part of its workforce analysis to establish a space-related skills taxonomy specific to Australia⁵⁹. The SmartSat CRC undertook analysis of the Australian Space Industry and found that, similarly to the Australian surveying and spatial industry, no such taxonomy existed globally. Following extensive research, it was identified that there was no comprehensive job skills taxonomy for the space industry. As is the case for surveying and spatial occupations, most skill categorisations aligned to occupations were based on the (ANZSCO).

The purpose and value of a taxonomy of occupations is to ensure planning and advocacy use the same nomenclature that is clearly understood across the sector by all participants, emphasising specificity of language. A standardised language for describing the work performed by individuals, occupational taxonomies or classification systems fulfil three basic functions⁶⁰:

1. Underpin statistical information collection
2. Facilitate workforce analysis
3. Enhance career planning and job searching

The Australian Space Skills Taxonomy (ASST) was built on a three-tier hierarchy structure of space skills covering technical and business/governance related skills. These include technical skills; technology specific skills; business, management and governance skills; as well as soft skills relevant to the higher education, professional development, workforce development and vocational education sectors⁶¹.

As defined by the International Standard Classification of Occupations (ISCO), classifications of occupations or taxonomy of occupations, are used in national contexts for collection and dissemination of statistics from sources gathered in Australia by the Australian Bureau of Statistics. The Australian Government is building on its current gathering of data to include in addition to labour force statistics, data on job vacancy advertisement trends aligned to occupations.

⁵⁸ Australian New Zealand Classification of Occupations (ANZSCO) 2322 Surveyors and Spatial Scientists

<https://www.abs.gov.au/statistics/classifications/anzsco-australian-and-new-zealand-standard-classification-occupations/2021/browse-classification/2/23/232/2322>

⁵⁹ Smartsat CRC, March 2021, *Technical Report No. 5, Space Industry Skills Gap Analysis* pg 16

⁶⁰ Inter-American Development Bank, September 2018, *Occupations: Labor Market Classifications, Taxonomies, and Ontologies in the 21st Century*, pg 4

⁶¹ Smartsat CRC, March 2021, *Technical Report No. 5, Space Industry Skills Gap Analysis*, pg 8

The intrinsic value in having a taxonomy of occupations is it provides the basis from which people can identify with the industry through the occupations they hold. It is generally considered that breaking down job roles into required skill sets (defined through the Competency Framework) can allow employers to better understand viable job transition pathways based on the level of similarity in the skills required for different roles which will support more informed decisions regarding the reskilling and upskilling of workforces to help with transitions⁶². Leveraging existing frameworks to develop a taxonomy of occupations for the Surveying and Spatial sector will support relevance particularly with fast changing workforces.

Important with the development of the taxonomy will be anticipating emerging skills so ensuring consultation includes technology organisations to anticipate how job functions will be impacted by new digital transformation.

Aligning with global and national occupational standards will be important to support recognition of skills across borders under the Mutual Recognition Act and subsequent Automatic Deemed Registration.

The Content Model (diagram below) is one of many models designed to develop a taxonomy of occupations. It provides a framework that identifies key categories of information about occupations⁶³. It was applied to inform the development of the U.S Geospatial Technology Competency Model and provides a framework to leverage development for the Australia market (see Attachment G).

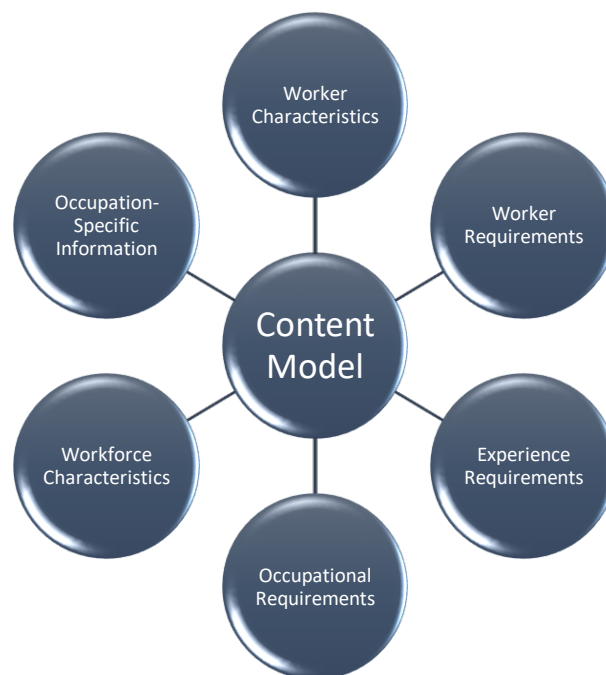


Diagram 7: An integration framework that identifies the most important types of information about work and integrates into a theoretically and empirically sound system.

Source: O*Net Content Model

⁶² World Economic forum, January 2021, *Building a Common Language for Skills at Work A Global Taxonomy*

⁶³ <https://www.onetcenter.org/content.html>

5. National Skills and Career Pathway

Output:

Develop a National Skills and Career Pathway bringing together and map all pathway programs. The pathways map should align to the National Competency Framework and Taxonomy to deliver consistent information to the market.

Impact:

Greater access and transparency around multi-dimensional pathways into the surveying and spatial workforce.

Careers in the Surveying and Spatial industry is a complex matrix of experiences including a combination of education and training, work, volunteering, community partnership and other community-based roles underpinned by several transitions with lifelong learning. This along with the disruption of technology and the growing competition for skills industry needs to provide greater support to attract and retain talent.

Within this dynamic environment people across all ages and experience need greater support to adapt to change and to make career decisions where opportunity presents itself.

This paper advocates for a consolidated **national skills and career pathway** aligned to the National Competency Framework and Taxonomy of Occupations. Skills and Career Pathways are connected systems of education and training programs that build upon one another to help a person enter and advance his/her career in an industry may be developed alongside the National Competency Framework and can take learnings from other industries such as the Mining sector (see the *Queensland Minerals and Energy Academy* Attachment H and the *Skills for Information Age* (SFIA) Attachment F and the Australian Computer Society Gateway to Industry Pathway Attachment I).

Skills and Career pathways should form the basis of strong and business-driven industry partnerships and be designed to support individuals interested in entering the Surveying and Spatial industry.

Ideally the pathways would include career options with decision points aligned to:

- School (Yr7-9)
- School (Yr 10-12)
- School to Vocational Education & Training
- School to University
- University to Registration
- Return to work or Industry (parental leave, personal leave, attrition)
- Retirement
- Career progression
- Industry transition
- Skills migration

Significant efforts have been undertaken by industry associations and operating companies to develop career and skills pathways that represent career progression (see Attachment J). They generally represent the learning pathways set out by institutions leading to the registration of a surveyor (cadastral, mining, engineering) and geospatial study. Whilst these pathways are essential to guiding career development, they may not explore multiple paths of entry into or within the industry. Innovation has led to unique program design for kids at school, for instance, Wavell State High School

collaborates with industry to drive school students into STEM subjects by leveraging technology (see Attachment K).

Employers are continually seeking creative ways to attract and develop the skills needed in the workplace, and in many cases are driving the need for change (see Attachment L for a case study from Veris Australia on professional development programs and Attachment M for innovative ways a small company, Land Solution Australia develops talent).

Shaping the pathway and recognised courses to adapt core and specialisations would provide more flexible options for those interested in the field but not quite certain it is their field of choice.

Recommended steps to develop a national skills and career pathway would include:

1. Conduct exploratory research about occupations and career pathways (wherever possible map to the Roadmap programs for context and relevance)
2. Explore pathways opportunities and needs with industry (employers)
3. Conduct education and training pathway analysis to understand under and over supply (leverage environmental scan data regarding gap analysis)
4. Maintain coordinated marketing and communications across the sector (accessible) via multiple channels
5. Have in place industry coordination led by the National Workforce Taskforce

As previously mentioned, the career decisions people make can differ leading some who may not choose to progress from Surveying degree directly from school but may choose a career pathway with aligned sectors.

The industry (employers and industry bodies) has developed various skills pathways which forms a strong base for further development and consolidation, for instance:

- [GIS for Schools](#) (Esri Australia),
- [SheMaps](#),
- [A Life Without Limits](#),
- [Destination Spatial](#)
- [Get Kids Into Survey](#)
- Veris Australia Young Professional Program

Bringing together these and other career development programs into a single framework will help to promote opportunities for those seeking to make career decisions.

An example of industry-led program is the [Esri GIS for Schools](#) program which brings together industry leading software to K-12 schools across Australia. The program provides GIS technology into schools to help young people become familiar with GIS technology and its applications across many diverse areas of professions. The value in this type of program is to build awareness of location data through technology to help the use of GIS technology across various disciplines of science-based occupations. This along with the promotion of STEM subjects within the school system aims to increase the size of school-aged children entering surveying and spatial related disciplines.

To date, the Esri GIS for Schools program is delivered in 1,200 schools and over 50 Universities throughout Australia.

A national skills and career pathway should include occupations under job families, competencies (including mapping to jurisdictional competencies for Surveyors) including skills definition, and map to articulated career pathways including vertical and horizontal pathways.

Key features to include in the career pathways should include:

- Connect and articulate the full range of K-12 curriculum, higher education and qualifications, industry training and certification, professional licensing with seamless transitions between levels.
- Present multiple entry and exist point to make it easy for individuals to commence, stop and re-enter education and training throughout their working life.
- Embed stackable industry recognised credentials (recognising industry/professional certification).
- Present work as a central context for learning through on-the-job training, apprenticeship/cadetship, work-based internships, mentorships, and other channels.
- Promote accelerated education and career advancement through assessment of prior learning and experience, integrated “basic” education and technical training.
- Present integrated supports across the sector such as diversity inclusion programs, school and teacher support, experience, career advice, coaching, career transition advice.

The effectiveness of these features will be impacted by industry’s success in working with the education and training system to be more responsive to industry needs in terms of content, responsiveness and flexibility.

Fundamental to a National Career Pathway is that it represents a **whole-of-system career support model** and should be led by the National Workforce Taskforce:

Career Pathway to include the following elements

	Represents lifelong learning
	Relevant to the sector and reflects emerging trends
	Connected to the community via relevant networks and channels
	Presents current information
Focuses on empowering people through their skills development and career decisions throughout	life’s changes
	Accessible information for people of all ages, abilities, diverse backgrounds

Conclusion

Observations gained through the development of this paper indicate that the greatest risks associated with the sector's ability to address workforce issues relate to a lack of sustained coordination and a disaggregation of funds to support long-term program delivery due to silos and over representation.

Wherever possible, it is recommended that programs support a **rationalisation** of program ownership to drive the greatest impact and that The Surveyors' Trust funds projects that fit within the recommendations of this paper to drive greater collaboration which is overseen and evaluated by the Workforce Taskforce. The value of greater rationalisation would include:

1. Targeted effort to address issues and support opportunities for the industry (professionals, employers and suppliers)
2. Ensure concentrated effort is maintained and achieves greater impact
3. Increase the profile of the industry through greater coordination and unified messaging
4. Drive sector-wide development and endorsement of standards
5. Reduce the number of industry bodies that organisations and professionals feel compelled to join to consolidate program investment and achieve greater return on investment
6. Enable targeted advocacy and influence over workforce policy
7. Support greater cross-industry collaboration to access relevant skills

The time for action is now and timing is critical. The Surveying and Spatial sector has an opportunity to leverage national efforts to improve the quality of training and education. Increasing the supply of talent is an immediate priority and must leverage non-linear pathways into the sector. Ensuring the sector has in place agreed positions around the recognition of skills for harmonisation of competence is encouraged and an industry-led provision of training and education is the only option.

The Author would like to thank the contributors to this paper and recognise the volunteers whose ongoing support and belief in the sector knows no bounds.

ACIL Tasman and BIS Oxford Economics Workforce and Skills Gap Analysis Reports

Scope and Recommendations Summary

<p>ACIL Tasman Report prepared for the CRC for Spatial Information and Spatial Information Services, 2013 “Surveying and Geospatial Workforce Modelling. Potential Skills Gap Analysis for Queensland in Particular with Estimates Extrapolated up for Australia”</p>	<p>BIS Oxford Economics Report prepared for the Consulting Surveyors National, 2019 “Determining the Future Demand, Supply and Skills Gap for Surveying and Geospatial Professionals”</p>
<p>Region: Focus on Queensland with estimates for Australia</p>	<p>Region: National</p>
<p>Scope: The objective of the study was to develop forward skill estimates that: Demonstrate that the surveying/geospatial industry has undertaken an in-depth analysis of its future skills needs Can be used to support the surveying/geospatial industry bids for Commonwealth/State funding for skills development assistance Allow the surveying/geospatial industry to consider strategy/action options for the development of its workforce Form the core of the surveying/geospatial industry’s workforce development strategy</p>	<p>Scope: Similar to previous research, the aim of this update is to: Estimate the size of the surveying and geospatial professional workforce in 2017/18 based on the most recent Census and labour market data Forecast skills demand for the profession based on the outlook of the industries serviced Compare the demand forecast for skills against the outlook for the existing workforce to identify potential workforce gaps by state and national level Contrast any measured workforce gaps against the outlook for new skills supply through university and TAFE graduates, which will identify any potential capability shortfall for the profession over the coming decade (2017/18 – 2027/28) Highlight the implications of the results for the profession and the broader economic impact, especially if measured capability gaps were to materialise</p>
<p>Key Findings: “The shortages in surveying, geospatial and technical skills projected for Queensland and Australia will require a very significant increase in domestic supply if dependence on net migration of skills is to be avoided.</p>	<p>Key Findings: “Critically, this report finds that surveying and spatial scientists will be in a capability deficit position at the national level for the next five years to FY2023... The surveying profession is currently experiencing significant workforce</p>

<p>Extrapolation of our Queensland modelling results indicates that the Australia-wide shortfall of graduate or licensed surveyors would be approximately 1,300 in 2025, while the Australia-wide shortfall of geospatial specialists with university degrees would be approximately 500 in 2017 and 300 in 2025.</p> <p>In 2025, the Australia-wide shortfall is estimated to be approximately 360 for surveying technicians with diplomas and associate degrees and 250 for surveying technicians with a Certificate I-IV qualification.”</p>	<p>gaps in key jurisdictions such as New South Wales, Victoria, Queensland, and South Australia which will not be completely met from new supply or shifting employment from other jurisdictions. The capability deficit is peaking in FY2019 and, while the size of the deficit will shrink in coming years in accordance with industry activity and labour demand, it will not be until the mid-2020s when the capability deficit sustainably swings back towards surplus.”</p> <p>The report provides comprehensive analysis for each State and Territory by industry breakdown.</p>
<p>Recommendations: “There are essentially four broad options to address the shortage:</p> <p>Continue with current policies and resource allocation Make marginal improvements – aim to improve some parts of the existing supply chain Policies and program action to increase supply and address root causes and key issues Adopt a high reliance on skills importation as a prime strategy”</p> <p>The paper presented Option C as the preferred noting that “it would be practical to break down the issues into the short and longer term. Some of the actions could be state/territory-specific and some may require a national approach. The latter will inevitably require time for consultation and, given the current budgetary situation at the Commonwealth and State levels, a long-term (10-15 year) approach is likely to be necessary.”</p> <p>In relation to Option C, the paper advised that “action would require a whole of industry approach and action to overcome existing impediments and over time achieve agreed domestic supply targets. Net migration would be relied upon less and only used to overcome short-term high demand needs.</p>	<p>Recommendations: “...the profession will need to focus on ways to maintain a sustainable workforce supply/demand balance.” Summary is presented below:</p> <p>Continuing its successful promotion of the profession to younger people – particularly those in secondary education and encourage enrolment in pathway qualifications at Universities and the VET sector. More needs to be done to examine why few women are entering current education pathways and what strategies could be put in place to improve these outcomes. With the emergence of ‘big data’ and widespread use of new technologies and systems such as BIM, demand for spatial data analysis is expected to grow very strongly. This will likely build strong competition to the surveying industry for graduates in the ‘spatial sciences’ Strengthen workforce retention strategies at all stages of employment Utilising technologies and systems to maximise productivity Focus on flexible strategies to meet emerging demands from key sectors and regions so that the profession can be agile in a sectoral sense, as well as regionally, as new demand drivers play out over the coming years. Strategies need to be put in place to make this happen</p> <p>“Finally, effective strategic workforce planning for the surveying profession also requires better, more meaningful, occupation and industry data from the</p>

A strong VET technician training program would need to be established and post undergraduate degree in-depth specialist postgraduate coursework programs would be available as a result of a cooperative Australia wide initiative.

Undergraduate degree courses would produce the numbers of graduates required. Strategies will be developed to stimulate student demand for these courses and programs.”

Further short-term recommended actions include:

Addressing problems that have been identified in regard to 457 Visas, particularly relating to in-house as opposed to external training requirements
Providing funding support for Destination Spatial and Life Without Limits under a program to focus on high school students in the first instance
Raising the issues covered in this and other reports with the Commonwealth Government to seek recognition that surveying and geospatial is a critical area of current and future skills needs that should be strongly supported through programs such as the National Workforce Development Fund (note: a Commonwealth Government funding initiative that replace the Critical Skills Investment Fund that is no longer available)

Australian Bureau of Statistics (ABS) as well as matching education data from universities and the VET sectors. Better data will enable more accurate, detailed analysis which should lead to better decisions. Currently there is no uniform way of referring to the surveying industry across occupation, industry and education data, and so we use ‘piecemeal’ datasets and approaches to estimate the size of the profession, the industries it assists, and where new graduates are coming from.

There also needs to be a stronger distinction in the data between surveyors and spatial scientists, what the key functions and roles within each occupation are best defined, and how they are changing with new data technologies.

With the current growth in mashing ‘big data’ with ‘spatial data’ there will likely be an increasing need for more training in data analytics and data science within the surveying profession which, in turn, will open opportunities, overlap and competition for spatial skills across a greater number of fields.”

Surveying & Spatial Regulatory Workforce Initiatives

The Surveying and Spatial sector is currently undergoing a review of workforce needs and licensing arrangements which will impact the way skills are attained and how they will be recognised. Below represents some initiatives currently under development and led by regulatory authorities that will impact the sector.

CRSBANZ	Commenced consultation to develop a National Standard of Competency standard for licensed/registered Surveyors. This project is to support the ongoing commitment to mutual recognition of professional registration in Australia and New Zealand and support the Cadastre 2034 Goal 5 - <i>achieve a cadastral system that is a federated cadastral system based on common standards unified cadastral system.</i>
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The development of a National Standard of Competency will require the surveying profession to consider:

- the role of a cadastral surveyor across the diversity of modes of practice now and into the future;
- the broad scope of their work and their contribution to the community;
- changing needs of the surveying and mapping industry;
- current and emerging risks and opportunities across the whole profession;
- competencies graduates should achieve at completion of tertiary qualification;
- post graduate training requirements; and
- skilled workforce supply chain.

The project timeframes are as follows:

- Submissions closed - Monday 14 March 2022.
- Preliminary competency review report delivered to Board - 28 March 2022.
- Board feedback to be available for consideration at CRSBANZ meeting to establish agreement on National Standard of Competency – 12 April (date to be confirmed).
- Roundtable discussions to synchronise the agreed competencies with a review of Fryer Mitchell Report – between 19 and 22 April. Board members invited to attend roundtable discussions to consider what are undergraduate and post graduate competencies.
- Final report due 30 June 2022.

ANZLIC Strategic Planning

ANZLIC is undertaking consultation on its strategy which will explore the evolving use of spatial data with the aim of creating value and delivering better outcomes for business, government, and the community.

The review is focusing on:

- Emerging trends and challenges for stakeholders
- Aligning ANZLIC's strategic priorities to support stakeholder needs
- ANZLIC's value proposition for stakeholders to create impact and shared value
- Where to focus collective efforts in the future

Under Initiative 10 of the ANZLIC Strategic Plan 2020-24: Skills and capability:

- Engage with relevant spatial industry peak bodies to scope spatial skill and capability industry.
- gaps and potential actions.
- Advocate for, and share information on, important applications of spatial data, skills and capabilities to build awareness and promote the importance of spatial skills and capability.
- Australia and New Zealand spatial capability and expertise continues to grow.
- Higher productivity, innovation and use of spatial data through improved awareness of the value of spatial data and the spatial sector.

During the initial workshop which included the participation of Surveyor-Generals, industry associations, key influencers, there was significant interest in workforce with recognition that stronger workforce planning for the sector is needed and improvement on the profile and recognition of professions.

The Surveyors Board Queensland (SBQ)

SBQ has undertaken a review of their Cadastral Endorsement Competency Assessment (2021). The Board has approved changes to the assessment of Cadastral Endorsement Competency by way of changing the assessment process to encourage more candidates to be registered.

The process - which is being trialled in 2022 - will involve two interviews conducted on consecutive days on a weekend. There will be three (3) appointed Board assessors conducting the interviews over five (5) weekends throughout the year allowing for 15 candidates to be licensed.

Surveyors Registration Board of Victoria Review of Licensing System

Currently reviewing the licensing system and identify opportunities to re-design the existing licensing approach. The purpose is to address issues faced by the industry around an ageing workforce and a dwindling pipeline of incoming cadastral surveyors that is insufficient to meet current and projected demand.

ACT Government, Office of the Surveyor-General

- Automatic Deemed Registration under the Mutual Recognition Act to take affect with efforts underway to prepare the workforce.
- Surveyors Act amendments with consultations underway. Planned Government consideration mid to late 2022 and if accepted, commence early 2023. Aim is to align the Act and other legal instruments with NSW such as CPD.
- The Engineering/Construction Surveyors framework is to be developed in parallel.
- Considering additional amendments Engineering Surveyors accreditation, certification and regulation to be similar to NSW BOSSI processes. Consultation commenced 1 March 2022 and aims for Government consideration from July to end of 2022 with approved changes to take effect mid-2023.

International Federation of Surveyors (FIG) Surveyor 4.0

FIG as the lead international organisation representing the interests of surveyors globally provides an international forum for discussion and development aiming to promote professional practice and standards.

FIG leads ten (10) Commissions. Commission 2 – Professional Education focuses on: curriculum development; learning and teaching methods and technologies; educational management and marketing; continuing professional development; networking in education and training.

The FIG Commission 2 is relatable to all other technical commissions particularly with Commission 1 “Professional Practice” regarding the Changing Nature of Work and the Role of a Surveyor.

The current term for Commission 2 aims to address ‘Enhancing Surveying Education through e-Learning’ with reference to the following two challenges: ubiquitous learning and open education.

Commission 2 is divided into working groups representing areas of focus in professional education:

Working group 2.1: Developing academic networks for knowledge sharing

Working group 2.2: Innovative learning and teaching/ “Curriculum on the Move”

Working Group 2.3: Joint Commission 2 Learning styles in surveying Education

The Commission will hand down its report in 2022

International Federation of Surveyors (FIG) Definition of a Surveyor

Summary

A surveyor is a professional person with the academic qualifications and technical expertise to conduct one, or more, of the following activities:

- to determine, measure and represent land, three-dimensional objects, point-fields and trajectories;
- to assemble and interpret land and geographically related information;
- to use that information for the planning and efficient administration of the land, the sea and any structures thereon; and
- to conduct research into the above practices and to develop them.

Detailed Functions

The surveyor's professional tasks may involve one or more of the following activities which may occur either on, above or below the surface of the land or the sea and may be carried out in association with other professionals.

1. The determination of the size and shape of the earth and the measurement of all data needed to define the size, position, shape and contour of any part of the earth and monitoring any change therein.
2. The positioning of objects in space and time as well as the positioning and monitoring of physical features, structures and engineering works on, above or below the surface of the earth.
3. The development, testing and calibration of sensors, instruments and systems for the above-mentioned purposes and for other surveying purposes.
4. The acquisition and use of spatial information from close range, aerial and satellite imagery and the automation of these processes.
5. The determination of the position of the boundaries of public or private land, including national and international boundaries, and the registration of those lands with the appropriate authorities.
6. The design, establishment and administration of geographic information systems (GIS) and the collection, storage, analysis, management, display and dissemination of data.
7. The analysis, interpretation and integration of spatial objects and phenomena in GIS, including the visualisation and communication of such data in maps, models and mobile digital devices.
8. The study of the natural and social environment, the measurement of land and marine resources and the use of such data in the planning of development in urban, rural and regional areas.
9. The planning, development and redevelopment of property, whether urban or rural and whether land or buildings.
10. The assessment of value and the management of property, whether urban or rural and whether land or buildings.
11. The planning, measurement and management of construction works, including the estimation of costs.

In the application of the foregoing activities surveyors take into account the relevant legal, economic, environmental and social aspects affecting each project.

National Skills Commission Emerging Occupations

In 2020 the National Skills Commission (NSC) conducted a review of trending and emerging occupations within Australia with consideration to how those skills will change the existing jobs. Trending skills are those that have grown over the past five years. These skills may not be new but have increased in demand. Emerging skills are trending skills that are also new to particular occupations over the past five years. They are distinct from other trending skills because they have recently emerged in some occupations where they were not previously required.

The NSC identified trending and emerging skills through job advertisements reflecting such skills across the wider labour market.

The emerging and trending skills affecting the way work is conducted across many occupations that connect with the surveying and spatial sector include 'data analysis' (trending in 61 occupations and emerging in 11 others).

Data and digital skills dominate the fastest growing emerging skills across the economy⁶⁴.

ANZSCO updated its Emerging Occupations list. Twenty-five (25) Emerging Occupations were identified. The below represents emerging occupations associated with Surveying and Spatial sector:

Data Analytics

Data Analytics	(Occupation size in 2015: 3,213 2019: 11,191)
Data Scientists	(Occupation size in 2015: 415 2019: 3,208)
Data Engineers	(Occupation size in 2015: 473 2019: 1,548)
Data Architects	(Occupation size in 2015: 547 2019: 2,262)

Emerging Business Practice

Logistics Analysts	(Occupation size in 2015: 1,956 2019: 3,878)
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Online Engagement

Digital Marketing Analysts	(Occupation size in 2015: 3,352 2019: 10,823)
Social Media Specialists	(Occupation size in 2015: 4,921 2019: 11,421)
User Experience Analysts	(Occupation size in 2015: 1,368 2019: 5,134)

Refreshing ANZSCO

Researchers	(Occupation size in 2015: 18,384 2019:27,545)
Research Assistants	(Occupation size in 2015: 9,061 2019: 13,640)

Regulatory

Risk Analysts	(Occupation size in 2015: 2,148 2019: 5,575)
Regulatory Affairs Specialists	(Occupation size in 2015: 6,743 2019: 12,174)

⁶⁴ The NSC report Emerging Occupations 2020 <https://www.nationalskillscommission.gov.au/emerging-occupations>

Key Systemic Issues Identified

Key systemic issues identified through stakeholder consultations include the following:

- Compared to aligned sectors such as engineering and technology, there is a lack of national standards for surveying and although efforts are underway to establish them, it can be expected that for the next 5 years inconsistencies will continue to negatively impact the supply of skilled workers.
- There is a lack of a clear understanding of the state of the workforce and where the workforce comes from. Outside of acknowledging the well documented risks of the workforce associated with the lack of diversity, an ageing workforce and the narrowing of licensed cadastral surveyors, clear articulation of other skills gaps impacting the workforce was generally not known.
- There is a limited number of recognised education and training pathways into the industry. Stakeholders discussed concerns about the decline in Universities and TAFE colleges delivering courses for surveying and spatial. This channel is commonly regarded as the only path to developing the workforce. Within this linear pathway, when courses are closed the impacts are severe. There is very little flexibility in skills and career pathways for cadastral surveyors.
- There is a lack of awareness around where skills are sourced into the workforce. This also applies to the education and training sector which struggles to know why students enrol into Surveying and Spatial courses and where the students come from.
- The industry takes a narrow approach to career pathways which limits the breadth of skills it needs. For instance, the industry does not seem to recognise work experience, Cadetships, Apprenticeships, work integrated learning etc as a pathway to industry even though some organisations offer programs.
- There is a lack of relevant subjects taught at school level such as geography at a scale needed to meet anticipated demand.
- There is a lack of an industry recognised, large-scale coordination of school to work programs with industry engagement such as cadetships, work integrated learning programs, para-professional qualifications and micro credentialling programs. Other industry sectors achieve success through these programs such as law, finance, accounting, engineering etc.
- There is no national framework to guide people through career planning and development. The industry is segmented through jurisdictional difference despite many competencies relevant across borders.
- The industry tends to take a defacto position of skills pathways determined by jurisdictional Surveyors Acts and regulation which is considered by some as a deterrent to change.
- Language used to describe the industry is confusing which makes it difficult for people to engage. There needs to be a hierarchy of language used to describe the profession at the broad with specialties (for instance, the use of Surveyor, Geospatial, Spatial, Geomatic etc).
- There are too many industry bodies representing the industry and offering guidance on career pathways. This is considered by many to be too confusing and lacks impact. There are more than 20 industry bodies at Federal and State/Territory levels representing professionals and businesses as well as organisations that provide skills and career pathway advice at national and jurisdictional levels.
- The issue of salary expectations not growing compared to other professions risks workers leaving to go to other sectors such as engineering or ICT.

Skills for Information Age (SFIA)

Originally launched in 2000, [SFIA](#) defines the skills and competencies required by professionals who design, develop, implement, manage and protect data and technology. SFIA is a resource for those who manage, work in or with business and technology professionals who design, develop, implement, manage and protect data and technology that powers the digital world. The framework:

- Consists of professional skills on one axis and seven (7) levels of responsibility on the other
- Describes the professional skills at various levels of responsibility
- Describes the levels of responsibility in terms of generic attributes of Autonomy, Influence, Complexity, Business Skills and Knowledge

Importantly, SFIA provides a common language to define skills and expertise in a consistent way. This is important particularly when promoting career opportunities to ensure pathways are understood.

SFIA 8 Summary Chart

Category	1	2	3	4	5	6	7
Strategy and planning							
Strategic planning					5	6	7
Information systems coordination					5	6	7
Information management	4	5	6	7			
Enterprise and business architecture					5	6	7
Solution architecture					4	5	6
Innovation					5	6	7
Emerging technology monitoring					5	6	7
Research	2	3	4	5	6	7	
Demand management					5	6	7
Investment appraisal					5	6	7
Financial management					4	5	6
Measurement					3	4	5
Sustainability					4	5	6
Continuity management					2	3	4
Security and privacy							
Information security					3	4	5
Information assurance					3	4	5
Personal data protection					3	4	5
Vulnerability research					2	3	4
Threat intelligence					2	3	4
Governance, risk and compliance							
Governance					5	6	7
Risk management					3	4	5
Audit					3	4	5
Quality management					3	4	5
Quality assurance					3	4	5
Advice and guidance							
Consultancy					4	5	6
Specialist advice					3	4	5
Methods and tools					3	4	5
Change and transformation							
Change implementation							
Portfolio management					5	6	7
Programme management					6	7	
Project management					4	5	6
Portfolio, programme and project support					3	4	5
Change analysis							
Business situation analysis					3	4	5
Feasibility assessment					3	4	5
Requirements definition and management					2	3	4
Business modelling					2	3	4
Acceptance testing					2	3	4
Change planning							
Business process improvement					5	6	7
Organisational capability development					5	6	7
Organisation design and implementation					4	5	6
Organisational change management					3	4	5
Benefits management					5	6	7

The SFIA Foundation is the global not-for-profit organisation which owns the Skills Framework for the Information Age. SFIA® is a registered trademark of the SFIA Foundation. © copyright SFIA Foundation 2021

The global skills and competency framework for the digital world

Category	1	2	3	4	5	6	7
Development and implementation							
Systems development							
Product management					3	4	5
Systems development management					5	6	7
Systems and software life cycle engineering					4	5	6
Systems design					3	4	5
Software design					2	3	4
Network design					3	4	5
Hardware design					3	4	5
Programming/software development					2	3	4
Systems integration and build					2	3	4
Testing					1	2	3
Software configuration					1	2	3
Real-time/embedded systems development					2	3	4
Safety engineering					3	4	5
System assessment					3	4	5
Radio frequency engineering					2	3	4
Animation development					3	4	5
Data and analytics							
Data management					4	5	6
Data modelling and design					2	3	4
Database design					3	4	5
Data engineering					2	3	4
Database administration					2	3	4
Data science					2	3	4
Machine learning					2	3	4
Business intelligence					2	3	4
Data visualisation					3	4	5
User experience							
User research					3	4	5
User experience analysis					3	4	5
User experience design					3	4	5
User experience evaluation					2	3	4
Content management							
Content authoring					1	2	3
Content publishing					1	2	3
Knowledge management					2	3	4
Computational science							
Scientific modelling					4	5	6
Numerical analysis					4	5	6
High-performance computing					4	5	6
Relationships and engagement							
Stakeholder management							
Sourcing					2	3	4
Supplier management					2	3	4
Contact management					3	4	5
Stakeholder relationship management					2	3	4
Customer service support					1	2	3
Business administration					1	2	3
Sales and marketing							
Marketing					2	3	4
Selling					3	4	5
Sales support					1	2	3
Delivery and operation							
Technology management							
Technology service management					5	6	7
Application support					2	3	4
IT infrastructure					1	2	3
System software					3	4	5
Network support					2	3	4
Systems installation and removal					1	2	3
Configuration management					2	3	4
Release and deployment					3	4	5
Storage management					3	4	5
Facilities management					3	4	5
Service management							
Service level management					2	3	4
Service catalogue management					3	4	5
Availability management					4	5	6
Capacity management					4	5	6
Incident management					2	3	4
Problem management					3	4	5
Change control					2	3	4
Asset management					2	3	4
Service acceptance					4	5	6
Security services							
Security operations					1	2	3
Vulnerability assessment					2	3	4
Digital forensics					3	4	5
Penetration testing					3	4	5
People and skills							
People management							
Performance management					4	5	6
Employee experience					4	5	6
Organisational facilitation					4	5	6
Professional development					4	5	6
Workforce planning					4	5	6
Resourcing					3	4	5
Skills management							
Learning and development management					3	4	5
Learning design and development					3	4	5
Learning delivery					2	3	4
Competency assessment					3	4	5
Certification scheme operation					2	3	4
Teaching					2	3	4
Subject formation					4	5	6
Levels of responsibility							
The SFIA Framework describes seven levels of increasing responsibility, accountability and impact from Level 1, the lowest, to Level 7, the highest.							
Each of the seven levels is labelled with a guiding phrase to summarise the level of responsibility.							
Level 1 - Follow				Level 2 - Assist			
Level 3 - Apply				Level 4 - Enable			
Level 5 - Ensure, advise				Level 6 - Initiate, influence			
Level 7 - Set strategy, inspire, mobilise							

www.sfia-online.org



Geospatial Technology Competency Model

The U.S. Department of Labor’s Employment and Training Administration (DOLETA) originally launched the GTCM in 2003 as part of its High Growth Job Training Initiative. Geospatial was identified as a high growth job sector.

The Competency model consists of 6 tiers comprising:

Tier 1: Personal attributes or “soft skills” that are relevant for most jobs

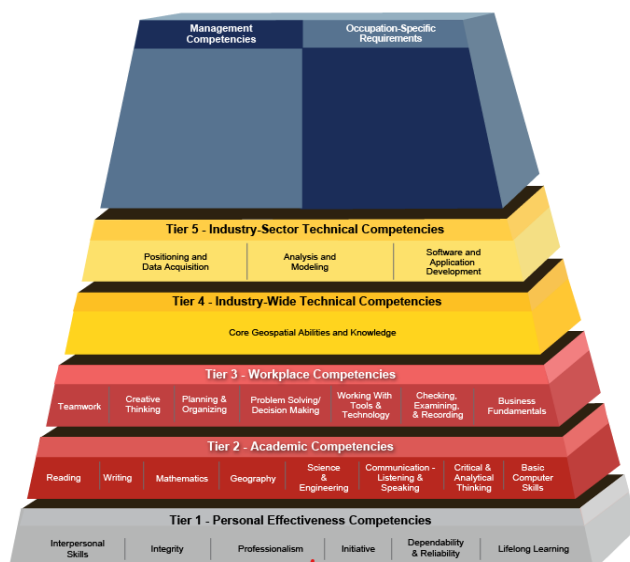
Tier 2: Academic competencies associated with thinking styles applied across most occupations

Tier 3: Motives and Traits as well as interpersonal and self-managed styles developed in the workplace

Tier 4: Industry-wide technical competencies comprising 43 examples of ‘Critical Work Functions’ that many geospatial professionals are expected to perform during their careers. The Core Geospatial Abilities and Knowledge specified in Tier 4 are exemplary, not exhaustive.

Tier 5: Industry sector technical competencies. Includes critical work functions and technical content areas required for worker success in each of the 3 identified sectors within the framework (Positioning & Geospatial Data Acquisition; Analysis and Modelling; and Software and App Development).

Tier 6: Comprises two building blocks: occupation-specific competencies and requirements that are specified in the occupation descriptions published at O’NET Online as well as management competencies represented in URISAs Geospatial Technology Management Competencies (URISA 2012)



The U.S. Department of Labor’s Geospatial Technology Competency Model graphically represented

Case Study - Queensland Minerals and Energy Academy

The **Queensland Minerals and Energy Academy** is a successful career pathway program to support school students prepare for career opportunities in the resources (and aligned) sector. The [Queensland Minerals and Energy Academy \(QMEA\)](#), has been in operation for over 10 years and has achieved extraordinary successes including:

- 88 schools participating in the program
- 4,972 students engaged in programs
- Collaborating with 324+ teachers
- Providing over 190 events per year

A key goal for this program is to place students into pathways into the resources sector and other science, technology, engineering and maths (STEM) industries. The program focuses on establishing gender balance and representation of Indigenous students to support greater diversity of the workforce.

Associated with the Queensland Resources Council, it is a key initiative supported by QRC members as industry recognises the importance of developing future skills. Some of the QMEA programs include:

- **STEM Unearthed** – a full-day event offered to students in year 10. The program provides students seeking to select senior year subjects, to experience STEM based activities around the life cycle of resource operations through themes of exploration, extraction and rehabilitation
- **Beakers, Bots & Build** – This program combines several challenge-based activities associated with science, technology, engineering and mathematics. It sets practical tasks for Year 9 students linked with current classroom learning. The challenges are based on chemical processing, robotics and programming, environmental practices as well as design and engineering
- **Classroom to Career** – provision of a series of talks delivered by industry to students, teachers and career adviser's
- **Powering the Future** – Promotes awareness of the various methods of electricity production and how they link to the National Energy Market. Students work in groups to better understand energy generation across Queensland, South Australia, Tasmania, Victoria and New South Wales (now and 50 years into the future)
- **Oresome Trade Camps** – Students are selected via application through their school. The students attend a five-day program and complete trade-based challenges. They also have the opportunity to work with trades people or apprentices to complete their project. Students participate in activities including orientation, safety induction, fabrication, mechanical and electrical training tasks and possible industry tours to mine sites and workshops
- **Women and girls mentoring programs**

The Mining industry set out 10 years ago to develop a suite of online resources to support students learn and provide teachers with materials to deliver in the classroom. The program called: [Oresome Resources](#) was a whole-of-industry approach to address a shrinking workforce and help create greater interest in resourcing careers.

Supported by the National and State-based industry associations, *Oresome Resources* is recognised as one of the world's best free educational resource libraries to attract people to STEM careers and or the resources sector.

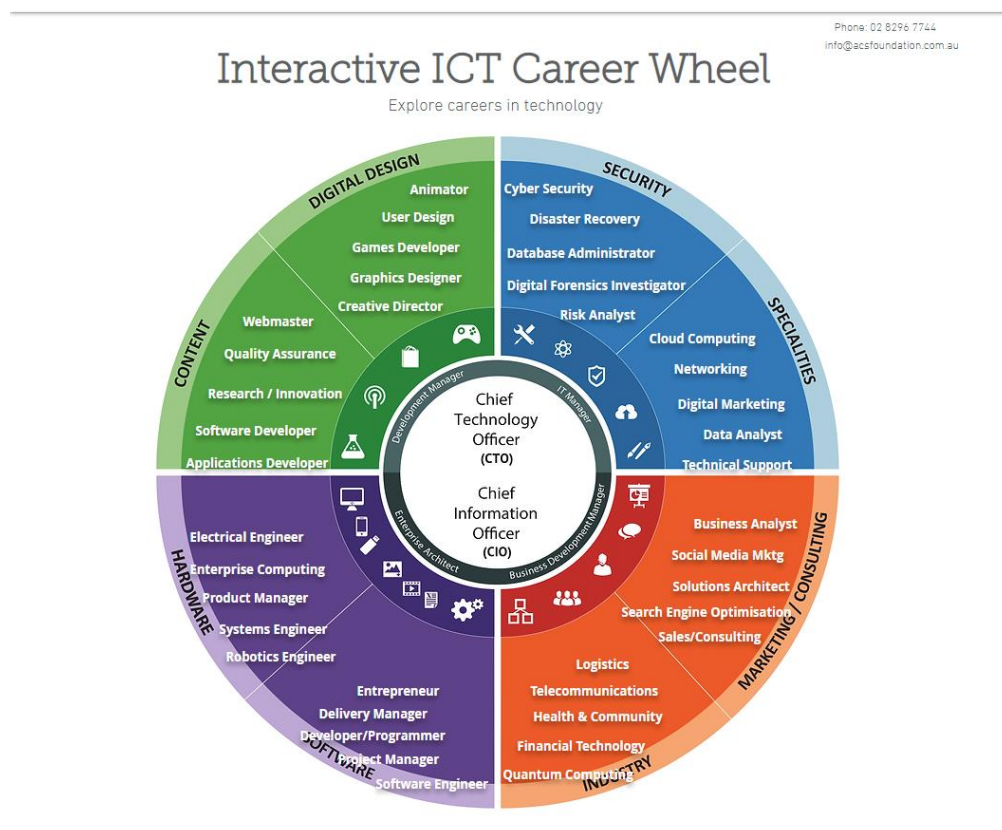
Case Study - ICT Gateway to Industry School Program

Information Communications Technology: The Australian Computer Society Gateway to Industry Schools program is supported by the Commonwealth Government of Australia and the ICT industry to provide advice to school students, parents and teachers to help inform students selection of subjects to prepare them for jobs of interest. It sets out vocational pathways including:

- Australian School-based [Apprenticeships and Traineeships programs](#)
- ICT courses at TAFE and other Registered Training Organisations; and
- University courses aligned to segments across the ICT and digital economy sector.

The ACS Foundation designed a [interactive career guide](#) to give students, their parents, teachers and career guidance advisors greater understanding of the depth and breadth of career opportunities.

ACS Interactive Career Guide



To support this initiative, the ACS along with industry, academic institutions, and governments, hold career development events providing unique experiences for students to meet with specialists directly from industry.

Further, the ACS recognise the value of well informed and trained educators and make available to teachers a suite of support materials to help shape curriculum, teaching tools, industry information to ensure teaching staff are abreast of latest information and learning resources.

For several years the ACS, driven by the ACS Foundation has collaborated with Industry to shape advice and tools to help guide students to choose ICT as a career of choice. It has kept a stable path and maintained its strategy to achieve the end goal. This has meant the momentum needed to be maintain and stay-for-the-course which drew larger sums of investment from Government and industry due to this ability to demonstrate impact.

Industry-Led Workforce Initiatives

The below captures a *selection* only (and may not represent all programs available) of a range of skills development initiatives/programs delivered across the Surveying and Spatial sector. The information presented can be publicly accessed.

INDUSTRY-LED

LEAD ORGANISATION	Initiative Title	Description
CSN	Professional Standards Scheme	<p>CSN National Initiatives</p> <p>The Professional Standards Scheme (the Scheme) is a legal instrument, established under the Professional Standards Act 1994 (the Act) and approved by the Professional Standards Councils.</p> <p>The statutory objectives of the Scheme are reciprocal in nature:</p> <ul style="list-style-type: none"> • It binds Consulting Surveyors National (as the occupational association for the surveying profession in Australia) to monitor, enforce and improve the professional standards of its members, and protect consumers of professional services; and • Serves to cap the civil liability or damages the Consulting Surveyors National Scheme participants may be required to pay if a Court upholds a claim against them.
CSN	Consulting Surveyors Campus	Provision of training under a service agreement (as required to satisfy the requirements of CSN's Continuing Occupational Education policy)
CSN	Webinar Series & CPD	<ul style="list-style-type: none"> • Various programs provided • Designed to facilitate CPD for professionals
CSN	Surveyors Academy	<ul style="list-style-type: none"> • Academy will deliver Certificate IV in Surveying and Spatial Information (Major in Surveying) • Diploma of Surveying
CSN	Business Academy	<ul style="list-style-type: none"> • Delivering Business Training nationally
CSN	Candidate Workshops	<ul style="list-style-type: none"> • Delivered in NSW to support preparation of candidates towards registration of Cadastral Surveyor
CSN	Skills Demand Study	<ul style="list-style-type: none"> • Study conducted on the Surveying and Spatial workforce (demand and supply) conducted on average every 4-5 years
SIBA GITA	QLD Consulting Endorsement	SIBA GITA undertakes the Consulting Endorsement accreditation on behalf of The Surveyors Board Queensland
SMARTSAT CRC	Space Industry Skills Gap Analysis - report	<p>SmartSat CRC undertook a study of the Australian Space workforce and released its findings in 2021. The report presented a Skills Taxonomy for the Australian Space industry (the first of its kind) comprising 319 individual skills.</p> <p>The gap analysis was directly aligned to the skills taxonomy. The study noted that there was a deficient number of education and training providers to meet emerging skills needs that requires urgent attention. Further, the report highlighted the types of skills needed to meet the demand and for the sector to achieve its target of building an additional 20,000 jobs to 2028.</p>

SPACE + SPATIAL 2030 ROADMAP	Workforce Committee	<p>Building on the Agenda2026, the Space + Spatial 2030 Roadmap is being developed with draft circulation for consultation within its committee. It will evaluate strategies to address the challenge of meeting the jobs growth target (20,000 additional jobs created by 2028) set by the Australian Space Agency including:</p> <ul style="list-style-type: none"> • National taxonomy of skills for Space and Spatial • Extend the 2021 skills gap study to cover other spatial related skills impacting the workforce • Undertake an audit of the existing suite of courses at tertiary level covering both vocational education and training and university sectors (incorporating micro credentialling to PhD level) • Source additional resources under the Diversity Leadership Network (SSS-DLN) program to strengthen capacity • Examine micro credentialling programs to support faster growth of skills into the workforce • Embed skills training and career pathways in space across primary through to tertiary education • Develop a more integrated approach to space and spatial education programs across Australia <p>The report is due to be handed down in 2022</p>
	Inclusion at Work Index (Space, Spatial & Surveying Industry)	<p>Building on the Agenda2026 and the Space + Spatial 2030 Roadmap, a survey was conducted in 2021 to have a better understanding of diversity across the workforce. There were over 1,000 responses to the survey which is due to be handed down during the 2nd quarter in 2022 and will directly impact workforce strategies across the sector.</p>
SSSI	Land Surveying Commission Project Sirius	<p>National Initiative</p> <p>The purpose of Project Sirius is to:</p> <ol style="list-style-type: none"> 1. Lead change in building a more recognised, skilled, and diverse national surveying workforce. 2. Collaborate with the broader surveying profession to nationally recognise and adopt new skills, attract new entrants, and improve 3. community engagement. 4. Collaborate to secure investment and engagement from allied industry disciplines so surveying skills and knowledge remain 5. nationally consistent, recognised, and relevant. 6. Lead progress though working with other industry peers and organisations across Australia and overseas. <p>Industry workshops to be held at Locate2022</p>
SSSI	SSSI Careers Committee	<p>National Initiative</p> <p>The intent of the Committee is the creating and disseminating information to students, teachers, parents, or those contemplating a career change to consider a career in the space, surveying, and geospatial sectors. The Careers Committee is represented by a diverse cross section of industry leaders who represent our various regions and disciplines.</p>

		<p>Undertake 3 initiatives:</p> <ol style="list-style-type: none"> 1. sharing stories through media engagement 2. Reactive Space, Surveying and Geospatial Careers Website (develop) 3. Education Forum – build awareness of courses and study pathways across Australia
SSSI	Certifications	<p>National & International Initiatives</p> <ul style="list-style-type: none"> • 5 Certifications: <ul style="list-style-type: none"> ○ General Certification ○ GISP-AP Certification (Spatial Information & Cartography) ○ Hydrographic surveying Certificate (internationally recognised) ○ Remote sensing & Photogrammetry Certificate ○ Engineering Surveying Certificate
SSSI	CPD	<p>National and some jurisdictional specific programs</p> <ul style="list-style-type: none"> ○ SSSI CPD Programs ○ BOSSI CPD Program (SSSI is The Surveying & Spatial Sciences Institute is one of five organisations ratified by the NSW Board of Surveying & Spatial Information (BOSSI) to undertake event assessments and issue CPD Point Summary Reports to SSSI members and others)
SSSI	YP Mentoring Program	
SSSI	Hydrographic Mentoring Program	
SSSI	Education committee	
SSSI	Webinars & Events	SSSI offer a library of webinars for member reference as well as delivering over 250 events a year
WGIC	Workforce Strategic Planning	<p>WGIC has in place a key initiative focusing on “Industry & Academia Collaboration” which aims to address the widening gap between educational programs and industry requirements. The WGIC is working to strengthen collaboration between the geospatial industry and academic institutions towards creating contemporary educational programs.</p> <p>WGIC is looking at ways to minimise tensions between academia and industry to strengthen ties. Elevate the connection of PhD entry into industry. Drive greater innovation in the private sector with greater collaboration between University and the private sector to drive greater investments.</p> <p>Academic PhD should involve industry supervisors to help bring industry experience to address issues relating to relevance and should be recognised as a contribution of industry to research.</p> <p>Further efforts to develop a national geospatial career framework that can guide procurement in Government and acknowledge staff across the workforce. Furthermore, there are</p>

considerations for a unified framework across all occupations throughout the sector.

SCHOOL TO WORK PATHWAYS

LEAD ORGANISATION

AUSTRALIAN GOVERNMENT

Initiative

[Advancing Women in STEM Strategy and the 2020 Action Plan](#)

New funding to support women in STEM initiatives

Description

- Superstars of STEM program – the motto “it’s hard to be what you can’t see”. The program brings together a diverse collection of women STEM experts and helps them develop the skills and networks to build their public profiles. It aims to shift public perceptions around gender in STEM fields and inspire girls to pursue STEM careers
- Australia’s Women in STEM Ambassador
- Ambassador’s Future You program to help 8–12-year olds envision a future for themselves in STEM by showcasing diverse role models and career pathways

DESTINATION SPATIAL QUEENSLAND (DSQ)

[Geospatial Science](#)

- Originally formed in 2011 out of the then Spatial Skilled Workforce Executive, is tasked to address concerns regarding the declining number of students enrolled in surveying and geospatial university courses.
- DSQ focuses on enhancing the awareness of the industry, building relationships with students, parents, career advisors, teachers, schools and promoting courses and degree opportunities.
- The purpose of DSQ is to increase the number of surveying and geospatial science professionals to advance spatially enabled workforce
- DSQ collaborates with other jurisdictional programs such as A Life Without Limits increase awareness

DSQ collaborates with industry bodies, Government Departments and professional associations to promote the industry

ESRI AUSTRALIA

[GIS for Schools Program](#)

- The GIS for Schools program brings industry leading software to P-12 schools across Australia. Interactive maps created using Geographic Information Systems (GIS) make learning come alive in mainstream subjects—geography, history, science, environmental studies, agriculture—and beyond.
- Using mapping technology in the classroom illustrates geographic context, helping students connect lessons with real places. Spatial analysis and critical-thinking skills prepare young minds to succeed in studies, further education, and most importantly, life.
- See Wavell State High School Case Study (Attachment K)

[GET KIDS INTO SURVEY](#)

- Global initiative supported in Australia by A Life Without Limits (Surveying Taskforce) and Destination Spatial Queensland (Geospatial Science)
- At Get Kids into Survey we recognise that, in order to secure the future of our industry, we need to unite the geospatial community to inspire a new generation of surveyors. We know that people like you take great pride in their work, and we want you to share your enthusiasm with young people.

	<ul style="list-style-type: none"> • Provide education on everything Geospatial, including different areas of surveying, equipment, solution and jobs • Nurture and grow the community and Brand Ambassadors (Craig Sandy recently became a Brand Ambassador) • Work with and educate teachers • Partner with survey associations, like-minded individuals and companies around the world • Offer scholarship schemes globally • Australian Brand Ambassadors: <ul style="list-style-type: none"> ○ QLD – Karen Joyce & Paul Mead (SheMaps) ○ NSW – David Iping (Iping Survey Group) & Narelle Underwood (NSW Government) ○ ACT – Mike Stapleton (Veris) ○ VIC – Craig Sandy (Victorian Surveyor-General)
<p>NATIONAL SURVEYING ALLIANCE</p>	<p>Surveying Careers</p> <ul style="list-style-type: none"> • Promotes careers in Surveying. Provides guidance on course selection, promotes career potential and highlights work experiences to assist students to make a career choice.
<p>SHEMAPS</p>	<p>SheMaps – STEM Program and Resources</p> <p>SheMaps focus is to grow the understanding of the surveying and spatial industry in schools across Queensland through its Partnering for Purpose model.</p> <p>SheMaps aims to create an awareness of the importance of surveying and spatial professionals and the roles they play in solving problems and serving the community in a way that students find relevant. By taking a skills based approach, linked to the Australian Curriculum, SheMaps is able to embed real world problems and role models into the classroom creating authentic learning opportunities and meaningful points for engagement by surveying and spatial professionals into schools. SheMaps develops teacher resources and provide off-the-shelf programs as well as design programs for schools</p> <ul style="list-style-type: none"> • Programs include: <ul style="list-style-type: none"> ○ Pippa & Dronie (K-Grade 4) ○ Classroom Drone Essentials (Grades 5-9) ○ Map My School (Grades 1-10) ○ Drone Mapping (Grade 10-Industry) ○ DroneBlocks – Advanced (Grades 7-12+) ○ Lighthouse Schools Program (Advanced Secondary Schools) • Participation at industry conferences annual such as EduDrone
<p>SURVEYING TASKFORCE</p>	<p>A Life Without Limits Victoria head organisation</p> <p>Formed twenty (20) years ago to address concerns then about the industry not being recognised as a career of choice. During its early stages, the initiative was considered successful due to the support from industry, government, and academia.</p> <ul style="list-style-type: none"> • Separate State & Territory organisations overseeing jurisdictional programs (NSW, WA, SA, ACT, QLD now DSQ) • To change brand to Surveying Careers

- Focus on surveying careers
- A Life Without Limits promotes Surveying and Spatial/Geospatial as professions across schools, promotes STEM courses to school students, offers resources to teachers, parents and students and delivers industry collaboration programs to enable students to have experience with Industry
- Provides guidance on the path to be a registered and licensed Surveyor
- Supports the Kids into Survey program

AUSTRALIAN EDUCATION AND TRAINING INITIATIVES/CHANGES

LEAD ORGANISATION	Initiative	Description
AQF REVIEW	Australian qualifications Framework review (2019)	In 2019 the Australian Government conducted a review of the AQF to improve education and training outcomes to meet the needs of industry. The recommendations if adopted by State and Territory governments, will change the way education and training is delivered and skills are recognised. The Federal Government has accepted the recommendations.
NATIONAL SKILLS COMMISSION	National Skills Commission – informing standards for Vocational Education and Training	<p>The National Skills Commission provides advice on Australia’s labour market including current and emerging workforce skills needs. The NSC plays an important role in simplifying and strengthening Australia’s Vocational Education and Training system.</p> <p>Key initiatives include:</p> <ul style="list-style-type: none"> • Shaping skills classification of occupations including categorising emerging occupations which informs ANZSCO • Forecasts workforce and employment trends nationally • Defines skills clusters to inform how Training Packages (qualifications, skill sets, micro credentials) are formed and endorsed
DEPARTMENT OF EDUCATION, SKILLS AND EMPLOYMENT (FED)	Review of University-Industry Collaboration	A review Conducted by Emeritus Prof. Bean and Emeritus Prof. Dawkins into the collaboration of University and industry in teaching and learning is underway with a paper submitted 2021 to the Commonwealth Department for Education, Skills and Employment for consideration.
TEQSA ACT REVIEW	TEQSA Act Review	<ul style="list-style-type: none"> • On 27 April 2021, the updated Higher Education Standards Framework (Threshold Standards) 2021 was published on the Federal Register of Legislation. • This is the first update to the Threshold Standards since 2015. • The Threshold Standards were revised in response to the review of the Provider Category Standards conducted in 2019. The Higher Education Legislation Amendment (Provider Category Standards and Other Measures) Act 2021 gave effect to the Australian Government’s decision to implement all 10 recommendations arising from this review. • The updated Threshold Standards, which incorporate the revised provider categories came into effect from 1 July 2021.

- Further amendments to Threshold Standards were made on 1 December 2021 to include a definition of Academic Freedom and update three standards.

BODIES ISSUING FUNDING, GRANTS & SCHOLARSHIPS TO ORGANISATIONS AND INDIVIDUALS

LEAD ORGANISATION

Initiative

Description

THE SURVEYORS' TRUST

Various initiatives to support the industry and its members

- Royalties from the sale of members' plan are collected by The Surveyor's Trust and reinvested in the industry for the greater good of surveyors
- Membership is free with benefits including discounted or free attendance at events, mentoring, scholarship invitations, information/newsletters
- Each year the Trust allocates funds from the pooled royalties from the sale of survey plans. Funds go to:
 - A history project (communicate the historical significance of surveying to all stakeholders)
 - An education project (offer key subjects to give experienced surveyors a commercial edge and protect against new market entrants)
 - A skills project (develop a certificate program alongside industry partners to advance the skills of emerging surveyors)
 - An industry project (to strengthen the surveying industry)
 - A bursary/scholarship (to provide two surveyors with either an education program or skills program each year (USQ))
 - Industry mentoring program to foster relationships and knowledge-sharing
- Currently support the following initiatives
 - Industry Association collaboration
 - Destination Spatial
 - USQ – Digital Disruption & Cadastral Plan IP
 - SheMaps
 - Consulting surveyors National Academy

ISAQ BEF BICENTENNIAL EDUCATION FOUNDATION

- Founded in 1988
- Registered as a Charity with ACNC it seeks to raise funds for investment into the education of surveying and spatial professionals who are Australian citizens
- Issue grants, scholarships, and bursaries to undergraduate candidates to complete courses at recognised tertiary institutions.
- The Foundation has completed the legal structure as a charity with DGR status governed by the corporate trustee ISAQ Ltd, and will increase its activities over the coming year
- Selection of candidates is determined by the Board assisted by expert advice from the Advisory Committee which is constituted by delegates from professional, business and academic sectors to assist the Board achieve the stated goals of the Foundation's Trust Deed

UNIVERSITY OF SOUTHERN QUEENSLAND

Surveying Residential School Bursary

- In 2021 USQ offered a number of Surveying Residential School Bursaries to students enrolled in a USQ surveying degree with a compulsory residential school in the

[SPATIAL INNOVATION
FOUNDATION](#)

(current) teaching period. The bursary was established by donations from The Surveyor's Trust

- Each bursary has a maximum value of \$500

Case Study - High School

Wavell State High School



Background on organization

Wavell SHS is a state secondary school with approximately 1800 students in the northern suburbs of Brisbane. Wavell has been successfully using spatial technology in the Humanities Department since 2006. Since 2018 and the implementation of the new Queensland Senior geography syllabus, Wavell's geography program has continued to embrace, upskill and promote the use of industry standard spatial technology and provide students with improved skill development and subject results. Wavell SHS has also worked to provide teacher, student and industry driven professional development opportunities to over 80 teachers from around Queensland over the last two years. Wavell SHS has also readily created and shared spatial technology resources and projects aligned to the syllabus to help teachers and students around Queensland to increase their capacity to take advantage of the opportunities that spatial technologies provide in the classroom.

Wavell SHS's combination of specific use of spatial technologies and a deep understanding of how spatial technologies can enhance assessment has provided students at Wavell SHS with opportunities to win and be recognised in State, National and Global competitions (See <https://arcg.is/ODyqz90>). They have also succeeded in achieving senior results well above state averages in the three Internal Assessment (IAs) over the past three years.

Wavell SHS has also developed strong relationships with the spatial industry, being a leading school in the SheMaps Lighthouse Program, which also led to an incursion of a leading global company, Emesent, who specialize in autonomous drones and Lidar technology. Wavell SHS has developed a strong working relationship with industry leaders ESRI Australia which resulted in a student being awarded an internship after completing Year 12 in 2021. Wavell SHS geography has also worked hard to development working relationships with councils, industry, community groups, tertiary institutions and other schools which has led to outstanding projects and results. Wavell's teachers and students have also presented their practices and assignments at local, state, interstate, national and global conferences including ESRI Education Summit, GTA of NSW, GTAQ, AGTA and EduDrone. Abstracts have been submitted to Locate22 in Canberra and the ESRI Education and User Summit in the USA in 2022.

Wavell SHS share projects using available industry data to help schools around South-East Queensland access ready made projects. This has made it easier for teachers and students to engage with spatial technologies and reliable data. A recent example is a project in Helensvale where a number of Gold Coast City data layers were married with Koala sightings and strike data providing schools in the area with a rich base dataset to work with to understand the issue of land cover change (See <https://arcg.is/0a9Seq1>). The Jacobs Well Environmental Education Centre (EECs) runs field work excursions in this area and this project provides access to key data, therefore assisting the centre which provides a valuable service to numerous schools using their facility for field work. This type of

project is a simple example of the power of identifying and assisting key stakeholders to effect change by engaging with readily available data with free industry standard software.

Describe the program of work or project you or your organisation have implemented to address skills for the Surveying and Spatial sector.

Wavell SHS geography department has been embedding spatial technologies into classroom practice in selected junior classes and across every assessment piece in Year 10 – 12 for the past 4 years. Projects are developed with the syllabus and the use of spatial technology use in mind, in order to achieve great outcomes for students. Wavell's teaching staff are always looking to use current, accurate and accessible datasets to enhance the learning outcomes of Wavell SHS students, while also creating projects to assist geography departments in other schools to access projects. Wavell SHS then collects spatial data in the field with current industry Apps to supplement the data obtained increasing the relevance of the projects. These processes provide the students with rich quantitative and qualitative datasets to analyse in their senior assessments and also allows them to create sophisticated interactive maps. A very high percentage of geography students go on to study at university in areas like planning, environmental management, environment engineering, epidemiology, transport, or end up in GIS analysis. Very few students view surveying as an option and industry needs to work to improve this gap in choices for some of the exceptional students graduating with a well-developed geospatial skill set.

Wavell SHS geography continues to lead the way in promoting and supporting the use of spatial technologies in classroom practice in Queensland. Wavell SHS regularly requests data from industry including councils to provide real-world projects which have been widely recognized as outstanding use of the technologies available. Wavell SHS continues to engage with council, industry, community, the tertiary sector, the state education department and other schools to build capacity and skills predominantly in South East Queensland. This has culminated in the development of one of Wavell's most exciting projects in undertaking a teacher in-residence at Norfolk Island Central School with four Year 12 Wavell students to embed spatial technology into the latest remote Queensland Education school. Education Queensland International and the Education Department's Rural and Remote schools' program have provided significant support to assist in realising this project. The industry and tertiary sector were approached for support. Overwhelming support was forthcoming from ESRI Australia in the form of software, merchandise, and experts on site as well as some financial support committed to the project. Norfolk Island Regional Council committed data to the project and in-kind support was obtained from SheMaps, GeoNadir and the Earth and Environmental Sciences Department at the University of Queensland. All the support is greatly appreciated and will lead to a rich and rewarding project for teachers and students at Norfolk Island Central School. Wavell will be able to share their knowledge and provide support to and build projects using spatial technology that are uniquely site specific. It will provide this island school with the ability to use industry standard ICTs to create meaningful local projects.

What are the key learnings you can share to improve skills development for the surveying and spatial sectors?

- Industry's meaningful engagement in education provides students with the ability to develop desirable skills and an understanding of possible pathways post school.
- Students graduating from senior geography at Wavell SHS have a deep understanding and a very sound working knowledge of geospatial technology which should be utilized by industry through the development of internship programs
- A high percentage of students completing senior geography at Wavell SHS in Year 12 are producing sophisticated assignments that would easily pass second year spatial technology university classes but upon entering first year university courses go backwards in their use of spatial technology. Therefore, students could enhance their spatial skills further through internships in industry straight out of high school while studying at University.
- Students' skills and interests should be matched to specialist spatial industry partners (e.g., student specializing in Digital Solutions and Geography (Spatial Technologies) and studying Urban Planning at QUT could be matched with a company like Aerometrex), while a student specializing in Biology and Geography (Spatial Technology) could be matched to the Department of Resources or Department of Environment).
- There are limited pathways opportunities for students not pursuing university studies to develop skills in the spatial industry. Research found only a Cert IV in Spatial Technology in NSW was available.
- A more collaborative approach is required by the surveying with other industries that use this technology in order to attract students to courses and the industry.
- Collaborative project development with real world data sets including developing the ability to work in the digital twin space.
- Industry supported competitions in junior and senior secondary education separately. It needs to be aligned to the national curriculum in Junior and State curriculum in senior. Awards could be presented at the Surveyors Trust lunch at the end of the year with invitation to senior students.

Case Study – Industry (large)

Veris Australia

Background on organization

Veris is Australia's leading provider of spatial data services. With over 500 people and 18 office locations across Australia, we combine national strength with local knowledge and expertise to ensure the best outcomes for our clients.

An ASX-listed company, we provide our services to both private and public sector clients across the infrastructure, property, resources, utilities, government and defence sectors. Our impressive client list includes Australia's premier property groups such as Stockland, Mirvac and Lendlease, blue chip mining companies such as BHP and Rio Tinto, as well as a host of major Engineering consultancies, Tier 1 contractors and Government agencies.

We are experts in all aspects of spatial data – from collecting measurements in the field to applying the latest 3D data capture, AI and visualisation technologies. Our expertise spans data collection and capture, using all types of sensors, as well as data processing, hosting, management, modelling, analysis, visualisation and sharing.

Unlocking the key drivers of social change within our organisation is embedded in everything we do. To us, this means fostering diversity within our workforce, and increasing the participation of women in the industry. Helping to close the gap between Indigenous and non-Indigenous Australia is a key priority for us too.

Our people are our greatest strength, and we make sure they know that – with opportunities to grow and shape the kind of career they truly want. Whether you're a seasoned professional or just starting out in your career, the opportunities we offer are challenging, exciting and rewarding.

Describe the program of work or project you or your organisation have implemented to address skills for the Surveying and Spatial sector.

Veris Young Professionals Program

The Veris Young Professionals Program is spread across 12 months, beginning every February, and is designed to provide exposure to all areas of the industry. The key functions the participant is exposed to are Digital & Spatial, Engineering Survey, Property Survey, Urban Design & Town Planning.

The program is designed to provide wholistic support to young graduates in areas of technical and professional development. The participant is also matched with a sponsor who is an expert in their field for the entirety of the 12 months to support and encourage them and build their internal and external network.

The professional development component focuses on areas such as project management, communication skills and stakeholder engagement to name a few.

The aim of the program is to support young professionals, build their network and support them to be part of a cohort of like minded individuals and provide opportunities to share ideas, experiences and learn from each other.

Veris Pathway Program

Veris Pathway to Registration Program delivers the training you need to become registered as a Licensed Surveyor.

Our approach places you at the centre, with supervision, training and guidance designed to help you achieve your career objectives. You'll get the support of our highly experienced team of Licensed Surveyors, and the opportunity to tap into their diverse expertise.

The program supports Surveyors by:

- Aligning them with a Licensed Surveyor
- Connecting them to a national network
- Structuring and tracking study – with half a day per fortnight dedicated to studying skills that help them achieve registration
- Covering fees – competency assessment fees
- Supporting their career – we encourage employees to join relevant industry bodies and take part in professional development events.
- Ongoing learning – with regular webinars designed to educate them on key topics relating to achieving registration.

Veris Indigenous Pathway Program

Veris Australia has established an alliance with majority Indigenous owned land and construction surveying company - Wumara Group. In partnership with Wumara and TAFE NSW we currently have 6 Indigenous trainees complete a Certificate III in Surveying. Upon completion we hope to employ them with Veris and continue to support them to pursue further qualifications and find an employment pathway.

What are the key learnings you can share to improve skills development for the surveying and spatial sectors?

- The need for senior professionals to be trained in how to train and develop others. The majority the senior professionals in the industry lack training in the skills required to adequately train and support the development and learning of more junior staff. The reality of the training is focused on technical competency. As such personality types naturally gravitate and the traditional career path is focused on the development of technical skills and the pressure to deliver on client demands. Furthermore, it is generally assumed within the profession that senior staff are expected to be able to adequately train and support more junior staff with the natural abilities they already possess. The skills required to adequately train and support the development of more junior staff are innate to a rare few and we

should acknowledge that these skills require respect and investment in education to develop properly. Until we address the coaching and skill development mindset, the industry will fall short in the resources required for skills development of young professionals.

- The need to develop and document customised development plans for young professionals. Development plans should at minimum incorporate two elements being:
 - a clear list of learning areas (tasks, skills or competencies) that can be referred to in order to understand the subject's current skills, identify areas for development, set goals and track progress and be used to form the basis of 12 month development plans.
 - a calendarised program of contact points over 12 month periods - generally monthly or bi-monthly - for the subject and mentor to check-in, review progress and set actions for the next period.
- Work-flows that provide for skills development. There are opportunities to enhance the skills development of young professionals by the way business units and delivery models are structured to enable subjects to complete a wide range of tasks from project commencement to completion. Such structures enable young professionals to gain a deeper and more connected knowledge and experience - for example, surveyors having exposure to both field and office-based tasks - developing more well-rounded, autonomous and adaptable young professionals who enjoy their work more. Businesses that focus on a narrow specialisation with young surveyors in the pursuit of improved efficiencies via technical specialisation or focus on one particular field/area may be punished in the long-term with operationally inflexible staff who are unmotivated and are unable to develop breadth of skills required.

Cast Study – Industry (Small)

Land Solution Australia

Background on organization and you as a professional

Land Solution Australia Business started in 2008, currently has 12 full time employees, 6 Registered surveyors 2 survey technicians, 2 programmers and one full time researcher. Diversified over the years into Automation and Technology SaaS Business offerings with Monitum Pty Ltd in 2017 and Kulroo Technology in 2021. Proudly privately owned small business.

The Founder (Lee Hellen), graduated with Bachelor of Applied Science in Surveying 1996 then worked for Qasco Surveys in Aerial mapping and consulting surveying to 2008 with stints in Europe and Asia and rural Australia in between. The Founder then became a Licensed Surveyor with the Northern Territory Surveyors Board in 1999 at age 26. The Founder then evolved as a professional through numerous leading roles becoming a Survey Manager at age 33 after roughly 10 years field experience. He then achieved Associate Certificate in GIS major USQ in 2002.

Lee applies his learnings and experience in the practical use of technologies for surveying applications which is a significant part of Land Solution Australia service offerings. Business transitioning led to the establishment of Land Solution Australia following after the dissolving of the Qasco group of companies in the late 2000's.

Lee is an active member of the surveying and spatial sciences Industry groups SSSI and Land Solution is a business member of SIBA|GITA, both memberships since 2006. Land Solutions Australia and its staff have received numerous industry and personal awards for innovation and technical excellence in the Spatial Industry.

Describe the program of work or project you or your organisation have implemented to address skills for the Surveying and Spatial sector.

We have implemented a strategy of remote work and automation of services for several reasons

1. Embrace the future of work
2. Embrace new survey technologies and efficiency in business operations
3. Limit exposure to skills shortages
4. Make the business more appealing to new entrants and clients.
5. Adopt improved business models to traditional consulting

What are the key learnings you can share to improve skills development for the Surveying and Spatial sector?

The key learnings to improve skills development for the sector include the following:

- Have a culture of learning and improvement in your business and yourself;
- Always be integrated with your professional community and give back to your network;
- Aim to learn faster than everyone else;
- Hire on aptitude and values, not skill;
- Work hard, always try and do better;
- Collaboration wherever possible to give you capacity and capability to do more (notably research grants);
- Listen to your customers and clients and invent things that will benefit them;
- Pay for good advice;
- You're paid to be right;
- Celebrate success; and
- It's a marathon not a sprint, be patient.

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