Do current graduates meet the needs of the industry defined by surveying and mapping and its allied fields?

1. All of our members from both SSSI and SIBA|GITA report of an ongoing shortage in the supply of graduates to meet the future needs of the industry.
2. In terms of course content, as a generalisation it is largely relevant given it is training graduates for a range of possible geospatial careers, not only limited to producing licensed surveyors. There are some concerns expressed by our members of how quickly the curriculums are being updated to meet the rapidly changing future of work requirement.
3. The length of time to complete the courses is of concern. Those studying part time can take 8 years to graduate, it is likely some of the content has been superseded by the time of graduation.
4. All Businesses (incl. government departments) report they are struggling with the time it takes for a graduate to successfully pass Board competency assessment. This issue of graduate competency is not new. The number of graduates each year is alarmingly low. A healthy industry has a steady graduate flow. This is sadly not the case for cadastral surveyors.
5. Graduates generally are capable to undertake the basic tasks required for a general survey, however there is a need for the attraction of higher academic performing entry level students to the courses to enable the industry to meet the challenges of the future, particularly given that most firms have moved to 1 man field parties which requires greater resourcefulness and responsibility from the graduates.
6. Even with the flexible study options, there is just not enough graduates to meet industry's requirements, so businesses are becoming more creative (or desperate) and hiring anyone that is is interested in surveying and encouraging them to study, TAFE or part time university and work in their practice, in the hope after 6-8 years they might get a good employee. This is a considerable gamble with varying degrees of success.
7. Businesses are employing greater numbers of students for longer, with lower competency levels than if they were employing a full-time graduate. This requires greater levels of supervision. This in turns puts pressure on competent staff manage staff to provide more practical skills training, reducing the productivity of the industry as a whole.
8. Equivalent Pay rates for students working part time are of the equivalent of graduates in other professions due to demand, this is impacting margins for surveying practices.
9. The skills shortage has led to a highly competitive employment environment with some businesses just offering higher salaries and actively poaching graduates from other companies that have invested the time, to support students during study. This is clearly good for the employees prospects but an unhealthy situation for the businesses. Higher salaries though come with expectations of higher output, leaving less work time for graduates to work on professional development and career advancement.

What skills, knowledge and experience are required for licenced or registered cadastral surveyors?

1. Graduates essentially need to demonstrate competency as a professional, and possess organisational ability, thinking and problem-solving skills, noting the prevalence of one-man survey crews now in the industry.

2. Other skills highly valued include:
    a. Best practice from a growing diversity of competencies including:
        i. coding for application development
        ii. engineering, science, and mathematics
        iii. communication skills including proposal writing
        iv. business skills including knowledge of contracts,
        v. Understanding of the changes occurring to Surveying/Geospatial profession future of work, that has already arrived (refer work economic report future of jobs) to remain competitive https://www.weforum.org/reports/the-future-of-jobs-report-2020
    b. precise positioning, cadastral surveying, engineering surveying, mining surveying, hydrographic surveying, Laser scanning, Data management which should be continually refined and improved by on the job coaching and mentoring by senior colleague.
    c. Professional ethics and communication – this is one the most critical points our members see as requiring much greater emphasis.
3. In government departments there is a lack of private industry participation and similarly in practices there is a lack of participation in broader industry activities leading to a decline in overall knowledge.

Identify required level of competence that cadastral surveyors must have to obtain or renew a licence to conduct cadastral surveys, for example needs to be "an understanding of" or needs to be "an ability to" carry out a task.

Our members raised the following pre-requisites:

1. A thorough understanding of the current legislation, requirements and standards affecting cadastral surveys
2. In depth knowledge of existing and emerging technologies and how they can be applied to improve productivity
3. Be fully competent in precise measurement techniques, sources of error, identification and treatment of errors, along with competence in instrument calibration and removal of positional uncertainty.
4. Be a good enough communicator to liaise confidently with clients, but also a willingness to mentor or coach graduate surveyors to assist them in obtaining their licence in a reasonable time.
5. Professional ethics and integrity is fundamental to maintaining the confidence in the cadastral system and the profession.

What can undergraduate surveying degrees contribute to developing the foundations to build the capacity and capability of land surveying for the future?

1. Consider alternative pathways to the 4 year degree, whereby a 3 year degree can be boosted with a series of micro-credentials on topics that are specifically relevant to cadastral and land surveying that can be studied concurrently with graduates working, gaining

experience and completing their project requirements for licencing. This would be one step towards shortening the pathway from graduation to successfully passing Board competency assessment.

2. This approach would embed a culture of continuous learning into younger surveyors which is becoming increasingly important with the digital transformation and the need for professionals to continually train and learn throughout their careers.
3. Surveying Graduates need to better understand that Surveying is expanding into a wider range of geospatial data capture, analysis and new delivery methods. The impact of Geospatial data in the overall economy is large and was identified as having a positive impact on 75% of the overall economy in a global study carried by Alpha Beta for Google in 2016.
4. As a sector we need to be better at attracting more women and other cultures into the surveying profession. In other countries women have higher participation rates and so do other cultural backgrounds. The perceptions for students entering the profession needs a lot of work and needs to include other fields not solely cadastral surveying. It needs to be a global view. Growing the cake will mean a bigger slice for cadastral specialisations.
5. Greater emphasis needs to be placed on the future role of a cadastral and land surveyor and the changes to their role caused by the impact of new technology. This is important as in many cases their mentors will not have strong knowledge of these impacts or be giving it much consideration. This includes artificial intelligence, Internet of things, cloud computing, big data analytics, robotics, encryption and cyber security, augmented and virtual reality, e commerce and digital trade, 3D and 4D modelling and space technology. This will require more offerings of double or hybrid degrees in surveying say with computer science or engineering to build graduates with higher cognitive ability in the future of work tasks.

Please provide any additional feedback you may have below.

1. SSSI & SIBA|GITA strongly believe that a recognised national competency framework for Cadastral Surveyors is essential. This initially would be a general land surveying national competency framework with jurisdictional endorsements for practicing cadastral surveys in each jurisdiction. Given that in each jurisdiction cadastral surveyors are providing a service that is the same, working under a titling system that is common to all jurisdictions there is no logical reason for state based management of licensed surveyors (while acknowledging the existence of separate legislation in each jurisdiction). In time we would like to see the jurisdictional differences for local endorsements be removed so that there is a genuine national competency framework bringing surveying into line with most other professions. Having a recognised national competency framework will also assist in attracting students to study surveying degrees as it raises the profile of a recognised profession.
2. The federal Government identified the lack of full mutual recognition between jurisdictions impacting many disciplines as a form of market failure that impedes business growth, as companies seek to expand into new locations. They brought in legislation to attempt to address this. It is very important that CRSBANZ makes meaningful reforms so that mutual recognition truly does exist.
3. The length of time it takes for a graduate to become licenced in any Australian jurisdiction is of great concern. With 10 years or longer being the average (longer than it takes a medical practitioner to become an elite specialist, or a law graduate to become a practicing solicitor). **This situation must be considered as a form of market failure that has remained unaddressed for far too long.**

4. Due to the scarcity of graduates and businesses employing students or completely untrained staff to meet their requirements, businesses are not supporting the emerging professionals as they once did. Employers of surveyors do not want graduates talking to other surveyors employed by competitors and sharing knowledge for fear of poaching of staff. In some cases, this is not in the public interest (conflict and delays) but it's not in the interest of the industry because surveyors are not contributing the profession of surveying outside of their job. SSSI and SIBA will provide more guidance to firms to help them become an 'employer of choice' and be more comfortable of sharing of knowledge with other firms for the benefit of the overall profession.
5. The term 'surveyor' to describe the profession should be reviewed in terms of its suitability for the role of what we currently call a surveyor in the future. A surveyor's role is poorly understood by the general public and given the rapid change to the role that Industry 4.0 is having, the term Geospatial Professional/Expert may be more appropriate. Automation, the use of drone based sensors, artificial intelligence is both impacting how the role is performed but are also contributing to raising the profile. Surveyors are not commonly associated with developing or utilising artificial intelligence applications (even though surveyors are working many of the new technologies on a daily basis) but Geospatial Professionals are associated with emerging technologies. We would like to CRSBANZ at least start this discussion as it will take some years to reach consensus.

Expression of interest for participation in roundtable discussions

- SSSI and SIBA and very keen to be represented with 2 people from each organisation to participate.
- Please contact any of the following:
    - Lee Hellen, Chair, National Land Surveying Commission, Lee.Hellen@landsolution.com.au
    - Alistair Byrom, Chair SIBA|GITA, a.byrom@veris.com.au
    - Paul Digney, President SSSI, paul.digney@jacobs.com
    - Tony Wheeler, CEO SSSI, tony.wheeler@sssi.org.au