Analysis of Technical Disciplines for Technology Professionals in Canada

Funded by Technology Professionals Canada

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Final Report

An Analysis of Technical Disciplines for Technology Professionals in Canada

1. Project Scope

This project was commissioned to conduct research on the technical disciplines currently used to accredit educational institutions, similar certification programs in other professions (including complementary certifications) and the perspective of stakeholders regarding programs offered in emerging areas of technology and certification programs for technical professionals.

In addition, key stakeholders were engaged to determine the appetite for a change in the way the Provincial Professional Associations manage their certification of technical professionals (i.e. by specific discipline). These stakeholders have been consulted to provide a perspective specific to their area of expertise.

The goal of this project was to determine if the current disciplines were sufficient to meet the needs of stakeholders or if there is significant interest in developing additional disciplines for use in accreditation of education programs and the certification of professionals.

2. Project Methodology

The project initiated with online research and analysis, followed by individual interviews and online surveys. The online surveys were targeted at four distinct groups: Students, Academia, Industry and Technical Professionals themselves.

Information gathered in the research stage was used to develop survey and interview questions. In addition, the outcomes of the preliminary research, particularly alternative disciplines and certifications in similar and complementary areas, was helpful in understanding many of the open comments left by the online survey participants.

The online surveys were analyzed independently by sector group. In many cases, answers to the same or similar questions by different groups were consistent. In other cases, the responses were significantly different, particularly when comparing the perspectives of students and academia.

3. Executive Summary

Need for New Disciplines

Results indicate no perceived need for the immediate development of new technology disciplines. A significant number of comments indicated that the standards should be reviewed on a regular basis with the intent of determining where new criteria are needed, and possibly where some have become redundant. Since this is part of the Technology Accreditation Canada (TAC) process,

these comments would appear to stem from a lack of awareness regarding the changes implemented by TAC.

A significant number of comments did reference the potential for dividing the Civil Engineering category into more focused categories. This appears to be supported by the statistic that twenty-nine percent (29%) of certified personnel across the TPC provinces are certified under the Civil Engineering discipline.

Survey and interview results indicate that inter and/or cross disciplinary professionals are needed in many sectors and there is a lack of recognition of interdisciplinary professionals. Building professionals and those involved in other forms of infrastructure cited the need for a broader base of knowledge with depth of experience. In addition, comments indicate that a professional's career path might be limited by more narrowly defining the technology in which they are certified, which might occur if additional disciplines were developed and the current practice of certifying personnel under one specific discipline is continued.

Requests for New Disciplines

Where a request for a new discipline is received from a College wishing to be the first to offer an accredited course in the area of an emerging technology, the question arises: "Is market advantage sufficient reason to consider the development of a new discipline?" TAC has been developed as an arms-length, process-based organization with the mandate to develop and update Canadian Technology Accreditation Criteria (CTAC). There is a process by which stakeholders can request the development of a new CTAC and the Standards Council decides on whether or not to proceed.

It is the opinion of the author that there is a need to formalize the criteria by which a decision to decline or move forward with a new discipline is made. Once these criteria are quantified and formalized, the TAC process for responding to requests and determining the need for new disciplines will function appropriately and should be the mechanism by which these decisions are made.

Interim Opportunity

How quickly these emerging technologies get a foothold in the Canadian economy might present opportunities for the provinces in a quick and efficient "micro-certification" (qualified speciality) of professionals within these fields. Since governments are slow to move with regulatory systems – a system of professional self-regulation (partnered with engineering associations) might be a stopgap solution that would enable these technologies to progress safely in the interim and meet the needs of the membership.

4. Findings

4.1 Current Discipline Categories for Certification

There is significant alignment of the certifications offered in the categories of technician and technologist across the Provinces in Canada. There is also a very significant alignment between the technology disciplines used by the Professional Engineers to accredit education programmes and the technology disciplines used by Technology Accreditation Canada.

Civil Engineering is the predominant certification discipline in the TPC provinces, representing 29% of all certifications in the TPC Provinces. Electrical (18%) and Mechanical (17.5%) are second to Civil. Together, these three disciplines represent close to 65% of the professionals certified.

Although the disciplines for Technicians and Technologists are not completely in line with the disciplines for Engineers, they are significantly similar. Disciplines are also not completely in line with those used in the U.S. as defined by ABET, although they are substantially similar.

The above considered, it was strongly believed by all survey respondents that the current technology disciplines were sufficient. Eighty one percent (81%) of Professionals and eighty-three percent (83%) of Industry representatives surveyed believed that the current disciplines covered the technological work performed by technicians and technologists in Canada. Sixty four percent (64%) of Academics and eighty-four percent (84%) of students surveyed believed the current disciplines covered the academic coursework required for Technicians and technologists in Canada. It is interesting to note that sixty-six percent (66%) of Academics surveyed believed that if a course could be accredited under a new discipline reflecting an "emerging technology"; it would provide the college a competitive advantage.

4.2 Hybrid Audit Criteria – Risks and Benefits

Where college programs cross over disciplines, the colleges work with the auditor to develop the audit criteria to which they are certified. This leads to the presumption that where there are multiple colleges all accredited to a hybrid program standard, the content has the potential to be completely different and/or more heavily weighted in one of the technology categories than the other. This seems to present the potential for students graduating from different programs having entirely different knowledge sets and skills.

Another risk is the requirement that a hybrid program standard is combined using only two disciplines. For example – to create the audit criteria for a program "Green Energy Technologist", two disciplines would be chosen between electrical, building, mechanical, civil and possibly petroleum – whereas all those disciplines come into play. Following this, the program would be formally accredited under only one of these disciplines, offering the graduating student that specific discipline as the only option when seeking certification.

It is recommended that when the TAC Standards Council clearly defines the criteria by which they determine where a new discipline is needed, existing accredited courses and the technical content of their hybrid criteria in new areas should be a factor.

4.3 Stakeholder Engagement Findings

Interviews:

Discussions were held with eight interviewees to determine their perspective on the current technical disciplines and whether there was a need for more defined or completely new disciplines.

A list of interviewees is included as Appendix A.

General concerns regarding the development of new disciplines included:

- Limiting a graduate's opportunities by defining their expertise too narrowly

- The inability to accurately define the technical criteria for an “emerging technology”, given its evolving nature.
- The “horizontal” nature of many emerging technologies; for example nanotechnology which impacts almost every existing discipline.
- The ability of Technology Accreditation Canada to appropriately “manage” a large number of CTAC, given that there is necessarily some crossover of technical content between standards and any one change can/may have an impact on another CTAC. The risk for discrepancy becomes greater as the number of documents grows.

Key insights regarding a need for new areas of defined expertise included:

- “Smart Building” professionals
    - This was cited in the areas of green buildings and health care facilities
- Interdisciplinary technology professionals
    - This was described as a senior level Technologist with education and experience in multiple technical areas, specifically Electrical, Electronics, Mechanical and Civil. The existence and need for this particular type of professional was cited by every non-Academic interviewee and was supported in the open comments within the online survey results in both the Industry and Professionals categories.
- Non-destructive testing
    - This was cited as a market gap that needs certified professionals and was cited in the online surveys.

In the interviews with the two Academics, it was indicated that there was value in the accreditation process and that international students in particular sought accredited programs. It was mentioned that there was a lack of support from Administration regarding the accreditation of emerging programs. It was also clearly stated by one of the interviewees that the rift between TAC and CTAB needed to be resolved, and that their College administration held off on accreditation decisions waiting for resolution to the problem of the parallel National systems.

Online Surveys

The online surveys generated a good response with a mix of perspectives from different industry groups and Provinces. The questions were targeted at four distinct groups: Professionals, Industry, Academics and Students. Four thousand, two hundred twenty eight (4228) surveys were fully completed, with an overall average completion rate of 85.6%.

Category	Initial Respondents	Fully Completed Surveys	Completion Rate
Professionals	3621	3042	84%
Industry	909	895	98.5%
Academics	111	77	69.4%
Students	355	264	79.4%
Totals	4996	4278	85.6%

General Observations Across all Categories

The Student and Academic surveys were heavily weighted towards Alberta with seventy five (75%) and forty six (46%) of respondents respectively. The Industry survey is weighted towards Ontario with fifty five (55%) of respondents.

Consistently cited throughout the open comments fields was the need for continual professional learning and recognition that the professional code of ethics was a foundational element of certification.

One issue consistently presented by Industry, Professionals and Students was that a certification was issued by discipline based on the educational program(s) completed and initial work experience. However as professionals advance in their careers, many different opportunities will change their technical knowledge and focus. There is no provision in their Provincial Professional Association for a professional to change their technical discipline, or to cite expertise in more than one technical area. This is an interesting perspective given that only two percent (2%) of the professionals surveyed indicated they were certified in more than one discipline.

Academics

Please reference “Appendix C”.

In terms of geographic representation, close to half of the responses received from Academics were from Alberta.

Please indicate your Province or Territory	Response Percent
British Columbia	5%
Alberta	46%
Saskatchewan	23%
Ontario	25%
Yukon	1%

What is your role in your Academic Institution?	Response Percent
Dean/ Associate Dean	6%
Chair / Associate Chair	5%
Department Head	16%
Professor/ Instructor	64%
Other (please specify)	10%

The majority of respondents were Instructors in their college.

“**Other” category included:**
Applied Research Consultant
Design & Engineering Director
Engineer
Engineering Technologist - Undergraduate Academic Support
Facility manager
President
Retired department head
Support staff

Almost forty percent (40%) of respondents indicated they were involved in “emerging technologies” in their institute. Identified areas of technology in the open comments included:

- IT Program related
- Water / Environmental
- Advanced manufacturing (3D printing, Robotics)
- Engineering Drafting & Design

Eighty five percent (85%) of respondents indicated that there were accredited courses in their institute. When asked whether they believed that the disciplines currently in use met the needs of colleges when seeking accreditation, only 52% said yes.

It is interesting to note that when asked if the technologies meet the needs of the colleges when they seek accreditation, the responses were almost evenly split. However when asked if they would find it more straightforward if specific disciplines be developed for emerging technology programs, more than 64% of respondents indicated yes. In general, the comments were split, some indicating that specific disciplines would add greater clarity; others indicated there was potential for a multitude of disciplines that might become obsolete.

Sixty six percent (66%) of respondents believed that if courses in “emerging technologies” could be accredited under a discipline unique to that technology it would add to the institute’s competitive advantage. Yet, only 47% of Academics surveyed believed that accreditation was an important factor in a student’s decision to enroll in a course and the same percentage (47%) believed that certification specifically within an emerging technology would benefit recent graduates.

When asked about the competitive advantage that accreditation provided for specific technologies, where respondents had an opinion, the disciplines most highly cited were:

- Architectural, Building and Construction Engineering
- Civil
- Electrical
- Electronics
- Mechanical

Academics were statistically more likely to cite the need for new disciplines in emerging technologies. However many comments indicated that the nature of emerging technologies are hard to pin down, hence their categorization as “emerging”.

Students

Please reference “Appendix D”

The online survey was completed by 355 Students with a geographic breakdown as follows:

Please indicate your Province or Territory	Response Percent
British Columbia	10%
Alberta	75%
Saskatchewan	1%
Ontario	13%
Manitoba / NWT	1%

When asked if their current coursework was in the area of “emerging disciplines”, 89% of student respondents indicated they were not, however 25% indicated they planned to pursue a career or further their education in an area of emerging technologies following graduation. In the 11% that did not fall under the traditional disciplines, broadcasting, welding and water treatment were most often cited.

Seventy three percent (73%) of students indicated accreditation was an important factor in their decision when choosing an educational program. It is interesting to note that only 47% of Academics believed that accreditation was a driver for student registration. 37% of Academics believed the Technology was the primary driver for student selection of a program, as opposed to only 27% of students.

Eighty percent (80%) of students surveyed intend to pursue certification after graduation. Only four percent (4%) do not intend to pursue certification. This is very positive news for the Provincial Professional Associations if we can extrapolate this data across the other provinces.

Seventy three (73%) of students surveyed believed it would be beneficial to have programs accredited under specific, emerging technologies, and yet 76% did not believe that any of the programs were so unique they were not covered under the existing disciplines. In the author’s opinion, the ability to become certified under the specific emerging or unique technology is the driver in the eyes of the students who indicated within the open comment fields that areas such as biomedical, water, drafting and welding were of interest. Many students indicated they believed that a more specific certification would be a differentiator when searching for employment.

When asked about the level of understanding that students have regarding their ability to become certified post-graduation, more than forty-five percent (45%) of student respondents chose the “not interested” or “do not know” answer. Since just over 80% of students indicated they wished to seek certification post-graduation, there appears to be an opportunity for student engagement during their college years to increase the potential for future members.

As would be expected, the comments related to specific certifications were targeted at the ability to realize employment post-graduation. Many students cited a preference for specific certifications to provide a clearer indication of expertise for prospective employers.

Interestingly, when asked if any emerging technologies were so unique they should have their own discipline, seventy-six percent (76%) of students said no. However, when asked if they would like to be certified under a specific emerging technology, seventy-three percent (73%) said yes.

When asked about the competitive advantage that certification provided within specific technologies, the disciplines most highly cited were:

- Architectural, Building and Construction Engineering
- Civil
- Electrical
- Mechanical
- Renewable Resources (Technologist)
- Power Engineering (Technician)
- Instrumentation
- Chemical

A positive indicator from this question was that only three percent (3%) of student respondents felt that certification offered no competitive advantage. Fifty-nine percent (59%) believed that certification was extremely valuable, or provided somewhat of an advantage for technicians, sixty-one percent (61%) believed the same for technologists.

Industry

Please reference “Appendix E”.

Responses to the surveys from the Industry perspective were more heavily weighted to the Ontario perspective with more than fifty-five percent (55%) of respondents.

Please indicate your Province or Territory	Response Percent
British Columbia	21%
Alberta	4%
Saskatchewan	19%
Ontario	55%
QC, NB, NS, YK, NV, NU	1%

Construction, Manufacturing, Professional, Scientific or Technical Services and Consulting represented sixty-three percent (63%) of the industry sectors. Numerically significant “Other” categories included Utilities, Telecom, Public Transit and Education.

The majority of respondents were classified as senior managers and technical personnel. Numerically significant “Other” categories include Retired, Building Inspector, and Building/Plant management/maintenance.

Seventy percent (70%) of respondents were Certified Technologists and close to nineteen percent (19%) were certified technicians. When asked for other certifications, frequently cited inclusions were Electrician, Millwright, Inspector, Professional Engineer with Technologist certification (dual).

When asked if they believed the disciplines covered the full spectrum of technical work performed by technicians and technologists in Canada more than eighty three percent (83%) said yes.

When asked, almost eighty-five percent (85%) indicated they would hire an uncertified technician or technologist, although sixty-four percent (64%) indicated that certification was preferred. Yet when the question of validating an applicant’s certification during the hiring process was asked, only thirty two percent (32%) requested validation of both certification and technical discipline.

Forty percent (40%) of Industry respondents believed there would be risk associated with a generic certification. For the most part, the comments supported the idea that Certification came with an ethical obligation to only perform work within your abilities. Those who believed there would be a risk indicated that it would be realized if the professional operated outside their scope of expertise. It should be noted that in organizations that only hire certified personnel, the perception of risk related to generic certification increased to sixty one percent 61%.

Where respondents held a business degree or did not hold a technical designation, only thirty two percent (32%) believed there would be risk with a generic certification.

When asked whether a specialty designation (micro-certification) conferred by the Provincial Professional Association would be helpful when hiring, twenty six percent (26%) felt it would be very helpful and forty-one percent (41%) felt that it might prove helpful in recruiting personnel.

When asked if some emerging technologies were so unique they required special qualifications, seventy-nine percent indicated no. Open comments made reference to in-house training, proprietary technologies, continual learning and the need for cross disciplinary technical professionals. In addition, references were made to the potential for limiting a technical professional by over-defining their area of expertise. This idea is also strongly supported by comments in the Professionals surveys.

One issue that were cited frequently in the open comments was the perception of a lack of recognition of the value of technologists and their limited authority in the field.

Professionals

Please reference “Appendix F”.

Professionals represent the largest category of respondents to the four surveys with more than 3000 complete submissions. The geographic breakdown is as follows:

Please indicate your Province or Territory	Response Percent
British Columbia	15%
Alberta	46%
Saskatchewan	9%
Ontario	29%
Other*	1%

**Other includes:*

- *17 respondents from Manitoba, Quebec, Newfoundland/Labrador, New Brunswick, and Nova Scotia.*
- *18 respondents from the Northwest Territories and the Yukon*

Fifty-five percent (55%) of respondents have been certified for more than ten years.

Seventy-five percent (75%) of respondents are certified technologists.

Comments focused on alternate certifications and/or clarification regarding the “Associate” status being a technician or technologist in training, awaiting certification.

The roles of professionals were quite evenly dispersed, with approximately twenty percent (20%) holding senior management roles and technical project lead roles. Almost forty percent (40%) indicated they were technologists performing technical work. Others were technicians, project managers/coordinators and people leaders.

The industry sector breakdown is as follows:

Answer Choices	Response Percentage
Agriculture, Forestry, Fishing	1%
Construction	18%
Health Care	2%
Manufacturing	16%
Mining, Quarrying, and Oil and Gas	7%
Professional, Scientific and Technical Services	13%
Public Administration	8%
Transportation and Warehousing	3%
Utilities	10%
Consulting	16%
Other (please specify)*	6%

When asked whether they believed that the technical disciplines covered the spectrum of work performed by technicians and technologists in Canada, **eighty-one percent of respondents indicated yes, they believed the disciplines were sufficient. This statistic did not significantly change when analyzed by Province, by certification or by role.**

In open comments, common threads included references to Civil Engineering being too broad a discipline, encompassing water management, structural, transportation. It was recommended that these might be considered for individual disciplines, or sub-disciplines. Automation, Building systems (building envelope), welding and power engineering were also cited as areas that are unique enough to be considered as independent disciplines. Many comments supported the need for continual learning and the recognition of, and need for, cross or inter-disciplinary professionals, supporting the position of a number of the interviewees and the Industry respondents. It was generally communicated that any technical professional must continue to learn throughout their career, not only to augment their existing knowledge within their discipline, but also because interdisciplinary technical work is now becoming the norm.

When asked if specific certification within an emerging technology would be a benefit, fifty-one percent (51%) indicated yes. Where respondents answered “other” comments frequently cited the shifting nature of emerging technologies and the risk of a discipline in an emerging technology quickly becoming redundant. The potential for limiting a professional’s opportunities with narrow disciplines

was also cited. Interestingly, the potential for sub or secondary disciplines was offered as an option in the comments field, prior to question nine, which specifically asked about the value of specialization.

When asked if a "specialty" designation conferred through the Provincial Professional Association might prove helpful, sixty-three percent (63%) indicated that it would be very helpful or might prove helpful. British Columbia and Ontario had the highest ratings in this category, with 68% and 64% respectively. Albeit with an extremely small sample size, the "other" provinces/territories also indicated that 68% would find a specialty designation very or potentially helpful. In Alberta, sixty percent (60%) believed it would be helpful, in Saskatchewan fifty nine percent (59%).

When asked if some emerging technologies are so unique they require a special skill set, seventy six percent (76%) of professionals indicated no. Where comments indicated unique technologies that should be considered, Green Technologies (buildings and energy) were most often cited, with Nanotechnology being the second most commonly cited.

5. Identified Issues

Based upon the outcomes of the research, the author has identified the following issues:

- Potential for professionals working in emerging technologies to be certified in different disciplines, while working in the same field (e.g. Robotics, Water Management).

- Perceived level of dissatisfaction that a professional is tied to only one discipline. Comments indicate that this can be a limiter for professional growth.

- Strong indication that members believe Provincial Certification offers value through the code of ethics, legal knowledge and now the requirement for continual learning. The certification itself does not seem to be perceived as an indicator of technical proficiency.

- There is a strong indicator that Technologists feel marginalized and underutilized given a lack of legislative recognition.

6. Summary and Recommendations

It is clear that the majority of stakeholders across all categories do not believe it is necessary to immediately develop new disciplines in the areas of emerging technologies.

1. It is apparent there is stakeholder interest in the idea of "specialties", micro-certifications or secondary disciplines. It is recommended that the CEOs establish a cross provincial team to evaluate the feasibility of offering this service, ensuring they are fully transferable if developed.

2. Although the survey sample size is relatively small, and only two academics were interviewed, it does appear that the colleges see benefit in accreditation under unique disciplines based on emerging technologies. The information supplied by the respondents showed they believed that accreditation is a market advantage, and that new programs with unique accreditations would provide an even greater market advantage. Given that the colleges are the "customers" of Technology Accreditation Canada and one of the key stakeholders of the PPAs, it would be of benefit to engage the Deans or Department Heads in discussions to better understand their needs.

   The risk to the above recommendation is the potential for a decision regarding the development of disciplines based upon the request or perceived market advantage of a stakeholder rather than a technological requirement. *(It should be noted that where there were not sufficient safety and regulatory reasons to develop a new standard, oftentimes CSA would request funding for that development and proceed based on the funding).* The decision to consider this direction will require policy discussions at the highest levels across the TPC PPAs.

3. Through TAC, the Standards Council or Governance and Audit Council should define a process by which new programs and/or technologies are analyzed and document the criteria by which it is determined that a new "discipline" is required. These criteria should consider the number of courses accredited using "hybrid" CTAC requirements.

4. Inform the TAC Standards Council that information within the online surveys has shown an indication that the Civil Engineering discipline has the potential to be segmented into two or more distinct disciplines.

5. In open comments regarding alternate certifications, three areas were cited most often. It is recommended that the PPAs investigate the potential for strategic alliances between certification organizations in the areas of:
   - Health and Safety (BCRSP)
   - Project Management (PMI)
   - Risk Management (RIMS)

   Information Technology alternate certifications were also cited, however often comments indicated that those alternate certifications were very specific and generally more beneficial to job seekers in that field than the C.E.T.

6. There are a large number of individuals who indicated they wished to be contacted for further input. I would strongly recommend a follow-up with these stakeholders by email, advising them that the initial project had envisioned further stakeholder engagement through workshops; however the initial findings have clearly indicated there is no real appetite for expansion of formal accreditation/certification criteria at this point in time.

7. Finally, it appears students have a gap in their knowledge regarding the benefits of certification. When asked if certification would provide a competitive advantage, 39% felt there was no real advantage, or had no opinion regarding the benefit for Technologists; 41% felt there was no real advantage for Technicians. Yet eighty percent (80%) will pursue

certification post-graduation. Considering more than forty-five percent (45%) of student respondents indicated they were either not informed or uninterested as to how they would become certified post-graduation, it is the opinion of the author that, if this can be extrapolated across the rest of the provinces, there is real opportunity to engage with students while in college, increase their awareness, and thereby optimize the growth of the Provincial Professional Associations.

Appendix A – List of Interviewees

Academics:

Dr. Adel Esayed, Dean, Center for Construction and Engineering Technologies, George Brown College

Dr. Misheck Mwaba, Dean, Media, Trades & Technology Division, Niagara College

Industry:

Stephen Brown, Director, Emerging Technologies, CSA Group

Susan Winter, Executive Director, Canadian Electronics and Communications Association

Jeet Tulshi, Risk Management Specialist, Liberty Management Underwriters

Peter Vlahiotis, Director, Talent Management, Learning and Health and Safety, Infrastructure Ontario

Rita Mezei, Executive Director, Canadian Centre for Healthcare Facilities

Expert Personnel Certification:

Miles Murphy, Executive Director, Career Program at EDGE Skills Centre, Inc.

Appendix B – Select verbatim comments

This section provides select verbatim comments reflective of a number of respondent answers, yet, in the opinion of the author, particularly meaningful in the context of the questions asked.

Requirements and/or value for certification

“The whole purpose of being a technologist is to provide reassurance that the individual has the experience and rigour to undertake an expected level of responsibility, especially including training to embrace new disciplines. Certification into specialties will weaken the expected breadth of knowledge for individuals. “ (Category, Industry: Consulting – British Columbia)

“An operational code of ethics and standard of conduct is, in theory, good practice - but good practice is subject to individuals and their own ethics and values and cannot ever not be monitored sufficiently. Certification in multiple areas can elucidate various areas of study and expertise but runs the risk of laborious definition and accountability on the part of the professional and the professional certifying body. “ (Category, Professional – Ontario)

Perception of existing disciplines

“I feel the Civil program needs to be broken up and narrowed down for specific streams. A materials testing stream would be beneficial as I would venture to guess at least half of civil grads end up testing soil and concrete. A geotechnical stream would be useful with actual training on drilling, piling, inspections etc. Structural could break off into its own stream - of my 1998 graduating class of 20, one tech is designing roof trusses. We spent a lot of time in numerous classes thumbing through concrete, wood and steel design manuals. Perhaps a municipal stream with focus on urban planning, water delivery, wastewater system design etc. Perhaps the new grad would be labeled for example a Civil Tech , with a major in Geotechnical Engineering.” (Category, Industry: Consulting – Saskatchewan)

“The farther technologies diverge from classical and conventional technologies, the harder it becomes to relate to current technologies.” (Category, Student: British Columbia)

Perception of need for new disciplines

“We are about to embark on a huge period of massive infrastructure renewal. The existing categories do not recognize the important of Infrastructure Risk Management and the important process of Real Property Portfolio Planning. The public would be better served by highlighting this unique, important and fast emerging priority field.” (Category, Industry: Consulting – British Columbia)

"…This could very quickly lead to an exponential increase in the number of disciplines that would continue to grow; even if they quickly become irrelevant they will likely remain on the books..." (Category, Academic: Saskatchewan)

"When I first became certified, environmental was not an option and I had to be certified under the biological discipline which did not match my education. I imagine the same type of situation exists today for other technical/technological education programs. " (Category, Professional – Alberta)

"….There are many disciplines that can have specialty sub groups within the discipline, but that does not warrant the creation of a new discipline.ie Analyzers within the Instrumentation discipline…..Emerging technologies, and in some cases where the scope of a specialty within an existing discipline grows to a point where it warrants the creation of a new discipline. The problem is that in many cases the specialties and/or emerging technologies rely on knowledge from other disciplines, for example robotics relies on knowledge from mechanical engineering, information technology, electronics and, perhaps others as well. Historically the discipline of instrumentation also follows this since it relies on principles from chemical engineering, mechanical, electronics, materials engineering, and more. " (Category, Professional – Alberta)

Perception of risk associated with non-discipline specific certification

"A risk or liability is directly proportional to the level of specificity within a technical discipline. In other words, the more narrower the scope of responsibility, the greater the risk" (Category, Technical Professional – Ontario)

"No, I think the risk can be managed. A technologist must be aware of their own competences and limitations. If an individual is participating in a new or unfamiliar disciple to them they have the responsibility to ensure the work being done adheres to the appropriate standards and codes (ASET's ethics and conduct included)." (Category, Technical Professional – Alberta)

"Code of Ethics and Standard of conduct should cover this risk" (Category, Technical Professional –British Columbia)

"Without specifying the technical discipline, the certification implies that the Technologist or Technician is equally competent in all technical areas. The P.Eng. license does not specify, so licensed engineers are free to practice in any area they feel competent. Do you want to follow that model, or more of a limited license, like the LET, licensed engineering technologist?" (Category, Industry: Manufacturing – Ontario)

"… there are areas of unique speciality, but I would be concerned about pigeon holing people into finite areas of expertise. If candidates are going to grow in an organization, they need to have an ability to learn and be multi-faceted, plus have the people skills required to accept new challenges. Over my career, I ended up working in my "major" discipline for a relatively small period of time before taking the opportunity to branch out. Suggest considering this question from a career perspective, not just an entry level one." ?" (Category, Industry: Utilities –British Columbia)

General Comments

"The discipline needs a base for certification then the industry is required to develop the individual to the specifics of the discipline of the work. This ideology supports CPD." (Category, Industry: Manufacturing – Ontario)

I do believe certification should also reflect area of work as original acceptance is in field of endeavour (s) and references and experience have confirmed. In many cases abilities have exceeded levels expected and allowed for by system. (Category, Technical Professional – British Columbia)

Appendix C: Slideshow format - Academic Survey Results

Appendix D: Slideshow format – Student Survey Results

Appendix E: Slideshow format – Industry Survey Results

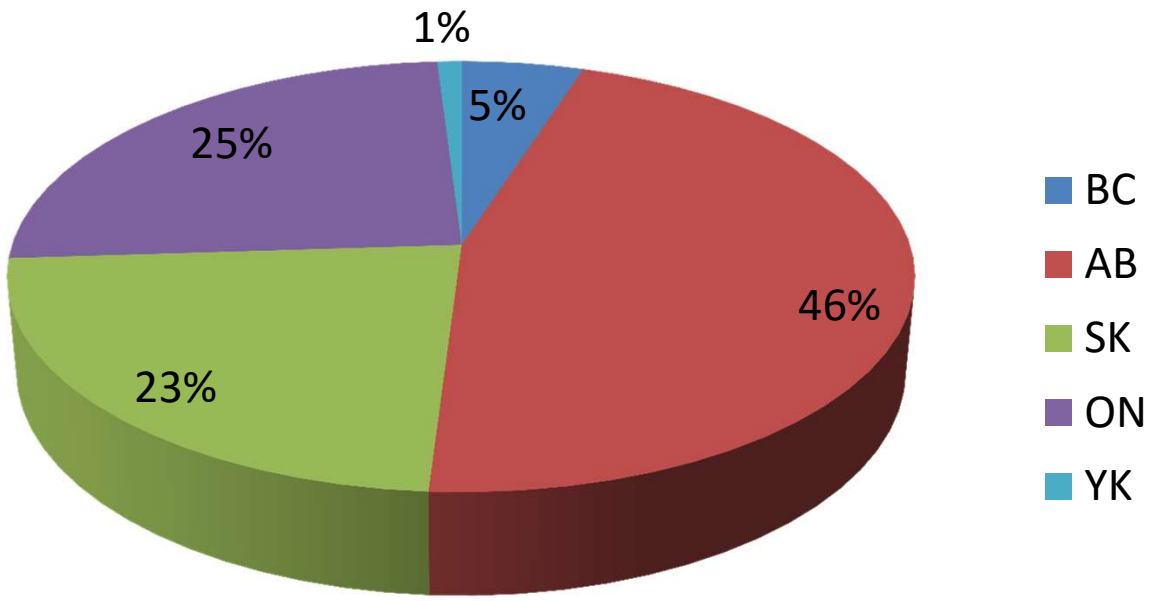
Appendix F: Slideshow format – Professionals Survey Results

Perspectives on Technology Disciplines - Academics

- Report: April 2016

- Survey was live online between January 6 and March 1, 2016.
- 111 respondents initiated the survey
- 77 respondents fully completed the survey
- Where responses are “frequently cited” the idea was included comments recurrently.

Q1: Please indicate your Province or Territory



Q2: What is your role in your institution?

What is your role in your Academic Institution?	Response Percent
Dean/ Associate Dean	6%
Chair / Associate Chair	5%
Department Head	16%
Professor/ Instructor	64%
Other (please specify)	9%

"Other" category included:

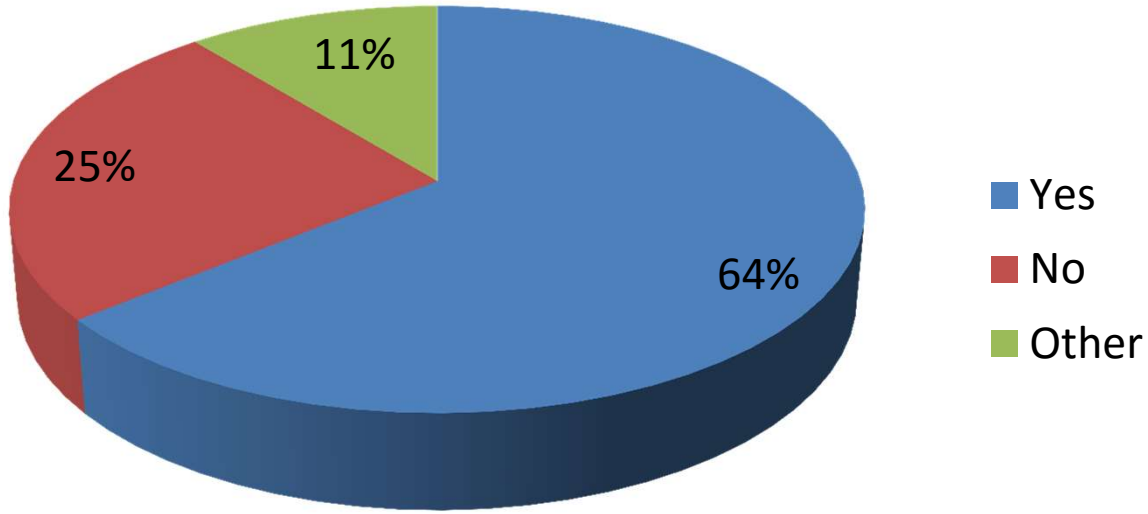
Applied Research
Consultant
Design & Engineering
Director
Engineer
Engineering Technologist - Undergraduate Academic Support
Facility manager
President
Retired department head
Support staff

Q3: Are you involved with what would be deemed "emerging technologies" in your institute?

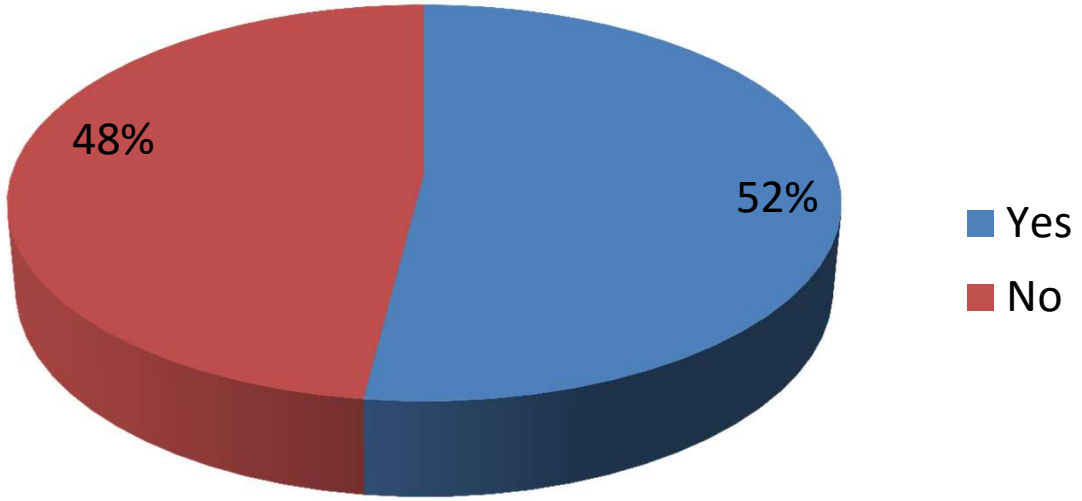
Answer Choices	Responses
No	33%
No, but there are others in my institute that are involved	22%
No, but plans are underway for the development of new curricula	6%
Yes *	39%

**Frequent cited technologies were: Information Technology, Water/Environmental, Engineering Drafting and Design and Advanced Manufacturing (Robotics, 3D Printing)*

Q4: Given your experience, do you believe the disciplines (listed above) cover the full spectrum of technical coursework completed by Technicians and Technologists in Canada?



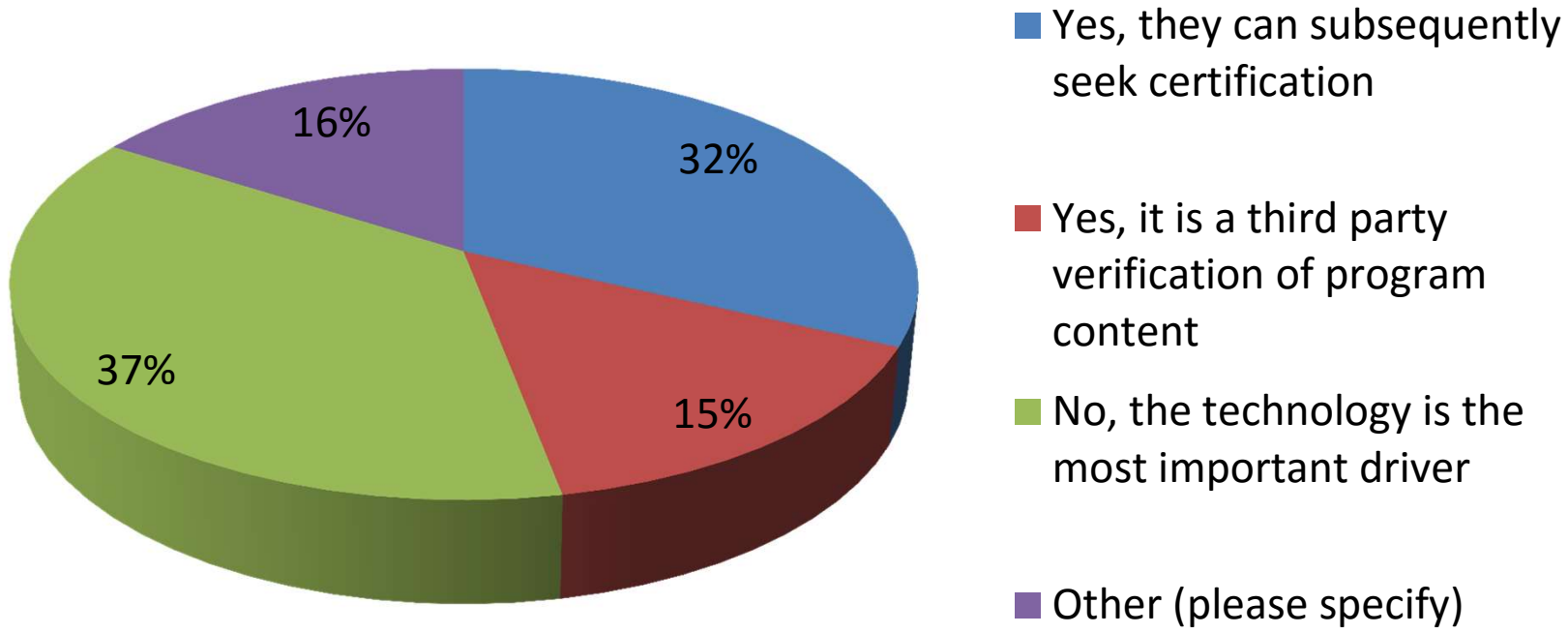
Q5: From your perspective, do the disciplines currently in use meet the needs of colleges when they seek accreditation, particularly in areas of emerging technologies?



Q6: Does your institution seek accreditation for all programs educating technicians and technologists?

Answer Choices	Responses
Yes. All programs are accredited	57%
No, we accredit only foundational courses	28%
No, we do not accredit any courses	15%

Q9: When students are researching college programs, do you believe accreditation is an important factor in their decision?



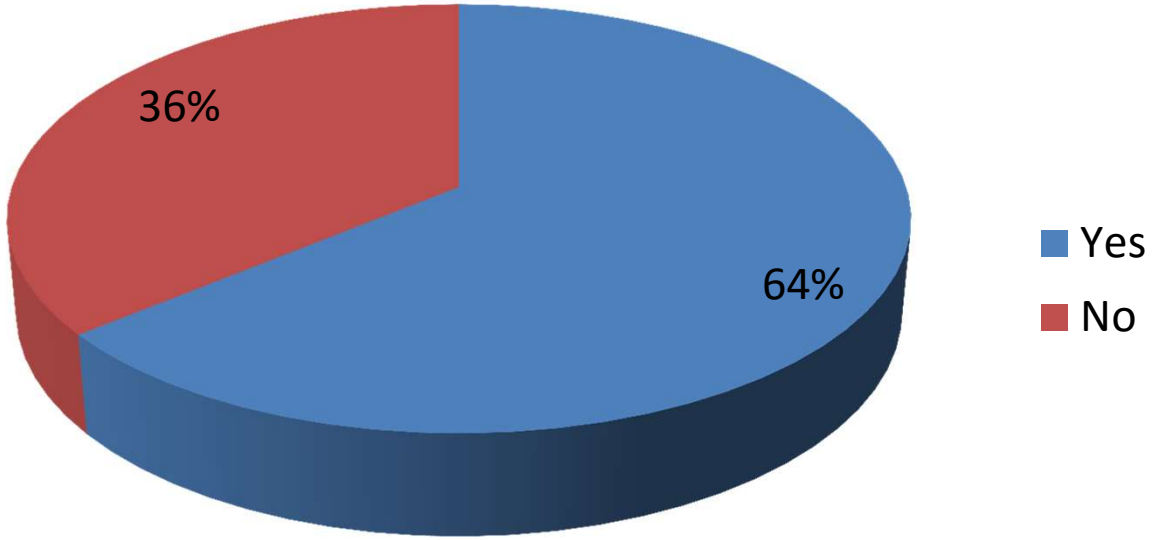
Q10: In your experience, do students understand the concept of certification post-graduation? If so, do they understand that they will be certified under one of the disciplines used to accredit the program?

Answer Choices	Responses
Yes, they understand about certification and are not concerned regarding the discipline	20%
Yes, they understand about certification and would prefer certification under a generic "Technologist" or "Technician" designation	17%
Yes, they understand about certification and would prefer a designation more closely aligned to their field of education in newer technologies	27%
No, they are not concerned with certification	27%
I do not know	9%

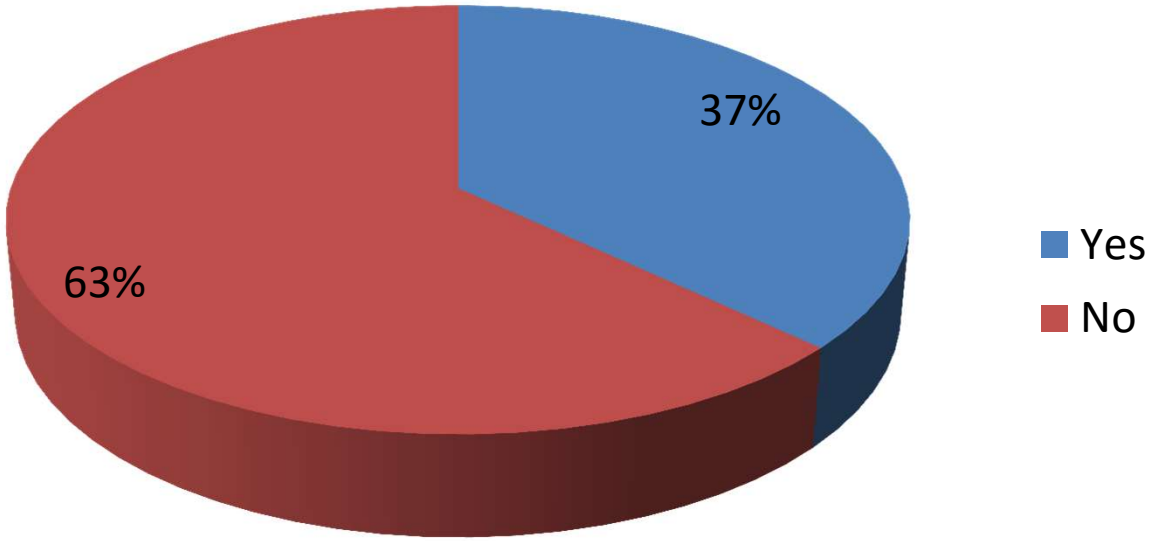
Q11: Is the process for developing the “Hybrid Criteria” under which a program such as Robotics is accredited more arduous for the college when seeking accreditation?

Answer Choices	Responses
Yes, the first stages are more complex	3%
Yes, the entire process is more complex	19%
No, there are no added steps or complexities	8%
I am not involved in accreditation under these types of programs	70%

Q12: Would you find it more straightforward if specific disciplines were developed in areas of emerging technologies?



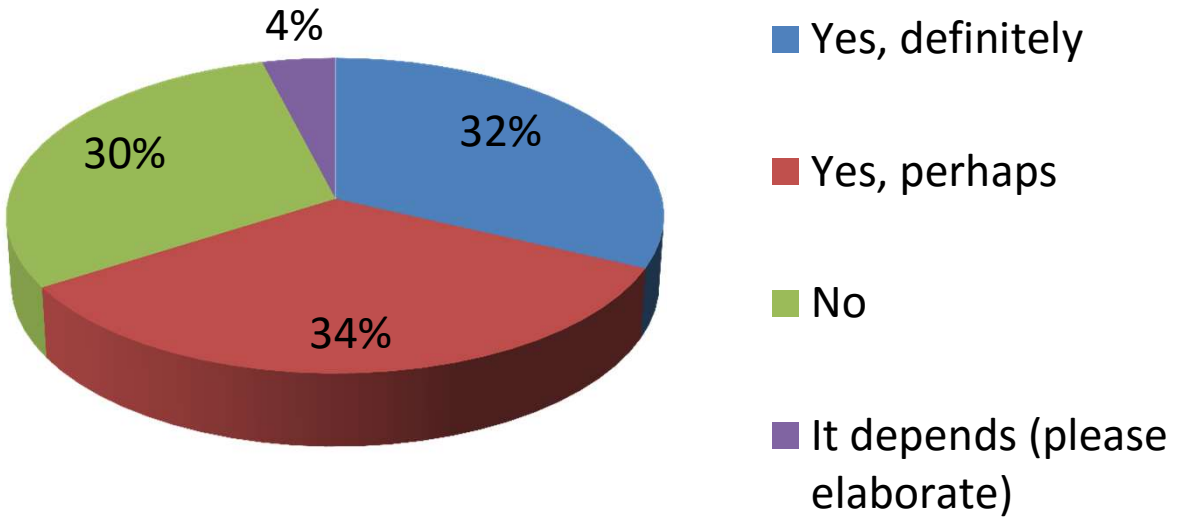
Q13: In your opinion, are some emerging technologies so unique they require a specific set of criteria when accrediting programs for technicians and technologists?



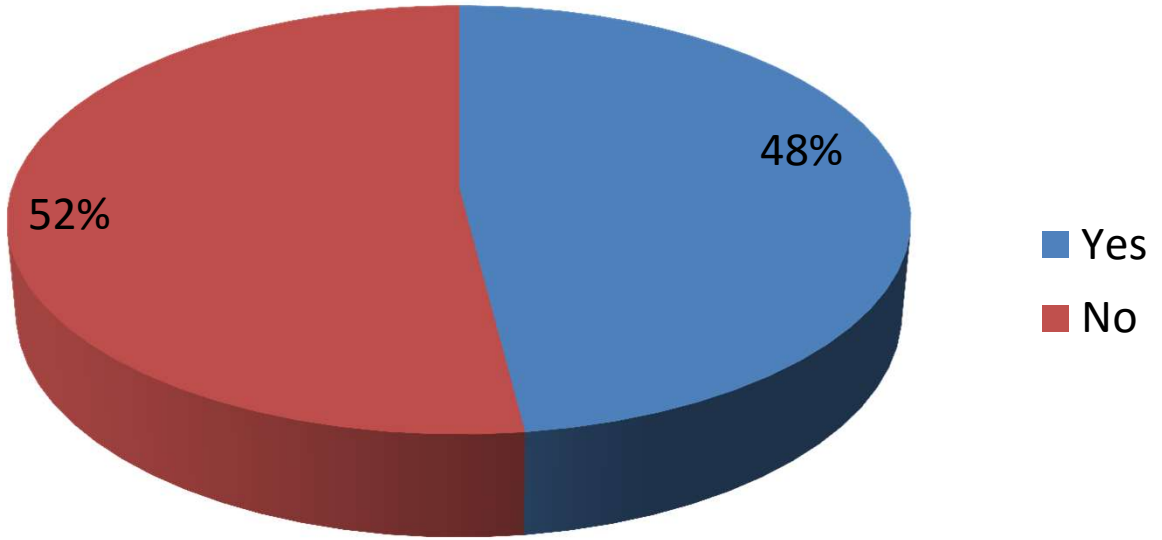
Q14: From your perspective, would it be a benefit for recent graduates to certify specifically within an emerging technology?

Answer Options	Response Percent
Yes, it would clearly define their knowledge in that emerging field	47.9%
No, the current disciplines are sufficient	17.8%
No, the certification alone indicates that the technical professional is competent	26.0%
Other (please specify)	8.2%

Q15: If programs for emerging technologies could be accredited under their own specific discipline, do you believe that would add to your competitive advantage?



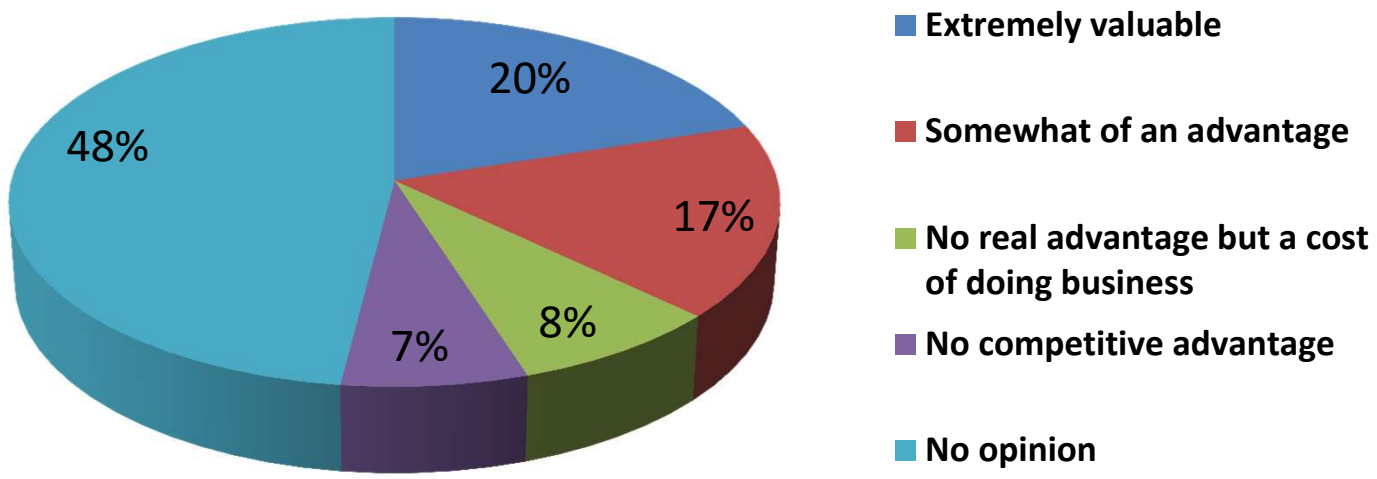
Q17: In your opinion would there be inherent risk if a Technologist or Technician was not certified specifically within a technical discipline?



Please indicate your perception of the competitive advantage that accreditation provides for your college in specific programs targeted at Technicians.

Answer Options	Extremely valuable	Somewhat of an advantage	Not really an advantage, but a cost of doing business	No competitive advantage	No opinion in this area
Architectural, building, and construction engineering technology	32%	19%	5%	6%	38%
Biotechnology	11%	16%	4%	5%	63%
Chemical Engineering Technology	18%	18%	4%	6%	54%
Computer Systems Technology	20%	16%	9%	13%	42%
Civil Engineering Technology	33%	18%	9%	6%	34%
Electrical Engineering Technology	24%	15%	9%	8%	44%
Electronics Engineering Technology	25%	18%	9%	8%	41%
Electromechanical Engineering Technology	18%	14%	8%	6%	54%
Environmental Engineering Technology	19%	15%	14%	8%	44%
Forestry Technology	10%	16%	11%	8%	54%
Geological and Mineral Resource Technology	18%	16%	6%	5%	54%
Instrumentation Technology	18%	16%	11%	5%	49%
Landscape Horticulture Technology	5%	18%	8%	11%	58%
Mechanical Engineering Technology	28%	18%	5%	8%	42%
Petroleum Technology	22%	13%	5%	8%	53%
Power Systems Engineering Technology	20%	15%	5%	11%	48%
Survey/Geomatics Technology	16%	24%	8%	5%	47%

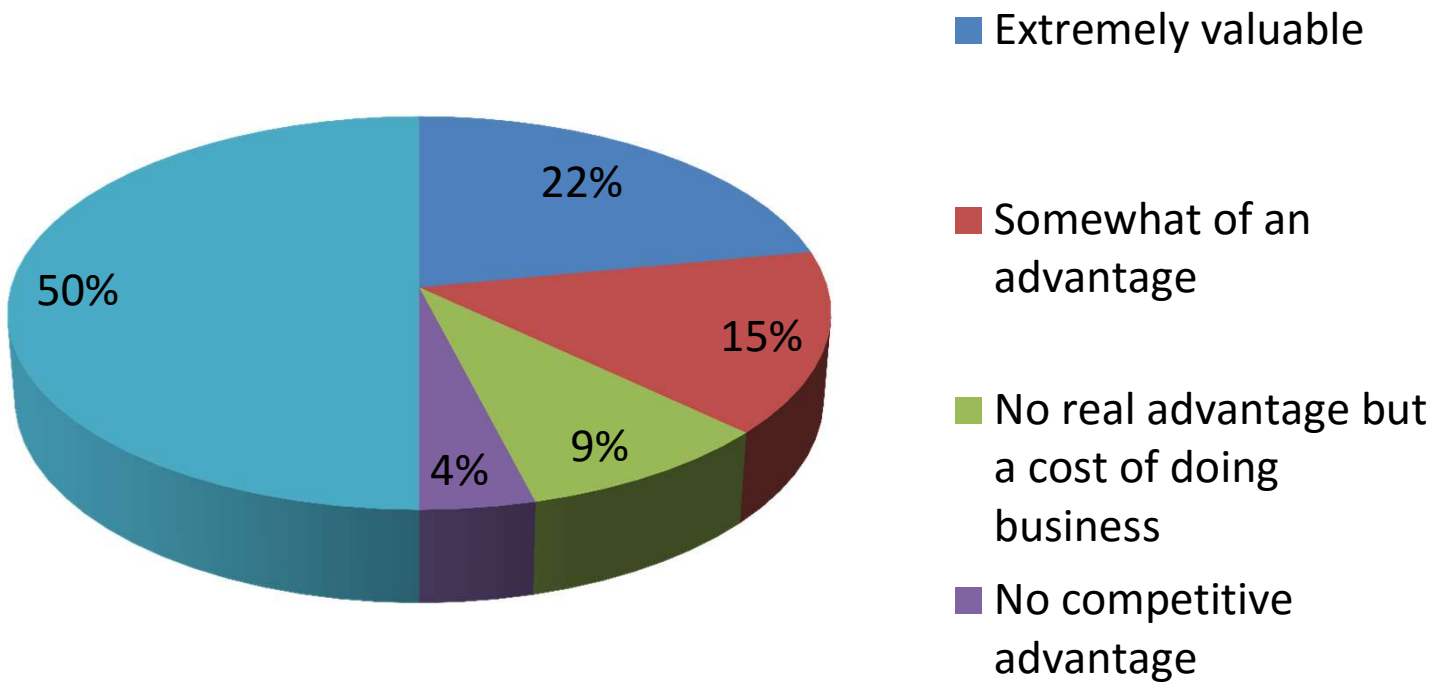
Overall perception of the competitive advantage offered by accreditation (Technician Programs)



Please indicate your perception of the competitive advantage that accreditation provides for your college in specific programs targeted at Technologists

Answer Options	Extremely valuable	Somewhat of an advantage	Not really an advantage, but a cost of doing business	No competitive advantage	No opinion in this area
Architectural, Building, and Construction Engineering Technology	36%	17%	5%	4%	37%
Biomedical Engineering Technology	16%	17%	5%	1%	60%
Bioscience Technology	11%	23%	8%	0%	59%
Chemical Engineering Technology	21%	16%	9%	3%	51%
Civil Engineering Technology	36%	16%	9%	3%	36%
Electrical Engineering Technology	28%	12%	9%	4%	47%
Electronic Engineering Technology	27%	15%	9%	8%	41%
Environmental Engineering Technology	27%	19%	11%	1%	43%
Industrial Engineering Technology	24%	9%	8%	3%	56%
Information Technology	21%	15%	13%	8%	43%
Instrumentation Engineering Technology	23%	11%	11%	5%	51%
Marine Engineering Technology	15%	15%	8%	3%	60%
Mechanical Engineering Technology	29%	15%	9%	3%	44%
Mineral Resource Technology	15%	19%	11%	3%	53%
Naval Architecture Technology	13%	16%	9%	3%	59%
Petroleum Engineering Technology	20%	15%	8%	4%	53%
Renewable Resources Technology	17%	16%	8%	7%	52%
Survey/Geomatics Technology	20%	20%	8%	5%	47%

Overall perception of the competitive advantage offered by accreditation (Technologist Programs)



General Observations

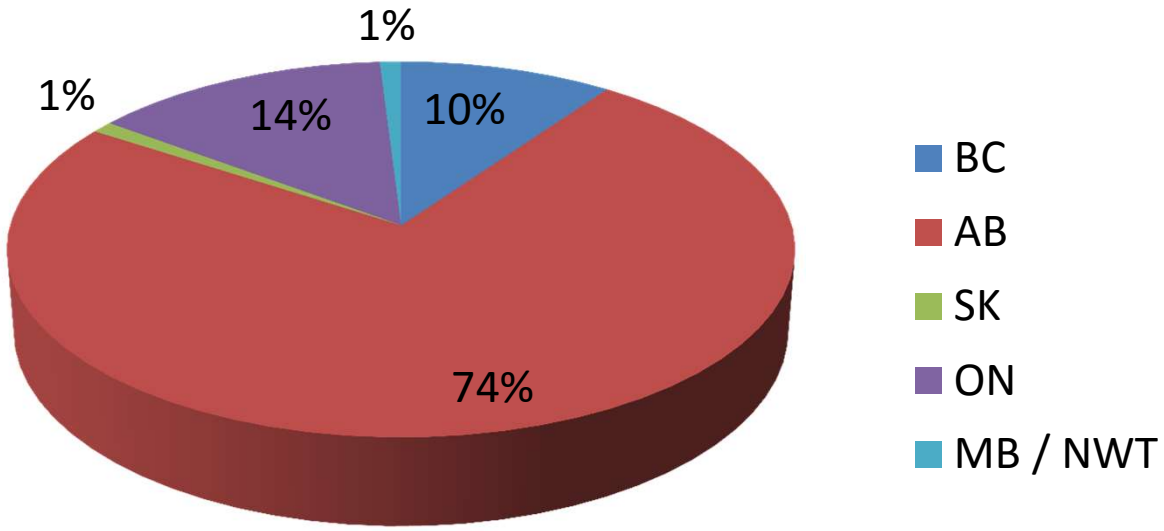
- Information Technology and Software programs were often cited as being areas that required review
- Engineering Drafting and Design was cited as an area that needed recognition
- Emerging technologies cited most often were
  - Water management
  - Robotics
  - 3D printing

Perspective on Technology Disciplines - Students

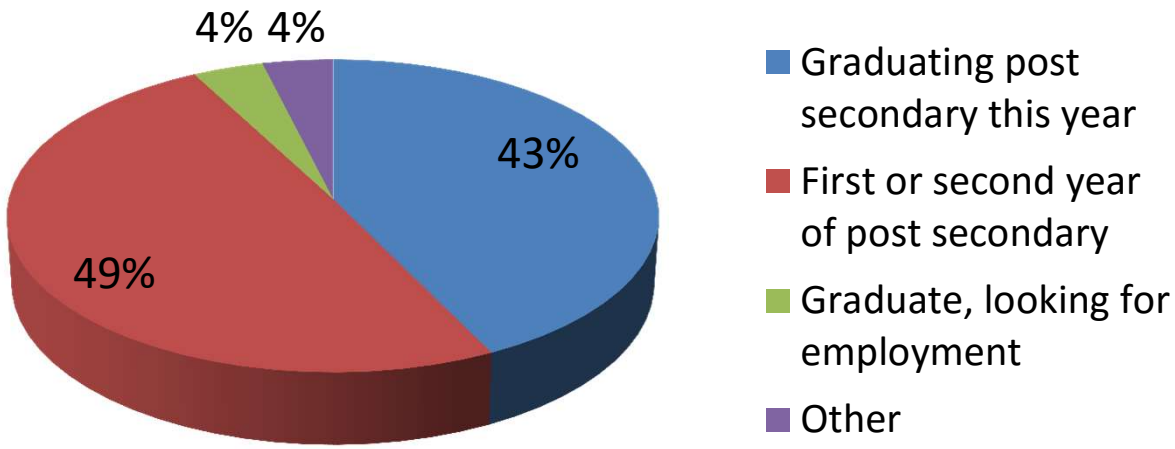
April 2016

- Survey was live online from January 6 to March 1, 2016
- 355 Students responded initially, 264 fully completed the survey
- Heavily weighted towards Alberta

Q1: Please indicate your Province or Territory

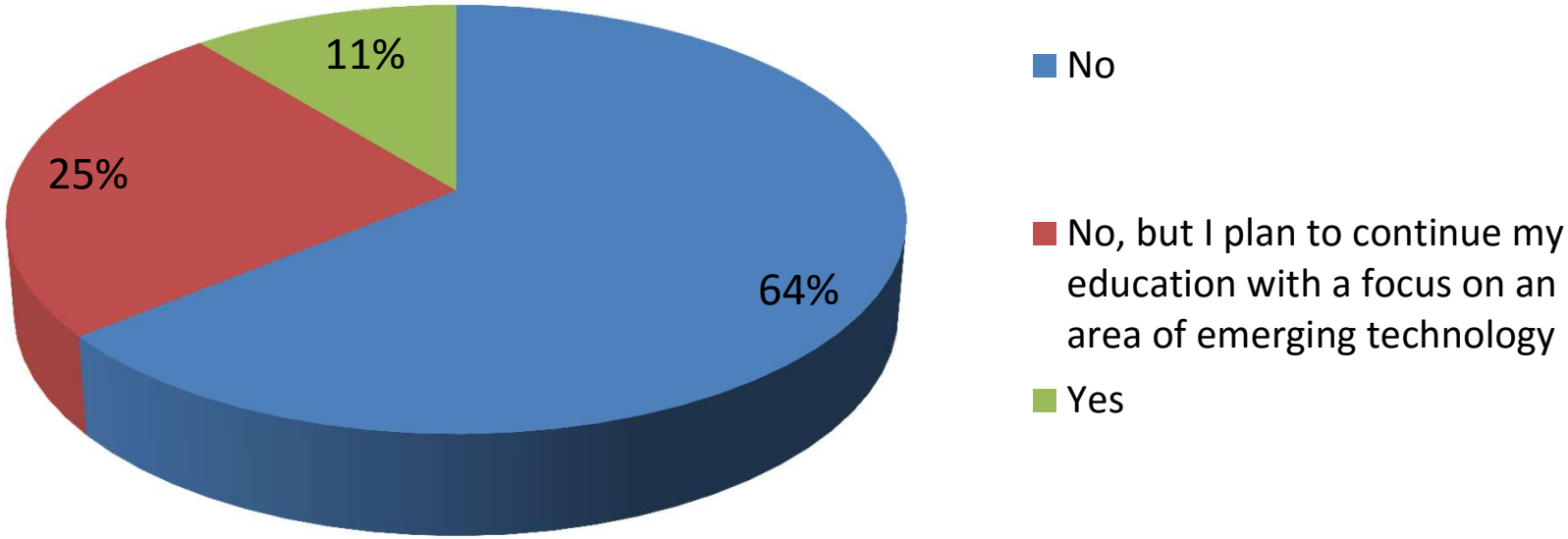


Q2: What is your current status as a student?



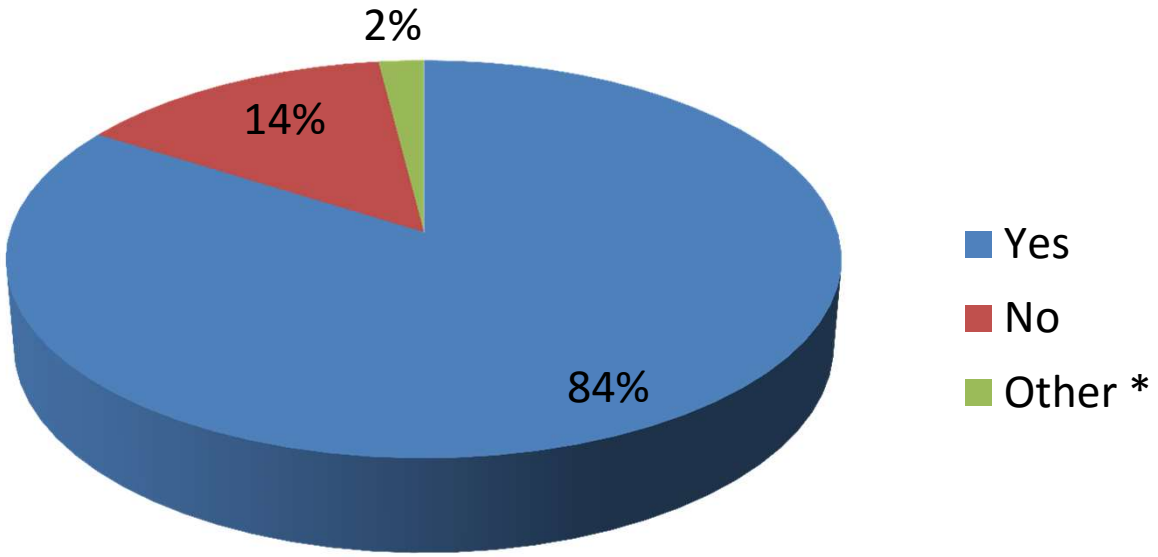
Other includes students who are returning to obtain an additional diploma or degree

Q3: Is your course of study in the area of "emerging technologies"?



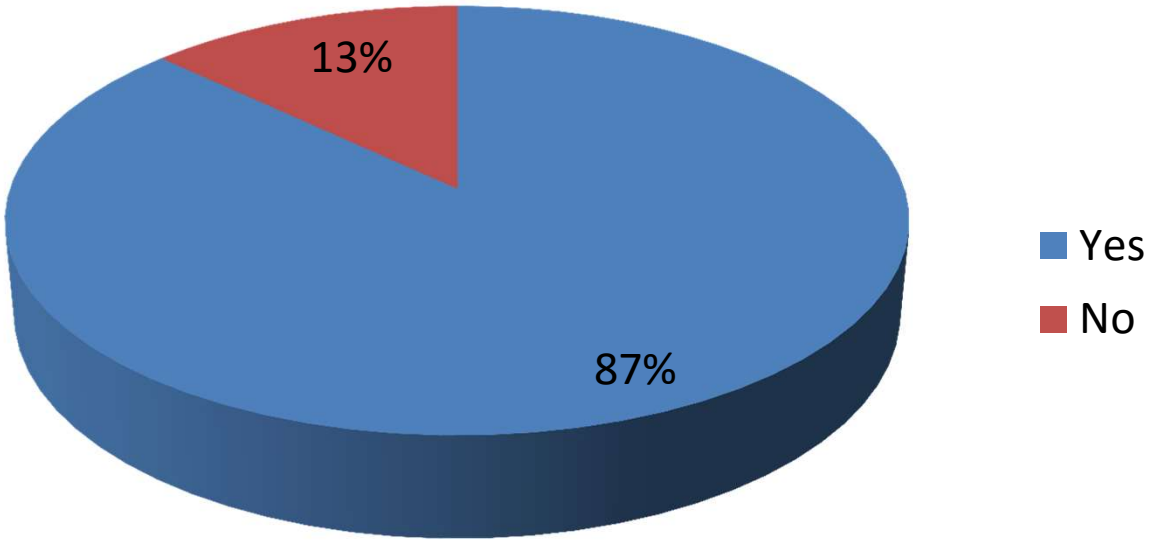
Where "Yes" answers did not reference a traditional discipline, Alternative / Renewable Energy was most often cited.

Q4: Do you believe the disciplines listed above cover the full spectrum of technical coursework offered when studying to become a technician or technologist?

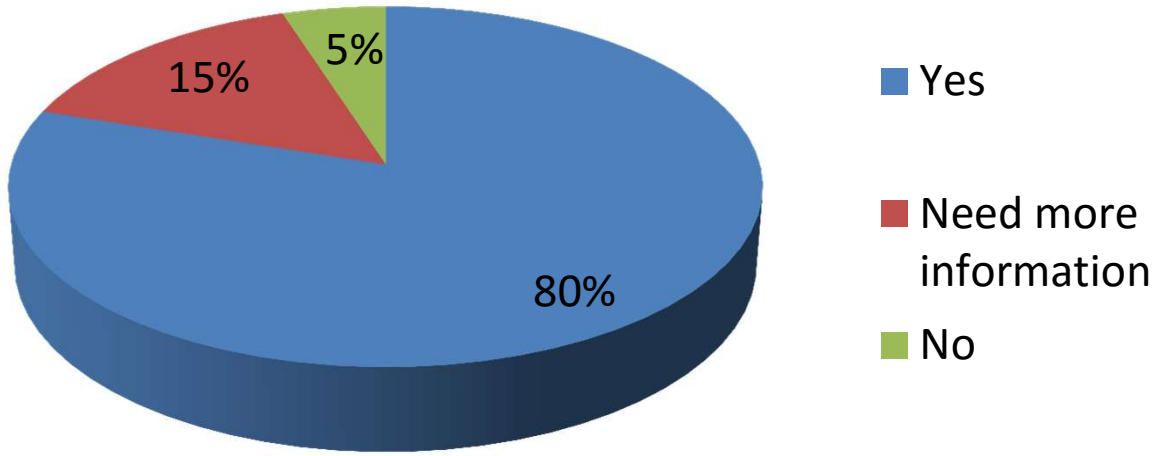


* Welding, Engineering Technology, Recreation, fish, and wildlife, Heavy Equipment Technician, Biomedical, Engineering Design and Drafting (2)

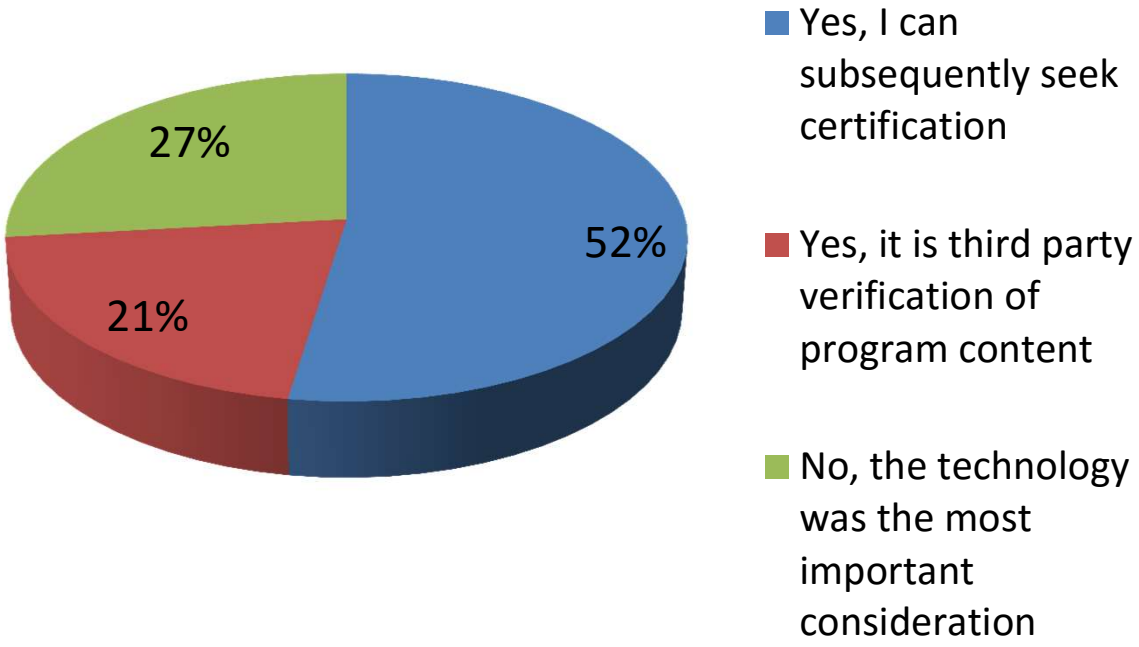
Q5: From your perspective, do the disciplines currently in use meet the needs of graduates when they seek certification post graduation?



Q6: Do you plan to seek certification post graduation?



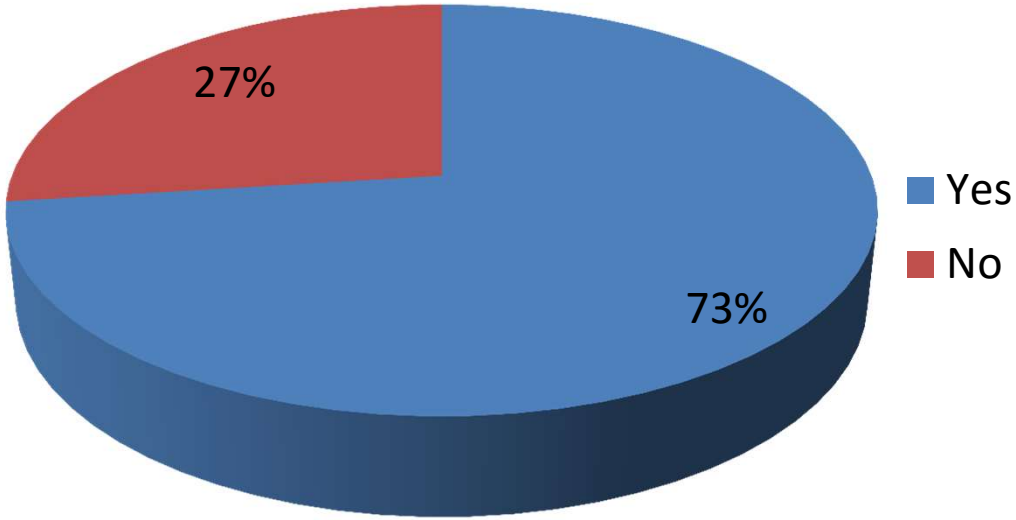
Q9: When you researched college programs, was accreditation an important factor in your decision?



Q10: In your experience, do students understand the concept of certification post-graduation? If so, do they understand that they will be certified the discipline used to accredit the program?

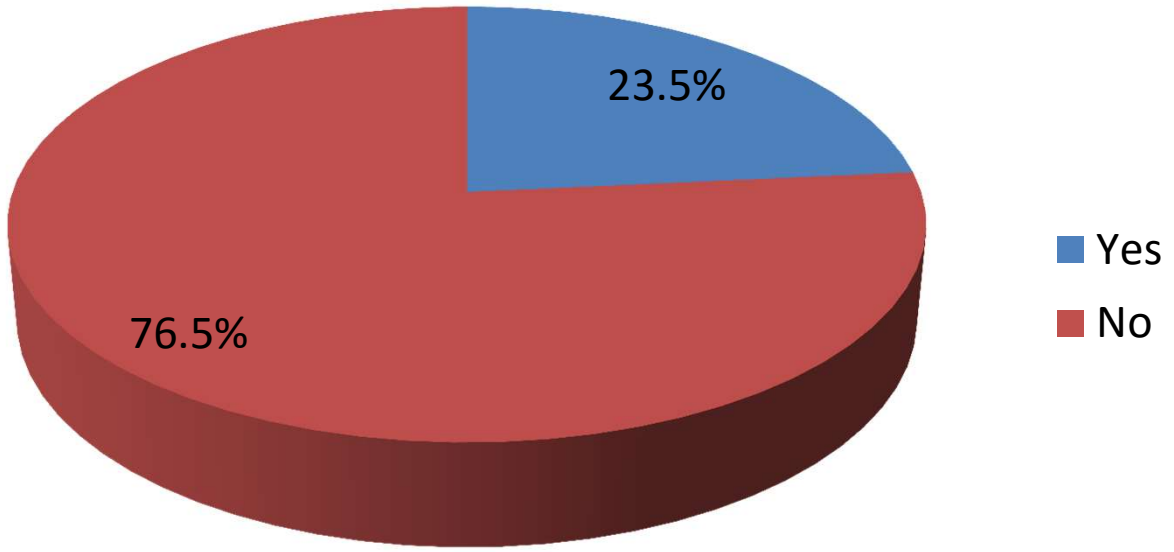
Yes, they understand about certification and are not concerned regarding the discipline	13.9%
Yes, they understand about certification and would prefer certification under a generic "Technologist" or "Technician" designation	20.7%
Yes, they understand about certification and would prefer a designation more closely aligned to their field of education in newer technologies	19.8%
No, they are not concerned with Certification	24.9%
I do not know	20.7%

Q11: Would you find it beneficial if the courses were accredited under specific technologies (eg. Robotics, Green Energy)? This would provide the opportunity to be certified under a specific technology.



Comments included the ability to impress potential employers with a "niche" certification; Risk of certification losing its value if it became too specific; certification as a differentiator, but not specific to a technology (quote: "I see accreditation in a similar light as a phd. Being a doctor doesn't necessarily mean being in the medical field.")

Q12: In your opinion, are some emerging technologies are so unique they should be defined as a specific discipline?



Q13: From your perspective, would it be a benefit for recent graduates to certify specifically within an emerging technology?

Answer Options	
Yes, it would clearly define their knowledge in that emerging field	59.7%
No, the current disciplines are sufficient	23.0%
No, the certification alone indicates that the technical professional is competent	15.5%
Other *	1.8%

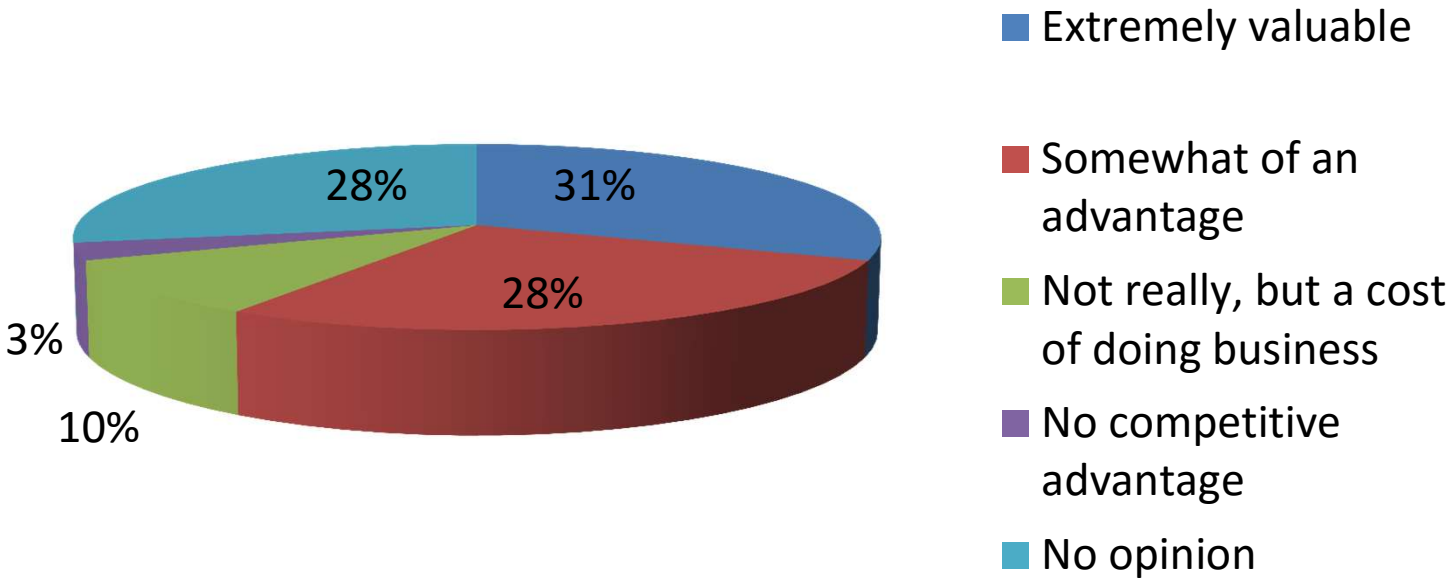
*Other answers were “Do not know”.

One respondent quote: “certification in a field is a beginning, over time, the graduate becomes more of an expert and once this occurs, I think a specific title can be given if desired. But I think the current CET is sufficient at the beginning of the career.

Please indicate your view of the competitive advantage that certification would provide in specific technical areas for TECHNICIANS.

Answer Options	Extremely valuable	Somewhat of an advantage	Not really an advantage, but a cost of doing business	No competitive advantage	No opinion in this area
Architectural, building, and construction engineering technology	35%	33%	6%	2%	24%
Biotechnology	23%	27%	10%	5%	35%
Chemical Engineering Technology	27%	29%	9%	3%	31%
Computer Systems Technology	34%	27%	10%	3%	26%
Civil Engineering Technology	42%	27%	7%	2%	23%
Electrical Engineering Technology	45%	25%	6%	1%	22%
Electronics Engineering Technology	35%	28%	9%	2%	27%
Electromechanical Engineering Technology	33%	27%	8%	2%	30%
Environmental Engineering Technology	28%	30%	10%	3%	29%
Forestry Technology	21%	25%	17%	4%	32%
Geological and Mineral Resource Technology	27%	29%	11%	3%	30%
Instrumentation Technology	35%	26%	11%	2%	27%
Landscape Horticulture Technology	16%	26%	17%	7%	34%
Mechanical Engineering Technology	38%	30%	6%	2%	24%
Petroleum Technology	33%	26%	10%	3%	28%
Power Systems Engineering Technology	37%	27%	8%	2%	27%
Survey/Geomatics Technology	25%	31%	14%	3%	28%

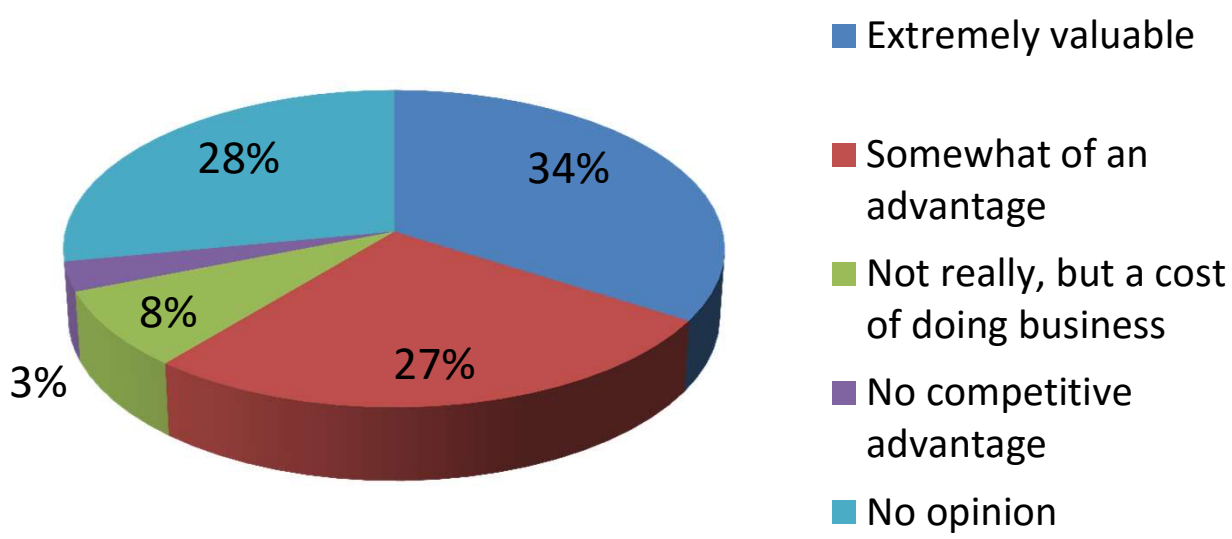
Overall perception of value of certification (Technician across all disciplines)



Please indicate your view of the competitive advantage that certification would provide in specific technical areas for TECHNOLOGISTS.

Answer Options	Extremely valuable	Somewhat of an advantage	Not really an advantage, but a cost of doing business	No competitive advantage	No opinion in this area
Architectural, Building, and Construction Engineering Technology	39%	31%	5%	2%	23%
Biomedical Engineering Technology	31%	23%	9%	3%	33%
Bioscience Technology	24%	28%	9%	4%	35%
Chemical Engineering Technology	35%	24%	8%	3%	30%
Civil Engineering Technology	43%	26%	4%	2%	25%
Electrical Engineering Technology	46%	27%	5%	2%	20%
Electronic Engineering Technology	37%	29%	7%	2%	25%
Environmental Engineering Technology	31%	29%	9%	3%	28%
Industrial Engineering Technology	36%	30%	4%	3%	27%
Information Technology	31%	26%	10%	4%	29%
Instrumentation Engineering Technology	37%	25%	11%	2%	24%
Marine Engineering Technology	29%	26%	9%	4%	32%
Mechanical Engineering Technology	39%	28%	6%	3%	25%
Mineral Resource Technology	28%	27%	9%	4%	32%
Naval Architecture Technology	26%	27%	9%	3%	34%
Petroleum Engineering Technology	37%	24%	9%	2%	28%
Renewable Resources Technology	35%	27%	6%	2%	30%
Survey/Geomatics Technology	29%	32%	8%	4%	27%

Overall perception of value of certification (Technologist across all disciplines)

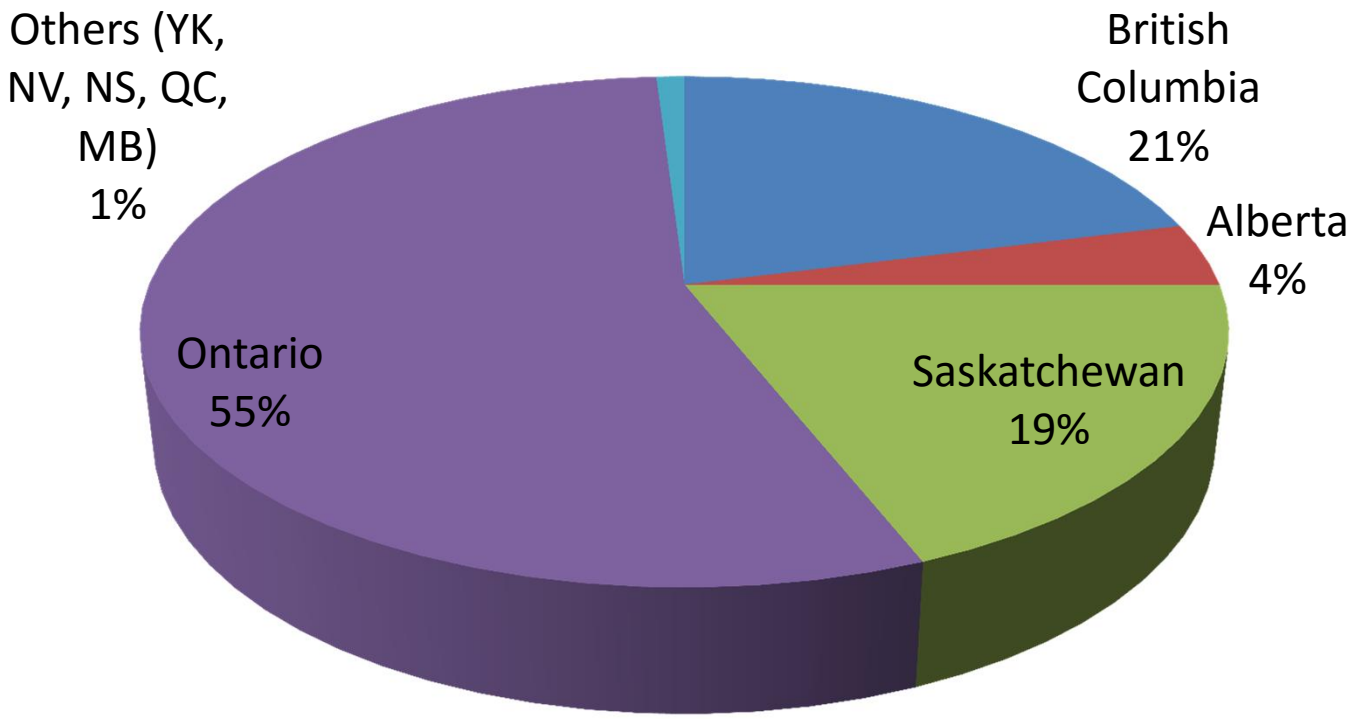


Perspective on Technology Disciplines – Industry

May, 2016

- The survey was live online between January 6 to March 1, 2016.
- 895 Respondents fully answered the survey
- Where responses are “frequently cited” the idea was included in comments recurrently.

Q1: Please indicate your Province or Territory



Q2: What is the nature of your industry?

Answer Choices	Response Percentage
Agriculture, Forestry, Fishing	1%
Construction	18%
Health Care	2%
Manufacturing	16%
Mining, Quarrying, and Oil and Gas	7%
Professional, Scientific and Technical Services	13%
Public Administration	8%
Transportation and Warehousing	3%
Utilities	10%
Consulting	16%
Other (please specify)*	6%

Frequently cited: Sales, Building Management, Safety, Marine, Retired

Q3: Please categorize your role.

Please categorize your role in the organization.	Response Percent
Senior manager	31%
Technical project leader	19%
Technologist involved in technical work	30%
Technician involved in technical work	9%
Ppeople leader with accountability for recruitment	4%
Other (please specify)*	6%

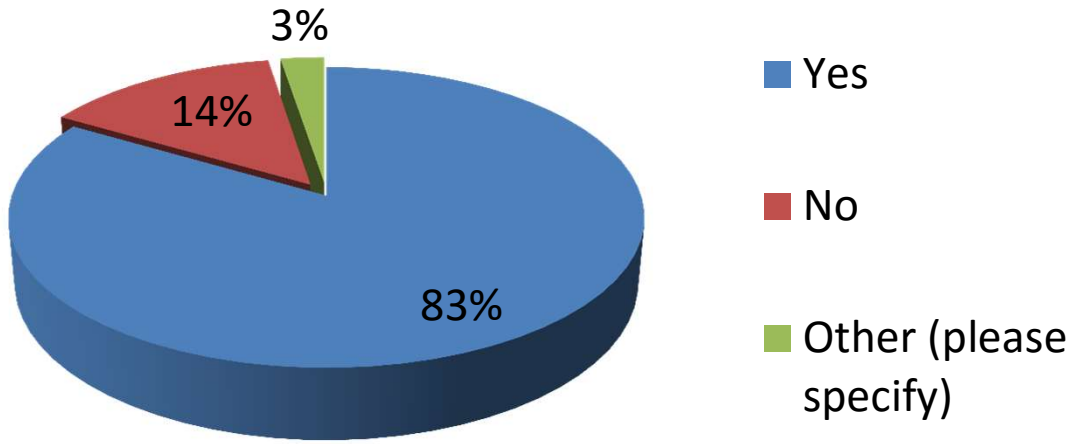
*Frequently cited: Sales, Retired, Maintenance and “Currently Unemployed”

Q4: Do you hold a professional technical designation?

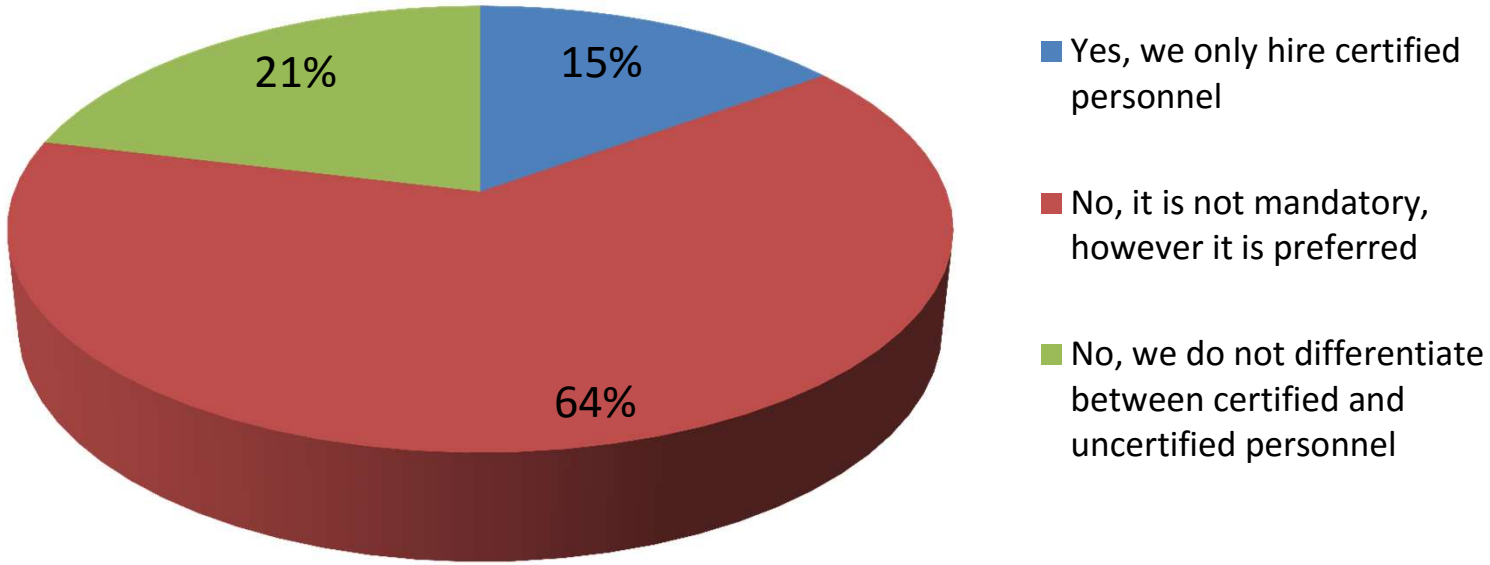
	Response Percent
No, I have a business background	4%
Yes, I am a Professional Engineer	3%
Yes, I am a Certified Technologist	70%
Yes, I am a Certified Technician	19%
Yes, I have certification through an organization other than Professional Engineers or Professional Technicians and Technologists. (Please comment)*	4%

*Frequently cited inclusions: Electrician, Millwright, Inspector, Professional Engineer with Technologist certification (dual).

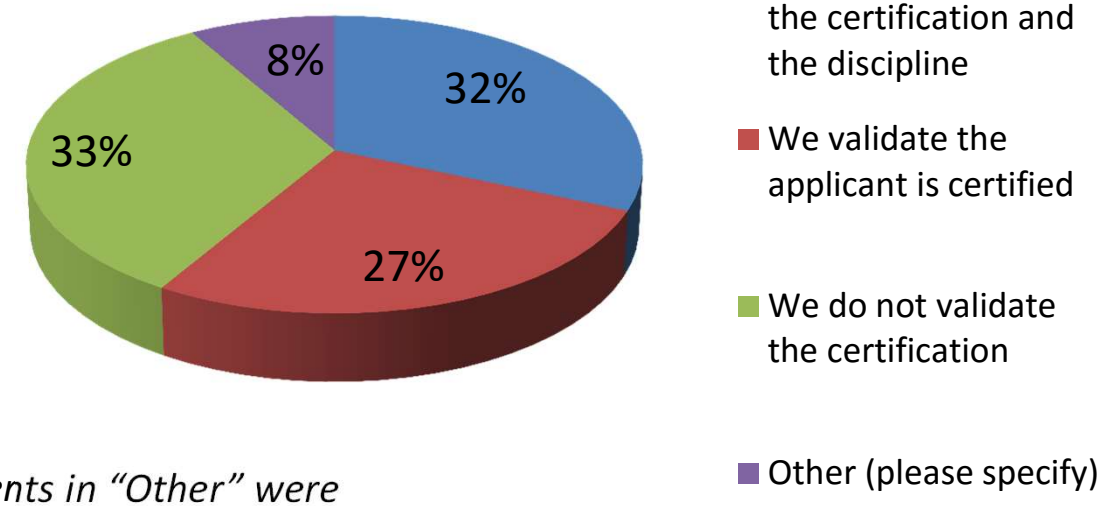
Q5: Given your experience, do you believe the disciplines listed above cover the full spectrum of technical work performed by Technicians and Technologists in Canada?



Q7: When recruiting for technical personnel, is certification (eg. C.E.T. or C.Tech. designation) a mandatory requirement for your organization?



Q8: When validating an applicant's credentials, do you verify the certification and the discipline under which they are listed?



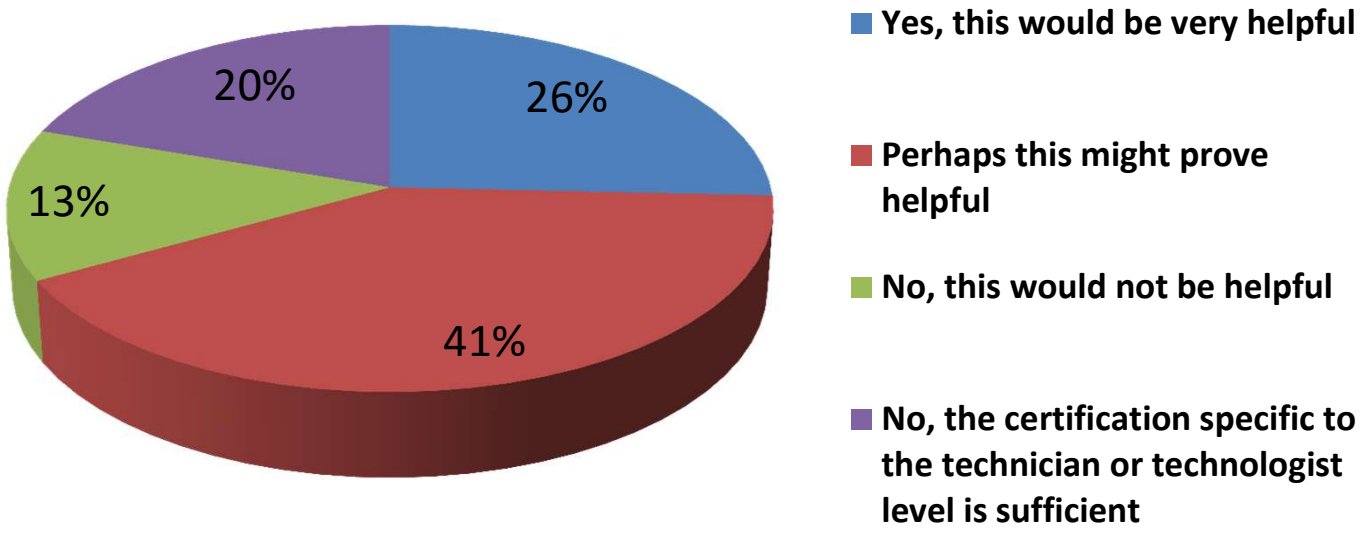
Note: More than 50% of respondents in "Other" were unaware if certification was validated, it was not their role.

Q9: From your perspective, would it be a benefit to certify personnel specifically within an emerging technology?

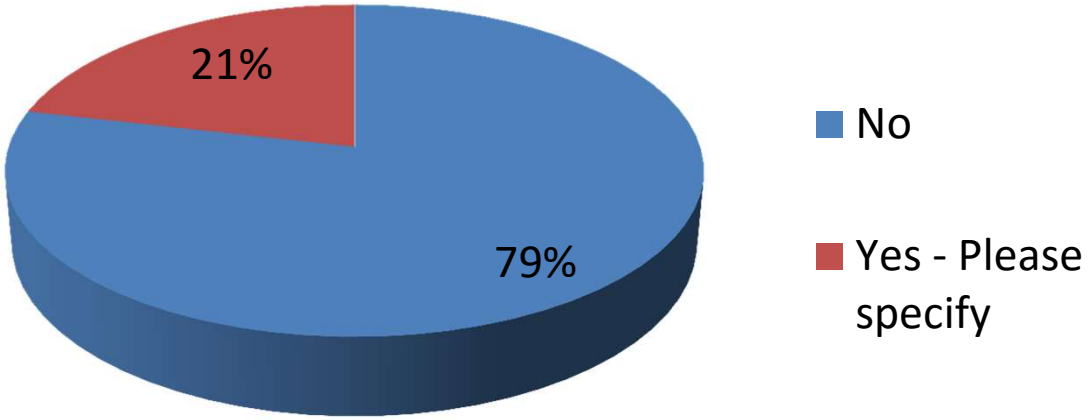
Yes, it would clearly define their knowledge in that emerging field	50%
No, the current disciplines are sufficient	27%
No, the certification alone indicates that the technical professional is competent	20%
Other (please specify)*	3%

Frequently cited: "No opinion; Need ability to be certified in more than one technology; Nature of "emerging technologies" makes it difficult to certify appropriately.

Q10: Do you believe that a "specialty" designation conferred by the Provincial Association within their field of technology, would be of benefit to you when hiring?

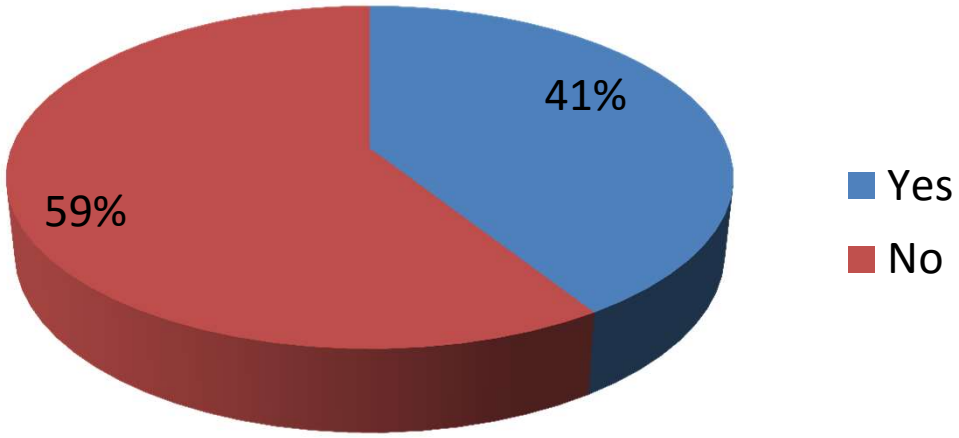


Q11: In your opinion, are some emerging technologies so unique they require specific qualifications for technicians and technologists?



Frequently cited: risk of limiting the opportunities if programs/certifications become too specific; In house specific training due to proprietary technologies; Need to integrate some emerging technologies into curriculum without defining a new discipline.

Q12: Do you believe there would be inherent risk if a Technologist or Technician was not certified specifically within a technical discipline?



Frequently cited: (Yes) Risk exists where an employee would work outside their area of expertise; (No) Compliance with code of ethics would prevent a professional working outside their area of expertise; Education and certification demonstrate the individual's ability to learn and continue to learn.

General Observations

Comments indicate:

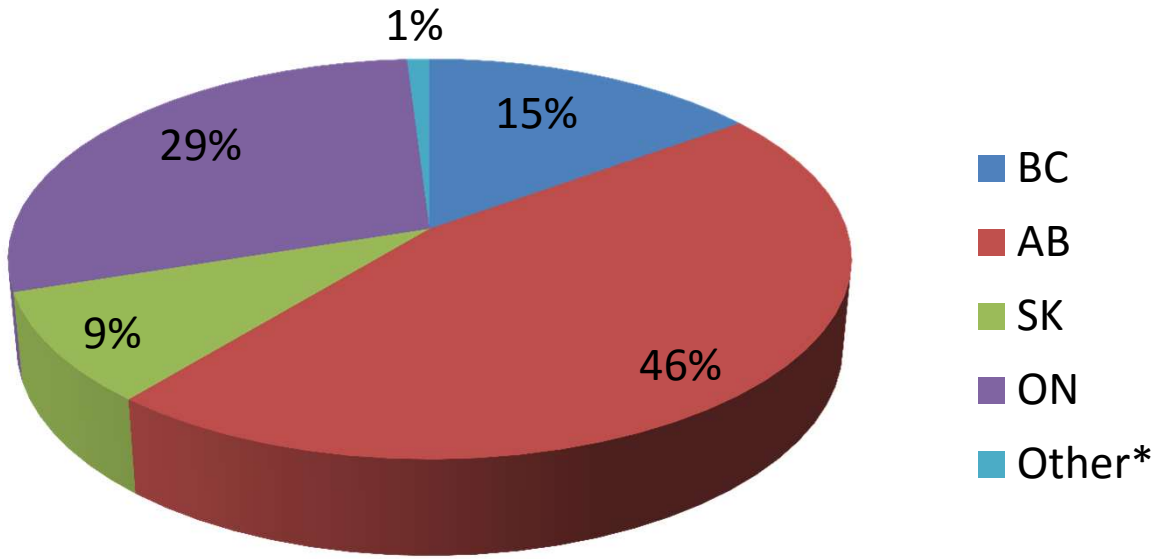
- Strong support for continual learning
- Perceived risk of limiting professionals with narrowly defined disciplines
- Need for experienced inter-disciplinary professionals
- Certification is indicator of commitment to professional ethics, work experience has greater influence on technical capabilities
- Need for greater recognition of the credentials of technologists (specifically cited)

Perspective on Technology Disciplines - Technicians and Technologists

- Thursday, March 10, 2016

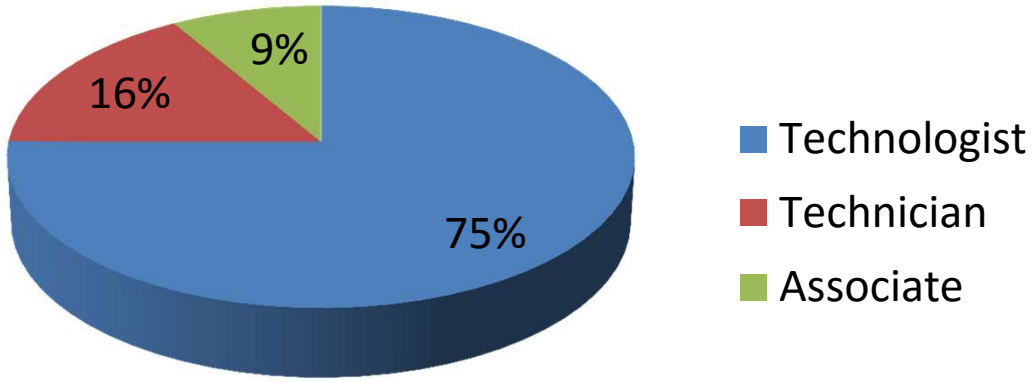
- The survey was live online between January 6 to March 1, 2016.
- 3042 Technical Professionals fully answered the survey
- Where responses are “frequently cited” the idea was included comments recurrently.

Q1: Please indicate your Province or Territory

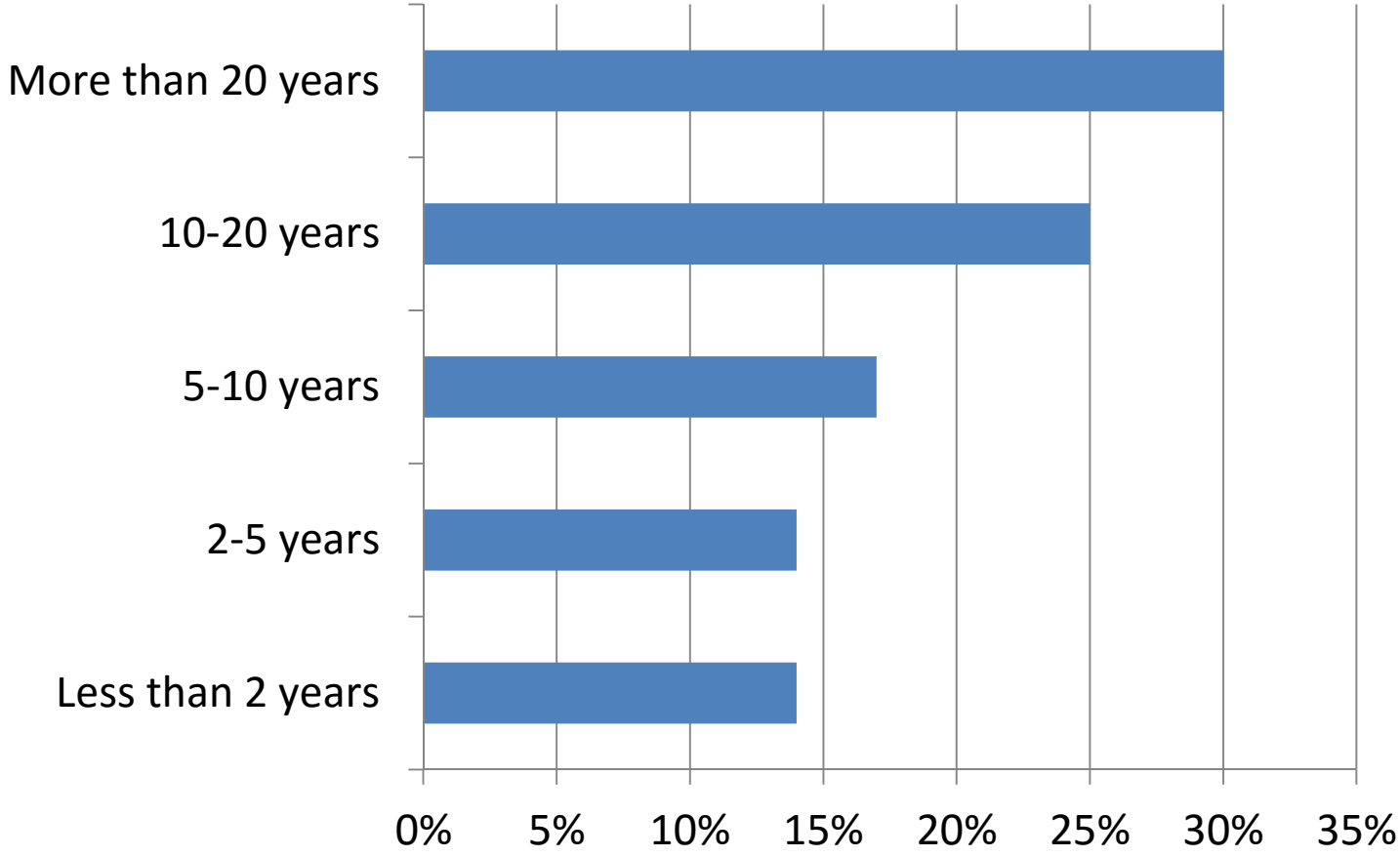


*Other includes:
17 respondents from Manitoba, Quebec, Newfoundland/Labrador, New Brunswick, and Nova Scotia.
18 respondents from the Northwest Territories and the Yukon

Q2: Are you a certified Technician or Technologist?



Q3: Approximately how long have you been certified?



Q4: In which industry sector do you work?

Agriculture, Forestry, Fishing	1%
Construction	16%
Health Care	2%
Manufacturing	9%
Mining, Quarrying, and Oil and Gas	15%
Professional, Scientific and Technical Services	13%
Public Administration	7%
Transportation and Warehousing	2%
Utilities	10%
Consulting	16%
Other*	9%

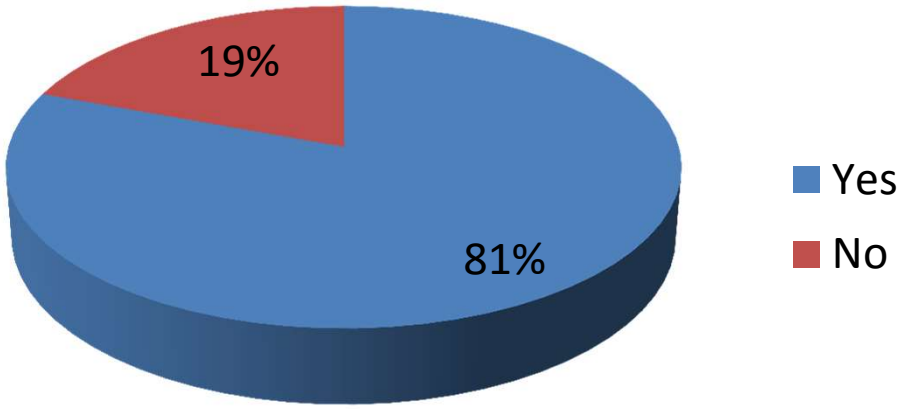
**Frequently cited: Education, Retired, Environmental, Building Management, I.T.*

Q5: Please categorize your role.

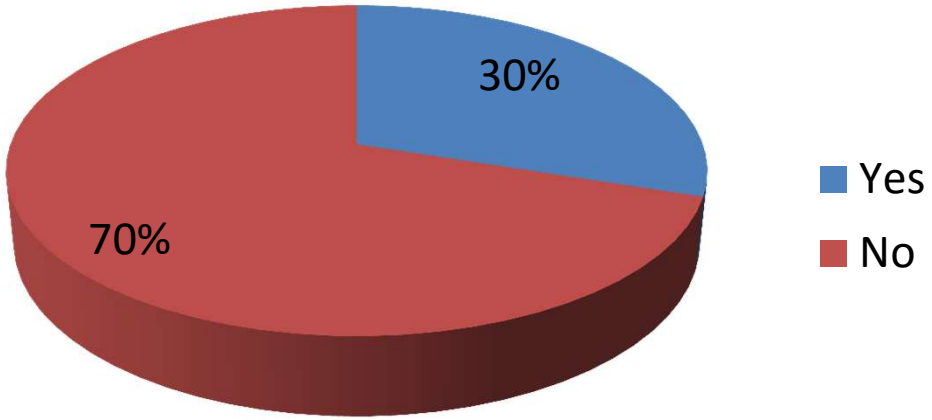
Answer Options	Response Percent
Senior manager	20.5%
Technical project leader	19.7%
Technologist involved in technical work	39.9%
Technician involved in technical work	8.1%
Project Manager/Coordinator	2.5%
A people leader with accountability for recruitment	3.5%
Other (please specify)*	5.8%

**Frequently cited: Sales, Retired, Contract Management, Trainer/Instructor, Building Official*

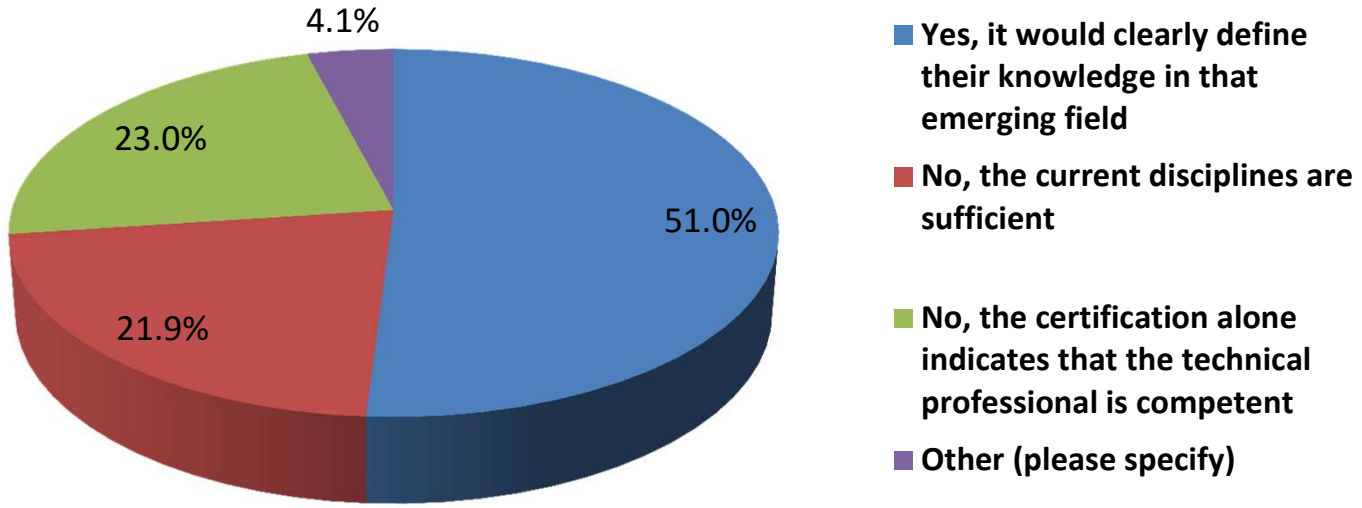
Q6: Given your experience, do you believe the disciplines listed above cover the full spectrum of technical work performed by Technicians and Technologists in Canada?



Q7: Do you believe there should be additional disciplines and accreditation criteria developed?

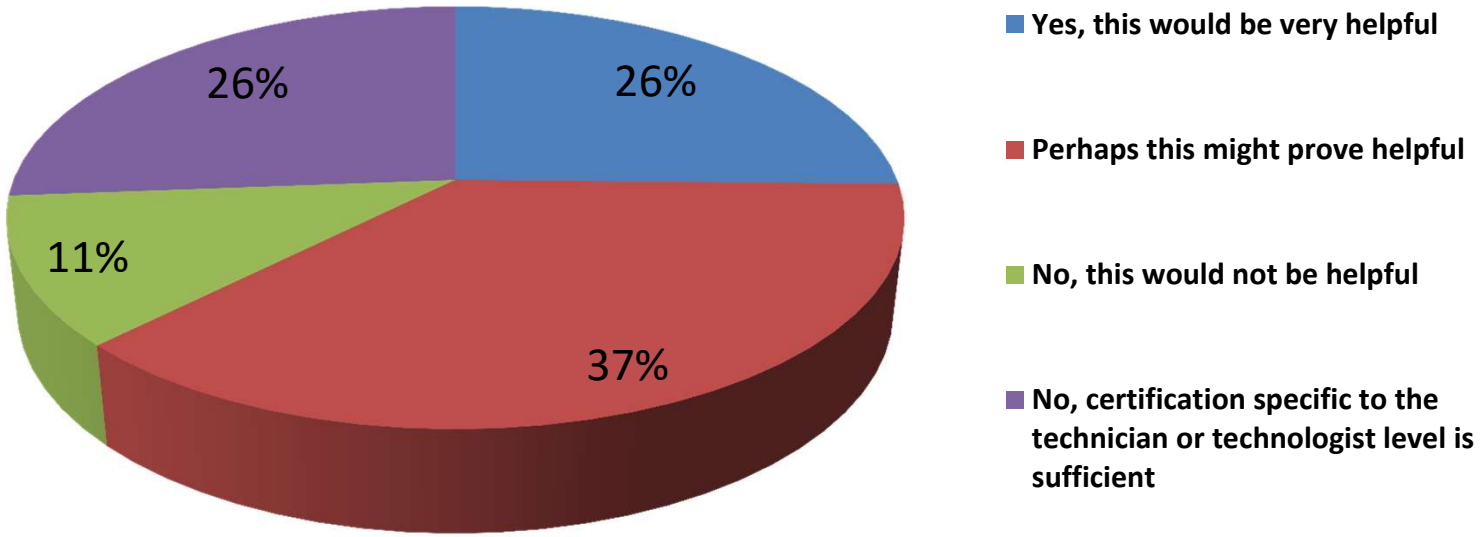


Q8: From your perspective, would it be a benefit to Technicians and Technologists to be certified specifically within an emerging technology?

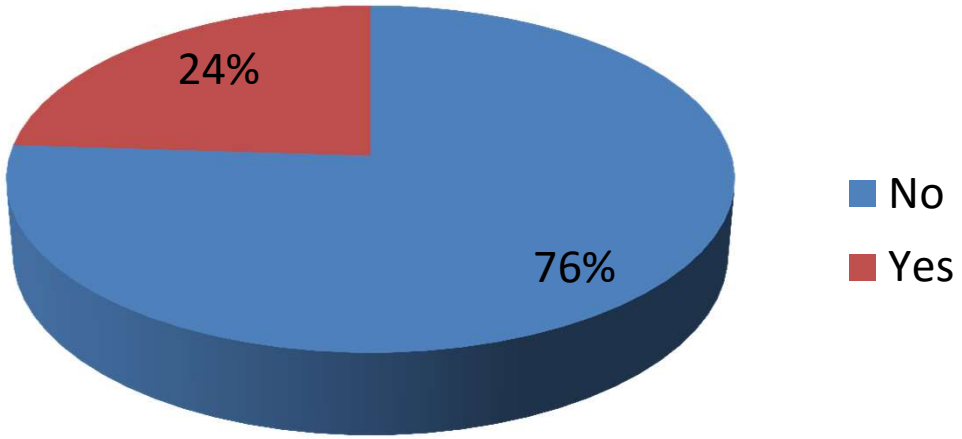


Frequently cited: Risk of limiting opportunity; Emerging technologies difficult to define; Subsets or specialties within existing disciplines would be preferred

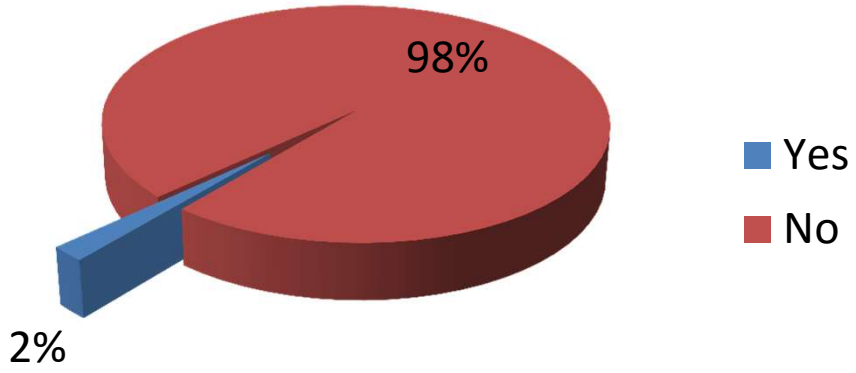
Q9: Do you believe that a "specialty" designation conferred by the Provincial Association within your field of technology, would be of benefit to the profession?



Q10: In your opinion, are some emerging technologies so unique they require specific qualifications for technicians and technologists?

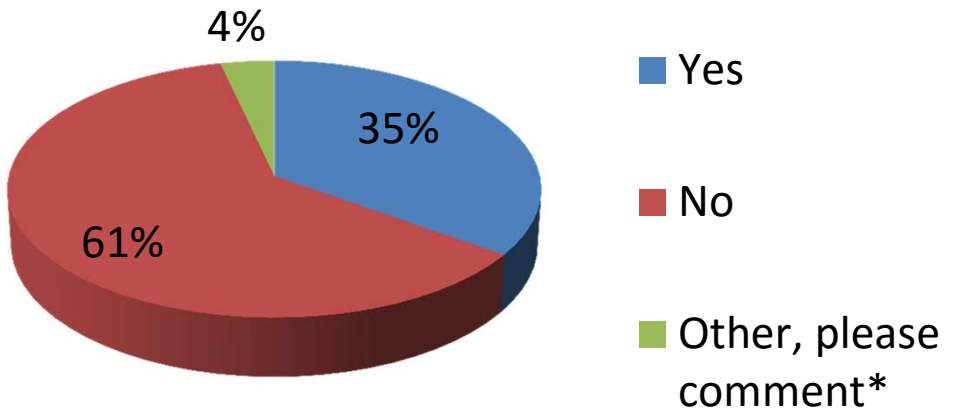


Q11: Are you personally certified under more than one discipline?



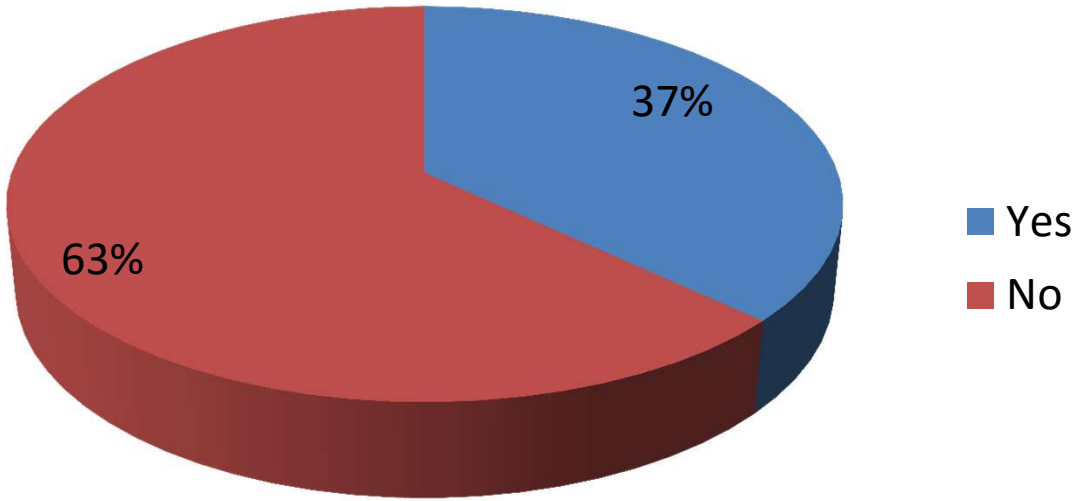
Frequently cited: Electrical/Mechanical/Instrumentation multiple disciplines most common; Project Management Professional (PMP); Registered Safety Professional (CRSP); Electrician

Q12: Given that Technicians and Technologists abide by a code of ethics and standard of conduct, do you believe it is necessary to certify them specifically within one discipline?



**Frequently cited: Multidisciplinary certification needed; Through experience and continual learning a professional's discipline might evolve;*
NOTE: A majority of comments in the "other" category strongly supported certification within defined disciplines.

Q13: Do you believe there would be inherent risk if a Technologist or Technician was certified in a broader sense rather than specifically within a technical discipline?



General Observations

- Need for recognition of interdisciplinary expertise
- Existing disciplines are sufficient; some interest in “specialties” or “sub-disciplines”
- Value for continual learning, recognition that it leads to cross-discipline expertise
- Strong value for ethical aspects of certification
- Need for greater recognition of technical professionals
- Civil Engineering too broad as a discipline