MEDICAL TECHNOLOGY SKILLS-EDUCATION GAPS ROADMAP

Inaugural Study – August 2023

Prepared for: VICTORIAN MEDTECH SKILLS AND DEVICES HUB

Conducted by: SWINBURNE UNIVERSITY OF TECHNOLOGY

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ACKNOWLEDGEMENT OF COUNTRY
VMSDH partners acknowledge the Traditional Owners of the unceded land on which we work, learn and live. We acknowledge and are grateful to the Traditional Owners, Elders and Knowledge Holders of all Indigenous nations and clans who have been instrumental in our reconciliation journey.

VMSDH partners recognise the unique place held by Aboriginal and Torres Strait Islander peoples as the original owners and custodians of the lands and waterways across the Australian continent, with histories of continuous connection dating back more than 60,000 years. We also acknowledge their enduring cultural practices of caring for Country.

We pay respect to Elders past and present and acknowledge the importance of Indigenous knowledge.

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Executive summary

The Australian Medical Technologies (MedTech) sector is experiencing rapid growth and significant investment in a market that spans diverse capability areas across a globally competitive ecosystem. With more than 1,400 companies making up 54 per cent of the life sciences sector in Australia, the industry has experienced significant growth in the past five years[1]. This thriving industry forms the proving ground for start-ups, spin-offs, a flourishing SME sector, and leading large national entities that draw together a growing sovereign supply chain.

As the demand for the application of MedTech devices grows across an expanding health care system, so too does the need for a suitably skilled and experienced workforce. This is coupled with the need for a strong talent pipeline to support and drive the expansion of the Australian MedTech sector into new and innovative areas, both domestically and globally.

To address local and global workforce needs, it is critical to understand and address the current and future MedTech skills and education requirements spanning the diverse MedTech value chain. Additionally, the challenges organisations are facing in a post-COVID global economy continue to impact on recruitment and retention of the best and brightest within the local domestic market. The growth of the MedTech sector will continue to demand a specialist and multifaceted workforce, with targeted specialisation to industry requirements.

The rapid nature of change requires a multi-faceted approach to upskilling recent graduates, existing and transitioning workers, whilst securing an appropriately trained future talent pipeline. A comprehensive suite of tailored higher education and vocational education course offerings, complimented by micro-credential courses, would offer diverse and expansive career pathway options spanning the MedTech ecosystem.

Framework for investigation

The *MedTech Skills-Education Gaps Roadmap* team used various discovery methods to gather data and insights on the MedTech industry skills and knowledge gaps, and related education and training offerings currently available across Australia. Desktop research and analysis was conducted on:

- Existing MedTech related reports, research papers, gap analysis documents and articles
- Job advertisements spanning a number of related recruitment sites
- Current education and training offerings, including higher education qualifications, vocational and education certificates, and short courses mapped to identified skills gaps categories.

Analysis has provided insights into the gaps in current education and training offerings that should be addressed in order to better meet the needs of the MedTech sector.

Industry consultation

Individual and small group consultation was conducted with stakeholders from the private sector, government, tertiary institutions, and industry associations. These consultations were held to gain an understanding of the current and future skills needs of the sector and workforce development requirements. Insights were gathered on the perceived gaps in current education and training offerings and potential solutions, as well as the qualifications levels sought for jobs roles and talent pipeline and recruitment challenges. Discussions included the role of work integrated learning and internship programs offered and their effectiveness in embedding real-world work exposure and preparedness for graduates. An industry survey was also distributed to over 180 MedTech industry stakeholders across Australia to gain an understanding of perceived skill shortages, qualification expectations of employees in the sector, and barriers to developing and accessing an upskilled workforce.

Skills and training needs analysis

The Australian MedTech industry spans diverse and highly technical areas that encompass research and development, clinical trials, manufacturing, commercialisation and IP, sales and marketing, health, and allied sector implementation. The industry also crosses over with other sectors, adding further complexity and the need for a nuanced approach to navigating sector workforce skills and education requirements.

The establishment of a MedTech Competency Framework that defines key competencies required to work within the sector would support organisations to establish standardised roles and skill sets consistent across the sector. Existing and future qualifications need to include a greater level of MedTech specialised streams, units, and content across the Australian Qualifications Framework. Key skills and knowledge areas identified as needing greater alignment with industry requirements include:

- Commercialisation and IP
- Regulatory frameworks and quality management systems
- Project management and business skills
- End-to-end product design process
- Advanced manufacturing and applied technologies
- Digital and data management including cyber security.

Micro-units and micro-credentials form an important role in upskilling existing workers and graduates through just-in-time learning options and would complement formal qualifications. Work integrated learning experiences such as internships and work placements also play a critical role in graduate job readiness and experience in the workplace.

Recommendations

To meet the immediate and long-term needs of the MedTech industry, a number of recommendations are provided that require a whole of sector approach, with greater collaboration across government, regulators, industry, and tertiary institutions.

1. Development of a National MedTech Competency Framework would inform industry and education institutions of the job roles, functions and standards required for working in the MedTech industry.
2. Higher education courses that address advanced manufacturing and engineering to include greater MedTech specialisation involving GMP, QMS and MedTech related regulatory frameworks.
3. Courses to include the design and development of MedTech devices including the phases of discovery, design, development, patenting, commercialisation, intellectual property, advanced manufacturing sales and marketing to the end user.
4. Further exploration of the role of VET courses to identify MedTech-specific skill sets and provide pathways into MedTech Higher Education courses and job roles.
5. Industry, university, and VET collaboration to develop sustainable skills and training offerings for the MedTech industry which will lead to industry led courses.
6. Utilise existing platforms such as Wilam.com to build the MedTech community by sharing collective insights, information, and resources for the MedTech industry.

Introduction

With the rapid expansion and exciting growth of the complex and highly diverse national MedTech sector, it comes as no surprise that Australia has been a leader in researching, developing, and manufacturing medical technologies for decades. In 1926, the world's first electronic heart pacemaker was developed at Sydney's Crown Street Women's Hospital; fifty years later, the first bionic ear was implanted, having been developed at the University of Melbourne[2].

By the end of 2022, the Australian Register of Therapeutic Goods (ARTG) listed a total of 62,381 approved medical devices[3] across Australia. Many of these devices provide vital, lifesaving physical and digital solutions to people to improve health and social outcomes. These devices span diverse diagnostic and therapeutical areas with many varied applications, ranging from medical imaging to the replacement of body parts to cochlear ear plants to e-prescriptions. Evidently, today's Australian MedTech industry is incredibly complex and diverse.

While there are well established and successful multinational MedTech companies that are based and operate in Australia, the majority of MedTech companies can be predominantly described as relatively young small-to-medium enterprises (SMEs). The design and development, clinical trialling, manufacturing, sales, and eventual distribution of these devices and technologies to the end user require a number of multi-faceted development stages and highly skilled work roles. In particular, start-ups require a good knowledge of the MedTech ecosystem if they are to succeed, including a comprehensive understanding of the skills required and a pipeline of suitably trained staff.

With 17,000 Australians directly employed across the medical technologies industry[4] and a 43% growth across the sector[5] over the 2021 to 2022 period, it is evident that the national MedTech sector is set to continue along this upwards trajectory. According to the recently published *The Value of MedTech Report*, however, 64% of companies within the MedTech sector are having difficulties filling job vacancies[6].

The *Medical Technologies Skills-Education Gaps Roadmap* builds on existing MedTech skill reports and industry feedback to analyse the current MedTech-related education offerings and job advertisements that are available across the Australian MedTech sector. This report draws preliminary conclusions as to the national training and education offerings that are required to support the continuous growth of the MedTech industry, ensuring the sector reaches a vibrant and fulfilling future.

Aims

The aims of this roadmap are to:

- Identify current MedTech-related education and training offerings across the national short course, vocational education, and training (VET) and higher education sectors.
- Capture insights from industry stakeholders on current and future MedTech skills requirements.
- Understand the current training and education needs of the MedTech industry.

The scope of this report relates to the skills, education, and training requirements of the MedTech sector and does not include the pharmaceutical industry.

Methodology

The *Medical Technology Skills-Education Gaps Roadmap* team employed a range of discovery methods to gather data and insights on the MedTech industry, skills and knowledge gaps, and related education and training offerings currently available across Australia.

1. Desktop research of MedTech reports

Current MedTech documents were reviewed to identify key skills and findings presented by various reports, research papers, gap analysis documents, and articles. These have been referenced throughout this roadmap and have supported the discovery team to gain an understanding of the Australian MedTech sector and its requirements for future development.

2. Industry consultation

A range of leading industry representatives, CEOs, academics, Jobs and Skills Councils, consultants and researchers were interviewed throughout the process of developing this roadmap. All stakeholders consulted with have experience in the Australian MedTech sector.

3. National industry stakeholder survey

A 10-question survey was distributed to more than 180 key MedTech industry stakeholders across Australia to gain an understanding of perceived skill shortages, qualification expectations of employees in the sector, and barriers to an upskilled workforce.

4. Desktop audit of MedTech Job advertisements

Regular reviews of Australian job advertisement websites took place throughout the development of the roadmap, utilising key words that relate to advertisements seeking individuals for specialist MedTech roles across the sector. This was partially built upon the discovery team's analysis of skills required for the Australian MedTech sector, with specialist skills and requirements searched for throughout the analysis of job advertisements.

5. Desktop audit of MedTech related education and training offerings

An investigation of national current education and training offerings included higher education qualifications, vocational and education certificates, and short courses. The qualifications have been collated and mapped to identified skills gaps categories.

Limitations of the study

The research conducted for the purpose of this study seeks to highlight the current educational offerings and future education and training needs of the MedTech sector; however, the following challenges limited the research conducted for this initiative.

Survey responses from industry representatives and stakeholders were limited, and therefore the survey presented in this report may not provide a full and complete representative overview of the complex training landscape in Australia for MedTech-related skills. In order to deeply understand the national landscape, further research and analysis is required into the potential training requirements for the sector. This includes gaining a complete understanding the value of the vocational education sector, which is somewhat untapped for MedTech sector skills.

Representatives from a wide range of MedTech companies have been consulted to identify skills gaps and education and training opportunities. However, no follow up consultation for further exploration of discussion points was possible due to the limited time frame for this report. Future investigation would support a more thorough exploration of all current education and training offerings across Australia, with a comprehensive analysis into understanding the

MedTech higher education landscape for all Australian universities and VETs. Further research is also required to understand the specific and technical skills and knowledge gaps outlined in the MTPConnect second[7] and third[8] reports in relation to the identified current education and training offerings.

MedTech education and training skill gaps

The MedTech industry is complex, employing a diverse span of professionals and tradespeople across the value chain. Research into advertised jobs relating to the MedTech sector has indicated that the workforce is predominantly university educated, with many holding higher education degrees in various engineering streams. The skills are based in science and advanced manufacturing, and are often interlinked and co-dependent by their nature[9]. Occupations fall into at least 13 groups, ranging from operations, engineering, research and development, supply chain, regulatory, quality assurance, finance/procurement, sales and marketing, human resources, business and commercialisation, data analytics and scientists.

To formulate a strong understanding of the needs and requirements for education and training that currently exist within the Australian MedTech landscape, several reports developed and published by MTPConnect provided valuable context and insights into the sector. As a leading Australian MedTech and pharmaceuticals industry growth centre, MTPConnect is an industry-led organisation that supports the growth of the medical technology, biotechnology, and pharmaceutical (MTP) sector in Australia.

From 2020 to 2021, MTPConnect released three skills gap analysis reports to provide a comprehensive insight into the skills gaps that exist in the Australian MTP sector. The *MTPConnect REDI Initiative Skills Gap Analysis: Second Report*[10] and *MTPConnect REDI Initiative Skills Gap Analysis: Third Report*[11] identify 81 skills gaps across the MTP industry, which are categorised across seven key themes. These themes include advanced manufacturing and supply chain, business operations, clinical trials, health data and cybersecurity, health economics and regulatory affairs, product development and commercialisation, and specialist and technical skills[12].

With the national and international impacts of the COVID-19 pandemic becoming clearer towards the end of 2021, the third MTPConnect report was published to refresh the Australian MedTech skills outlook with a focus on post-pandemic recovery. The third report[13] highlights four key skills that will be vital in supporting the growth and development of the MedTech environment in Australia following the impacts of the COVID-19 pandemic, with three of these four skills relating directly to the medical technologies sector.

A focus on supporting the development of advanced manufacturing capabilities continues to be salient across the sector, with Good Manufacturing Practice (GMP) knowledge and process design expertise identified as two of these three MedTech-specific skill gaps. Within the design expertise knowledge requirements, regulatory understanding and commercialisation skills are inherent gaps that will need to be met in order to drive the sector forward. The third skills gap sits under business operations, which again highlights the lack of commercialisation skills held by trained professionals within the sector. Business skills and commercialisation expertise was also highlighted in the MTPC Workplace Skills Report along with Regulation and Quality. Investor communication, collaboration and project planning embedded in a comprehensive awareness of regulatory affair are perceived as vital skills to drive the MedTech industry successfully into the future.

Representatives from the University of Melbourne have provided a research paper relating to the skills gaps that exist within the medical technologies sector. The *Gaps in MedTech and Opportunities for Education Enhancement* report[14], authored by Chen and Tsigaras (yet to be

published) highlights skills and knowledge gaps that are categorised into potential overarching subjects for future delivery. Four categories identified in the research conducted by Chen and Tsigaras include: Industry-relevant awareness, Job-specific skills, 'Going Digital' and Career preparation essentials. Chen and Tsigaras outline the importance of Quality Management Systems and standards (QMS), which strongly aligned with regulatory affairs, leadership and commercialisation, an awareness of cyber security, use of AI in design, and strategic design of clinical trials. They unpack subject matter for many of the MTPConnect skills. Chen and Tsigaras state that a common type of skill set required by industry is a combination of specific technical skills with business acumen and experience in a highly regulated environment. Engineers are traditionally trained for technical work and will need further skilling in commercialisation, business skills and better understanding of the stages of MedTech device and technology development to support the MedTech industry development and growth. A cross-pollination of traditionally discreet skills appears to be demand in the emerging MedTech sector.

The MedTech value chain

The complex MedTech manufacturing value chain contains various stages of design, development and implementation for manufacturers that reflect the path required to take MedTech prototype to completion, ready for release to the market. One such value chain has been identified by MTPConnect[15]; additionally, Rapid Direct[16] has released a comprehensive guide that highlights the stages of medical device development, which similarly provides information on how MedTech products are brought to market (2023). Whilst Rapid Direct's guide focuses predominantly on a U.S.-based analysis, the value chain identified within this report provides a pathway for MedTech device production that is similar to the Australian chain presented by MTPConnect.

Both reports utilise a model predicated on the requirement of implementing meticulous planning measures and conducting valuable research into market needs, other similar products, and funding strategies in the pre-production phase. Rapid Direct also emphasises the importance of implementing quality management systems and understanding regulatory requirements; a hot topic identified across the Australian MedTech sector that currently requires targeted education and training.

After undertaking the clinical development, the value chain moves towards the production phase, where specialised MedTech products are created. Following testing, vital clinical trials and market testing occurs, which evolves into the implementation of post-market activities such as sales, marketing, and the provision of ongoing services.

This description of the MedTech manufacturing value chain provides a relatively abbreviated overview of how products are manufactured. The development of education and training offerings that, in part, provide participants with a deep understanding of how MedTech products are manufactured and brought to market is highly beneficial, and will support the overall growth of the sector nationally. The skills and knowledge required for the MedTech industry are complex. The three key priority areas for developing skills that continuously appear throughout research documents and reports are understanding regulatory requirements and frameworks, GMP, commercialisation, the need for end-to-end translation experience of the ecosystem with experiential knowledge.

Job roles across the value chain

Based upon the desktop investigation of current job advertisements across the Australian MedTech landscape, the graph below demonstrates where MedTech-related jobs sit along the medical technologies value chain. This value chain has been identified and published by MTPConnect[17].

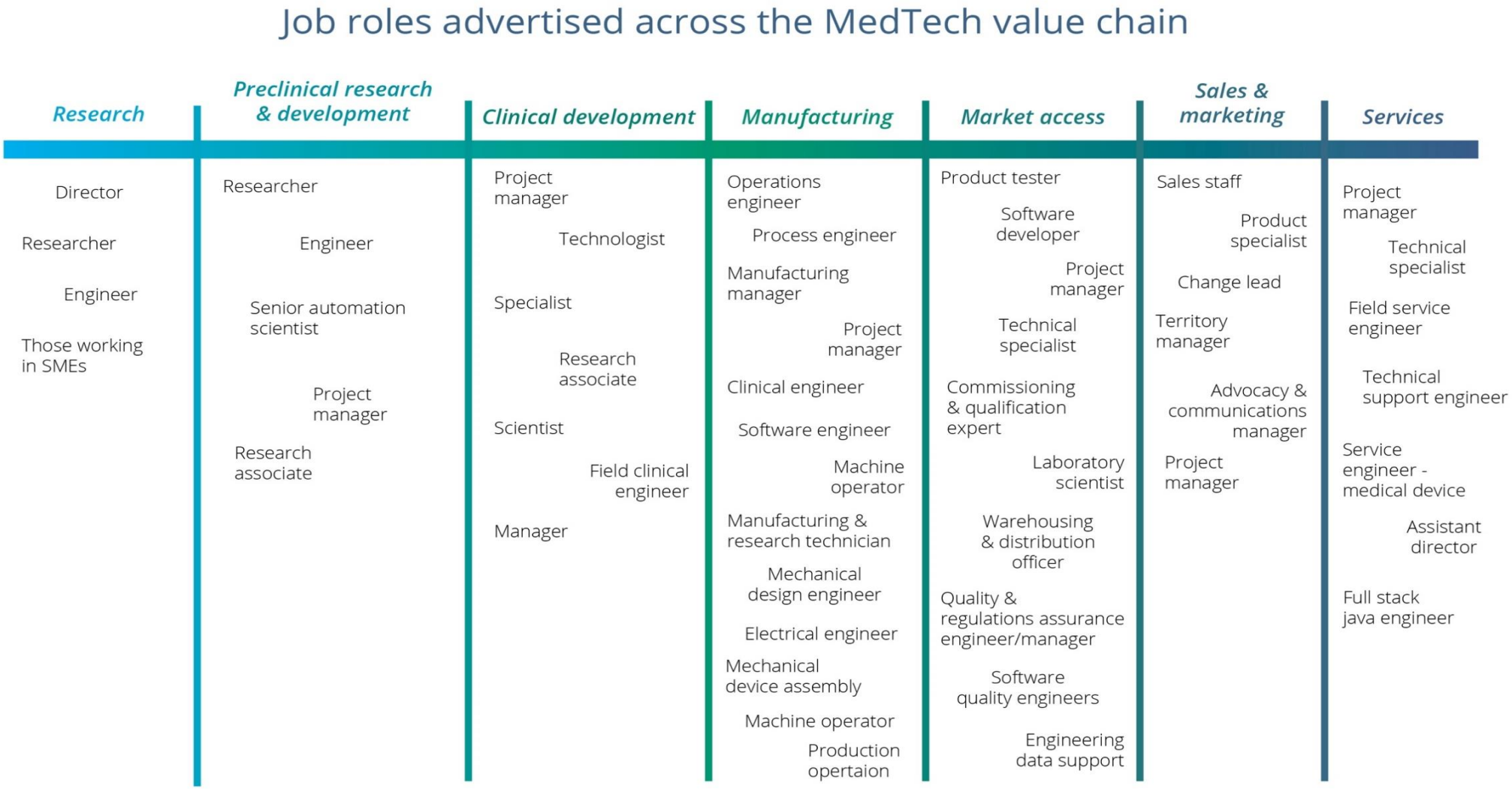

Figure 1: Job roles advertised across the MedTech value chain

The MedTech workforce is comprised of a high number of engineering specialists, with a significant volume of the value chain involving their expertise. The following examples of disciplines that occur across the engineering field in relation to MedTech have been gleaned from the analysis of job opportunities and education and training qualifications that currently exist nationally:

- Biomechanical engineering
- Biomedical engineering
- Electrical engineering
- Electronic engineering
- Mechanical engineering
- Mechatronics engineering
- Robotics engineering
- Product design engineering
- Software engineering
- Systems engineering.

A national workforce competency framework

The *Workforce and Capacity Summit*[18] published by ARCS Australia recommends the establishment of a national workforce competency framework and a national training curriculum for key MedTech professionals. In comparison, a competency framework for MedTech regulatory workers was developed and published in 2017 for workers in Southeast Asia[19], in addition to other international competency frameworks such as the recent AI and Digital Healthcare Technologies Framework[20] from the University of Manchester.

The creation and implementation of a national workforce competency framework would be highly beneficial for the development of education and training resources for the highly specialised medical technologies sector. The development of such a framework would ensure that academics and course developers, industry members and new and emerging companies are provided with an understanding of national regulatory requirements across the sector, as well as skills and personnel requirements.

A report released by Biotech Australia[21] outlines technical and soft skills for MedTech workers across the value chain, whilst also providing job descriptions for a range of MedTech employees in executive or senior management roles. Whilst this information is highly valuable for new and emerging MedTech companies, a national workforce competency framework is required for the medical technologies sector in Australia to guide curriculum, courseware development, and industry.

Consultation findings

To gain an understanding of the medical technologies landscape from leading industry members, consultation with 17 MedTech representatives from large and small to medium companies across the value chain was conducted across a 10-week period. Discussions provided valuable insight into the key requirements of the skills, education and training needs of the sector, whilst also informing the design of an industry survey which was distributed to more than 180 industry stakeholders.

Eight clear themes arose from these consultations with MedTech industry representatives, ranging from the most prevalent issues facing those entering the workforce through to challenges relating to a lack of vital specialised skills required for existing technical and managerial roles in the medical technologies sector.

MedTech ecosystem and career pathways knowledge

Those who are interested in entering and progressing through the MedTech sector are often faced with a complex and difficult to understand landscape. Awareness of the expansive MedTech ecosystem was identified by industry stakeholders as a knowledge gap of many graduates and those working within the sector. This is seen to limit understanding of career pathway options and subsequent selection of course stream or subject options. This includes specific stages of product design, manufacturing, sales, and marketing to the end user, which are not reflected adequately throughout current education and training offerings.

Industry and academic collaboration

Greater collaboration between industry and education and training institutes was called for by some industry stakeholders, sighting misalignment between industry needs and education and training offerings in some instances. This at times extended to tools and software used within the sector that are different to that used within university courses. Greater collaboration and alignment between MedTech sector employers and tertiary institutions could see an increase in real-world application of knowledge and skills obtained through study into the workplace, better preparing graduates and existing workers for both entry level and higher-level roles.

Of note is the omission of a biomedical specialist qualification within the tertiary education sector. Industry have called for a greater number of MedTech and biomedical related course offerings and specialised streams and elective units on offer to meet the highly nuanced and specialised skill sets required to work within the sector.

Greater collaboration with industry and within the education and training sector is encouraged to provide more detailed information on the nuanced MedTech streams and pathways in order to deliver a diverse suite of education offerings that align with opportunities within the sector and industry skills requirements to grow the sector into the future. This includes an increased focus on the VET course options and potential for greater career progression pathways to support graduates from VET into higher education.

Internships

Fostering relationships with tertiary institutions with regard to industry immersion and job exposure is also vital to supporting the growth of the MedTech industry. Partnerships between industry and the tertiary sector are critical to the alignment of education and training offerings to industry skills requirements and workforce development initiatives to ensure a suitably trained and qualified talent pipeline. A key element of graduate work preparedness is access to work integrated learning opportunities including work placements and internships.

Length of internships was raised as a concern by industry representatives, with the majority seeking a longer-term placement to ensure graduates have a solid grounding of the sector and workplace experience prior to graduation, including up to 6-month internships.

Blended 'earn and learn' models are shown to provide broad experience to graduates over time, however they do require considerable time commitment for students who need to navigate both work and study commitments over an extended period. As such, many students seek shorter term placements, and this is often reflected in tertiary internship offerings, which do vary in length, between institutions.

Regulatory and quality assurance

Navigating the complex nature of the medical technologies sector has been exacerbated by a general lack of understanding and awareness of the regulatory landscape and quality assurance requirements that exists across the sector. MedTech companies must traverse relatively intricate and complex regulative frameworks that are comprised of laws, guidelines, and standards, that are often not understood by most graduates. This also applies to knowledge of international regulations if supplying products for an international market, or those who work in the design or manufacture of products for multiple sectors.

Industry consultation has highlighted an inherent lack of knowledge and training offerings around MedTech regulations, intellectual property (IP) and commercialisation in current graduates and exiting manager profiles. Whilst a number of MedTech specific short courses on offer by the private sector were identified, these skill sets are not often comprehensively covered off in existing MedTech related qualifications, and therefore graduates are needing to upskill early in their career to bridge the gap, whether that be sponsored through their employer or at their own expense.

Reimbursement pathways and commercialisation

Commercialisation of MedTech R&D and reimbursement pathway options were identified as skills gaps for many organisations and their management teams. Knowledge of government and industry procurement and reimbursement pathways was highlighted as critical to the growth of the sector and a company's global competitiveness. Skills in funding application writing that is compliant with regulatory and quality assurance requirements was specifically highlighted as a common gap across the sector. This was noted as being evident within the MedTech R&D phase in particular, where commercialisation pathways are often not heavily considered. This includes the knowledge of viable commercialisation and reimbursement opportunities in the latter stages of the R&D cycle.

Additional knowledge gaps were identified in relation to understanding reimbursement pathways at the research and development stage. One consistent theme that has been identified is the lack of skills and knowledge in commercialisation, at both the domestic and international level. The requirements associated with commercialisation involves moving technologies to market, conducting sales, and providing customer support services, and remains a critical skills gap across the sector that needs to be addressed for both current and future workers to support growth of the sector and positioning of Australia as a trusted MedTech leader and supply chain partner.

It was also identified that end-user testing was not always considered a priority during the R&D process, prior to finalising a concept or aide product prior to it going to market. Examples were provided of disability aide devices not being socially sensitive for end users.

Future skills

A large focus of feedback from consultations was the increasing prevalence of future skills requirements in the medical technologies sector. These future skills include but are not limited to understanding the implications of utilising big data and artificial intelligence (AI), as well as specialised cyber security skills for the medical technologies sector.

Management

MedTech Project Management was identified as an in-demand role, with many companies seeking Project Managers with relevant MedTech sector experience. Management skills have been highlighted as being essential for continuously supporting the improvement and growth of the medical technologies sector in Australia. Industry consultation has identified that those in management positions throughout the MedTech industry would benefit from better understanding commercialisation skills and how to grow businesses. Additional skills that have been highlighted include having strong team management skills, implementing a creative mindset, and demonstrating vital leadership skills within a MedTech context. It has also been identified that those holding senior positions within MedTech organisations would benefit highly from upskilling to ensure that they have the ability to write submissions for funding opportunities.

Project managers with a specific understanding of and experience in the medical technologies sector has also been identified as being a job area where graduates and those entering the industry lack key knowledge and skills. Whilst project managers do tend to have highly transferrable skills across a range of industries, having a specific understanding of the MedTech sector has been highlighted as a key requirement for growth and development.

Mixed skills sets

The continual growth of the MedTech industry has coincided with a key requirement for those entering into and working within the sector to have experience that spans across a combination of disciplines. Many job roles are not discrete to a particular stream and can span mixed skill sets such as:

- Business and engineering/bio design
- Research & development and commercialisation
- Advanced manufacturing and project management.

Consultation has revealed that the industry requires people who have a mix of business acumen and technical or specialist skills to support the growth of the sector. This may require dual qualifications, double majors or unique electives and specialities to be built into relevant qualifications to ensure graduates are able to meet industry demands early on in their career.

The value of more practical-based skills training has been evident in the introduction of higher apprenticeship models within the Advanced Manufacturing sector, upskilling those with prior qualifications in either VET or higher education qualification gaining critical Industry 4.0 and advanced digitalisation skills aligned to multiple specialised applied technologies streams. The highly practical and workplace project-based learning model applied to higher education qualifications has shown enormous benefit and sector and workplace applicability, which includes project management, team leadership, presentation digitisation skills as well as the technical proficiency required of the particular discipline.

Survey results

To gain a deeper understanding of the education and training needs of the medical technologies sector, a targeted nation-wide survey was distributed to 187 MedTech-related industry professionals. These surveys were distributed to representatives of industry bodies, membership associations, and a job skills council representative, with 24 responses being received. The survey consisted of 12 questions aimed at ascertaining perceived skill shortages, qualification expectations of employees in the sector, and barriers to an upskilled workforce.

Of all the respondents, 70% indicated that they were CEOs or executives. 75% of respondents employed less than 100 people, indicating that much of the medical technologies industry in Australia consists of mainly small to medium businesses across this study sample. 18 of the 24 respondents indicated that they were based in Victoria.

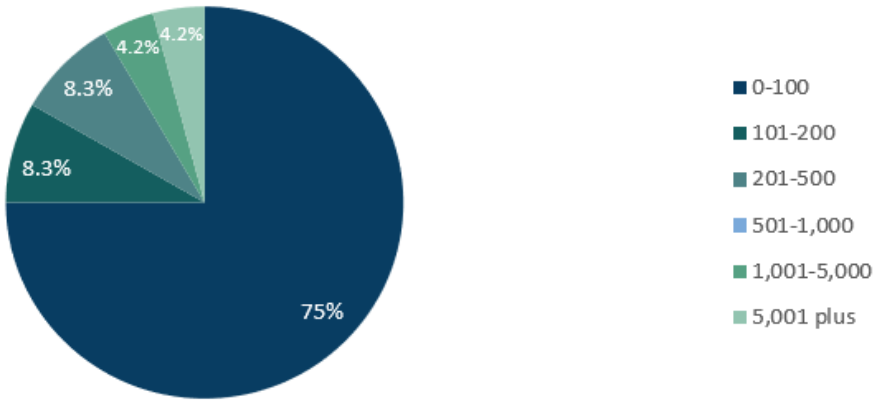

Figure 2: Number of employees in the organisations surveyed

MedTech sectors

Survey respondents indicated that they predominantly operated in the device manufacturing sector, as well as product research and development. Four out of the 24 respondents indicated that they were from sales and, with an additional four from marketing and another four from safety and quality assurance. Other respondents indicated that they worked within sectors that included consulting services, supply chain and logistics, clinical services, laboratories, and industry advancement organisations.

Job functions

The most frequently identified job functions held by respondents were found to be engineering and management roles within their organisations. In descending order, the next most prevalent job functions were commercialisation, clinical development, project management, sales and marketing, scientist, IT and data management, research, and process manufacturing roles. While commercialisation skills have been flagged as a significant skills gap throughout the consultation process and within the surveys distributed, a commercialisation-relevant role was not identified as being a position held by respondents from the organisations involved in this survey.

Challenges for recruitment

Barriers for recruitment were highlighted throughout the survey responses, with 16 out of 24 respondents indicating that they found it challenging to find appropriately skilled personnel when recruiting for MedTech-related positions. Limited availability and a national shortage of engineers contributed to the challenge, with respondents acknowledging the highly skilled and specialised skill sets demanded by the jobs in the MedTech sector caused significant challenges.

An additional challenge noted was the increasing expectation of finding talent with the right mix of skills.

Required qualifications

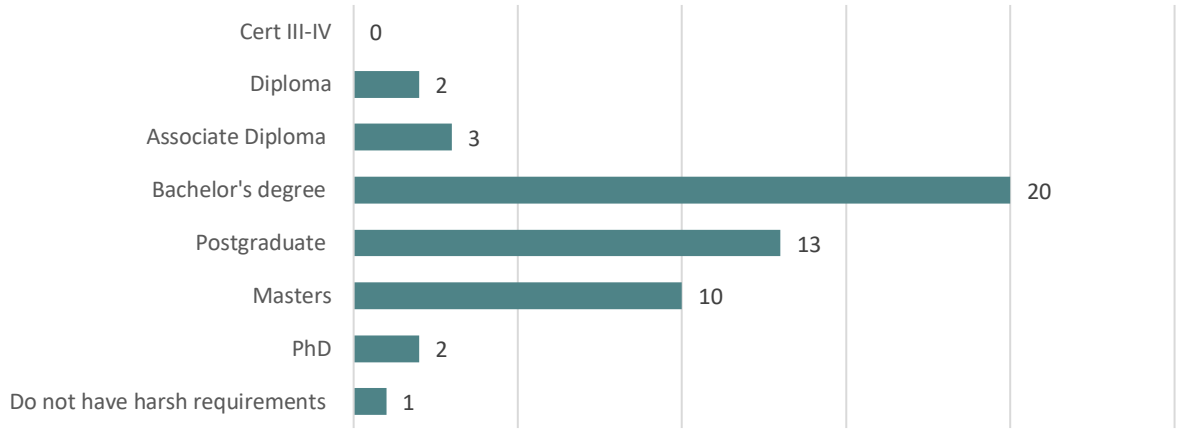

Figure 3: Qualifications required by employees

The survey results indicated that the qualifications required by employees throughout the medical technologies sector in Australia are typically at the higher education level, with employees that do not hold higher education degrees comprising approximately 10% of the sector for this sample. This reflects the highly specialised and professional nature of job roles involved within the Australian medical technologies industry.

Whilst to a lesser extent, Vocational Education and Training qualifications were identified as relating to the following job roles across the industry:

- Fitter & Turners
- Machine Operators
- Field Service Engineer
- Maintenance Fitter
- Dental Technician
- Service Technician Medical
- Team Leader Laboratory Technician
- Pathology Laboratory Assistant/Technician
- Line Repair Technician - Medical Technology
- Field Service Engineer
- Production Technician
- Sheet Metal Trades Assistant
- Installation & Service Technician
- Biomedical Engineer
- Medical Device Loan Kit Coordinator
- Technical Support - Medical Equipment
- Logistics Manager
- Warehouse Assistant
- Electrical Engineer

Internal training opportunities

Survey results indicated that the majority of respondents' companies offered internal training to their employees, with training predominantly focusing on quality management systems, standards and regulations, IP, and document management software. There appeared to be a balance between opportunities for internal and external training. Survey results also indicated that internal programs were also offered to new graduates.

Leveraging off the information supplied surrounding salient skills gaps from the consultations conducted, in addition to those identified within the MTPConnect report, respondents were asked to what extent they felt the following knowledge and skills were in shortage across the MedTech sector.

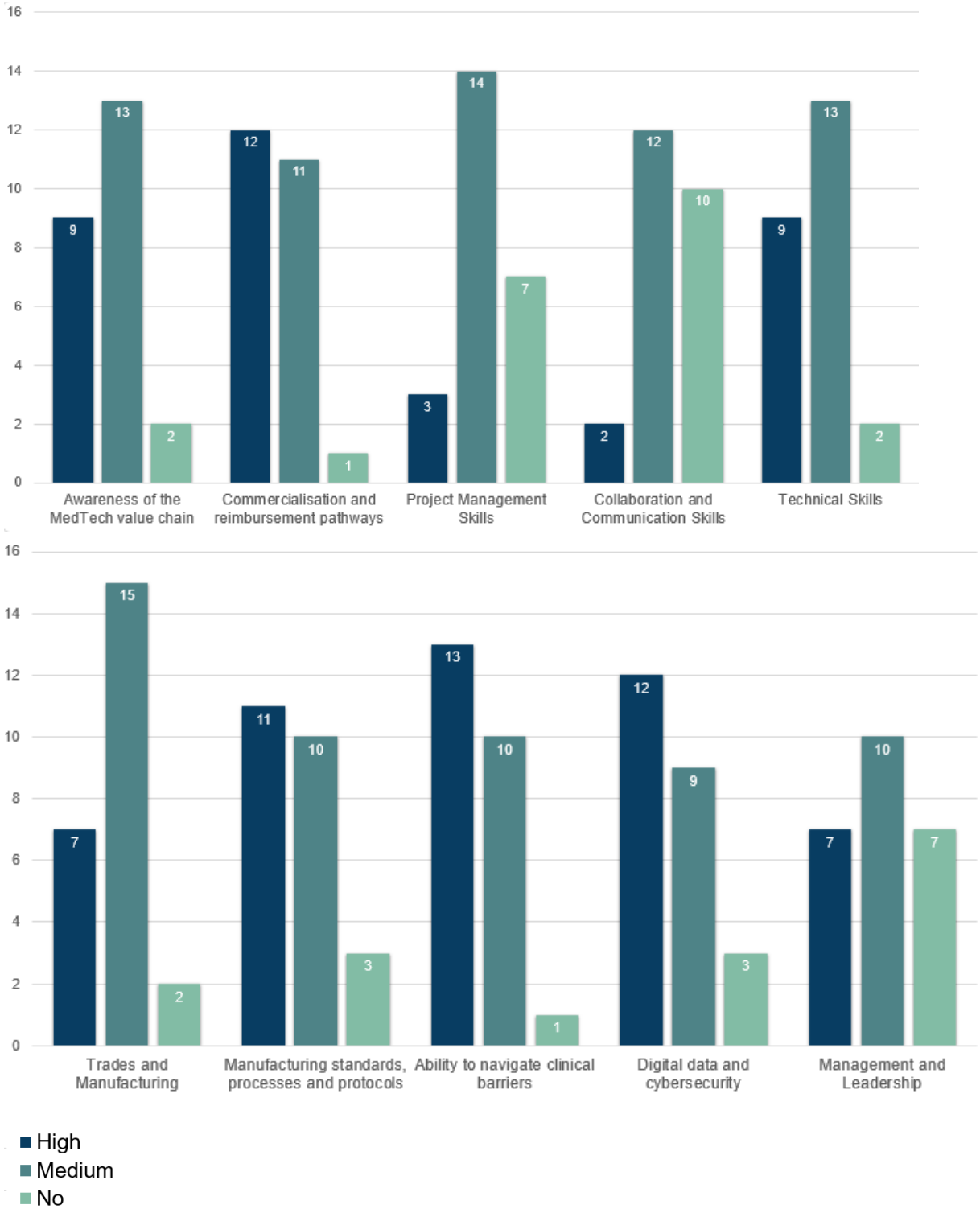

Figure 4: The extent to which skills are in shortage across the sector

The following results were found by adding the number of high and medium level shortage responses.

Skills gap	High- to medium-shortage	No shortage
Commercialisation and reimbursement pathways	23	1
Ability to navigate clinical barriers	23	1
Technical skills	22	2
Trades and manufacturing	22	2
Awareness of the MedTech value chain	22	2
Digital data and cybersecurity	21	3
Manufacturing standards, processes, and protocols	21	3
Project management skills	17	7
Management and leadership	17	7
Collaboration and communication skills	14	10

Figure 5: High- to medium-level gap shortages against no shortages

Existing training and education

Survey analysis resulted in 63% of respondents indicating that they believed that existing training and education programs do not currently meet the complex and vital needs of the MedTech industry. When asked to identify or make comment on what was needed to fill the training and education gaps, one survey respondent identified that short courses were meeting some specific gap needs more than full qualifications.

> *'University-based education tends to be taught with limited appreciation of industry standard project management and product development processes.'*

The survey results also indicated that respondents felt that engineers lacked the necessary knowledge and skills related to quality management systems, regulatory frameworks, and commercialisation pathways. The current lack of opportunities for students undertaking education and training to gain vital hands-on experience was also highlighted.

Existing barriers

Additional factors that have been identified as existing barriers to the necessary upskilling of the MedTech industry in Australia throughout the survey results include:

- Integration of disciplines across engineering, medicine, and science.
- Lack of opportunity to make tech that meets changing customer needs
- Decreased number of people coming into the sector from schools or university.
- Lack of talent pipeline of new graduates
- Changing skills set requirements
- Lack of workforce with appropriate current qualification in addition to industry experience
- Risk aversion to training people only to have them move on
- Spasmodic funding that creates uncertainty and a lack of consistent ongoing sector enhancement
- Lack of commercialisation skills, knowledge, and experience
- Erroneous perception that MedTech is a small market employer.
- Competition from conventional engineering disciplines with faster productisation timelines.
- Lack of knowledge and awareness of career pathways, matched to the non-existence of a flexible array of courses to tailor/personalise the training to the individual or organisation's needs.

The image below demonstrates the most common phrases used throughout the survey responses in relation to barriers to upskilling of industry employees and new graduates.

Figure 6: Most common barriers to upskilling

Desktop audit of advertised MedTech industry positions

To gain an understanding of the skills and education levels required for those being employed across the Australian MedTech sector, an analysis of publicly available job opportunities was conducted over several months. This desktop audit included continuous and consistent reviews of Australian job advertisement websites, including Seek, LinkedIn, government websites, company websites, Jora, Pharmiweb, and the Engineering Career Network. With reviews undertaken from the 5th of May 2023 until the 23rd of August 2023, 114 MedTech-related job advertisements were found and analysed.

Once job roles were discovered, they were then mapped to eight skills groupings. These skills groups were identified and formulated based upon existing reports, consultations and the national survey conducted for this roadmap, with each focusing on key areas that have been identified as lacking in relation to the needs of the sector. These eight skills groups and their descriptions can be found below.

Skills gap	Description
Advanced manufacturing	Manufacturing expertise in high-tech/specialised devices
Project management, business and communication skills	Shortage of MTP-specific project managers to support start-ups and spin-offs, communication and collaboration
Clinical trials	Strategic design of clinical trials to address regulatory and payer needs, shortage of experienced CRAs and CTCs
Health data and cybersecurity	Management awareness and best practice, big data, design and use of AI, health informatics
Commercialisation and product development	Value chain, market needs, clinical context, securing funding, industry collaboration, reimbursement pathways
Regulatory affairs	Regulations, standards, health economics
Trades and technical skills	Manufacturing, trades, technicians
Additional technical skills	Bioinformatics (incl. genomics)

Figure 7: Skills grouping with descriptions

The following figure indicates the number of jobs advertised by skills grouping.

Figure 8: Jobs advertised mapped to the eight identified skills groups

Seven out of eight skills groups required applicants to have received a higher education qualification, with most circumstances requiring at least a Bachelor. Jobs that were mapped to trades and technical skills preferred applicants to hold a vocational education qualification.

Jobs and qualifications mapped to skills groupings

No. of job ads	Theme	Examples of job types	Qualifications required
39	Advanced manufacturing	Manufacturing & Research Technician Commissioning & Qualification Expert Manufacturing Manager Warehousing and Distribution Officer Machine Operator - Plastics Manufacturing	Bachelor Degree in Engineering: Chemical, Mechanical, Mechatronic, Optical Biomedical Process, Electrical Bachelor of Science, Life Science, Medical Laboratory Science Bachelor of Computer Science. No qualification required for Machine Operator – experience highly regarded
36	Project Management Business, communication Skills	Director, Regulatory Affairs Research & Development Engineer-Mechanical Clinical Project Manager Project Engineer – Medical & Scientific Equipment Associate Product Specialist	Bachelor of Engineering -Biomedical Bachelor of Engineering-Mechanical, Software, Biomedical Bachelor of Social Science Bachelor of Communications/Journalism Bachelor of Science/Health/Engineering/Nursing Bachelor of Life Sciences Bachelor of programming Bachelor of Project Management Postgraduate in Life Science Master or PHD in Bioinformatics/Biotechnology
12	Clinical Trials	Clinical Measurement Scientist Field Clinical Engineer Clinical Technologist CRA II (Clinical Research Associate) Senior Clinical Project Manager	Bachelor of Medical Laboratory Science, Bachelor of Healthcare Bachelor of Health Science Bachelor of Medical Technology Bachelor of Science Bachelor plus of Engineering (Optical, Biomedical, Process) Bachelor of Nursing Bachelor of Biomedical Experience in Allied Health is highly regarded
6	Health data and Cybersecurity	Digital Surgery Technical Specialist Full Stack Java Engineer Application Support Specialist (Technical) Engineering Data Support CRA II- SCRA (Clinical Research Associate)	Bachelor of Computer Science Bachelor of Health Science, Bachelor of Engineering (Software) Bachelor of Robotics Bachelor of Allied Science Bachelor plus of Science
9	Product Development	Manufacturing & Research Technician Director, Regulatory Affairs Process Engineer Research & Development Engineer – Mechanical Software Engineer	Bachelor of Medical Laboratory Science Bachelor of Science Bachelor of Engineering (Mechanical) Experience in programming, science, mechanical engineering
3	Commercialisation	Quality Assurance Engineer Product specialist	Bachelors in a relevant field

		Project Manager	
20	Trades & Technical skills	Electrical Engineer - Radiology Medical Devices Maintenance Fitter Fitter and Turner Service Technician Medical Line Repair Technician - Medical Technology	Mechanical Trade Certificate Certificate III in Engineering Diploma of Dental Technology Experience or Certificate in electromechanical, electrical engineering Certificate III in Laboratory Skills Victorian Certificate of Education High school diploma, or relevant experience.
25	Specialist Technical skills	Medical Laboratory Scientist Digital Surgery Technical Specialist Technical Officer - Biomedical Engineering Biomedical Engineer Field Service Engineer	Bachelor of Medical Laboratory Science Bachelor of healthcare Bachelor of Health Sciences Bachelor of Medical Technology Bachelor of Science Bachelor of Engineering (Biomedical, Mechanical, Metallurgical, Chemical, Electronics, Electrical, Mechatronics) Bachelor of Robotics Bachelor of Allied Science Bachelor of Computer Science, Bachelor of Data Science Bachelor of Machine Learning Bachelor of Artificial Intelligence Bachelor of Applied Mathematics PHD such as chemistry (organic and/or polymer, engineering MSc or PhD in bioinformatics, biotechnology, software engineering.

Across every skill grouping, the most common qualification required by job advertisements was found to be the Bachelor of Engineering; the only theme in which this qualification was not required was in the trades and technical skills theme. As expected, the trades and technical skills theme indicated that a Certificate or Diploma in Engineering was preferred across many advertisements. Science and health qualifications were also found to be in demand.

Throughout the analysis of publicly available job advertisements, the different streams requiring students with a Bachelor of Engineering included majors in:

- Mechanical
- Biomedical
- Mechatronics
- Chemical
- Optical
- Process
- Electrical
- Software
- Electronics
- Metallurgical.

Despite the analysis of job roles indicating that engineering is a highly sought after knowledge requirement for many MedTech roles across the supply chain, Australia has a relatively low number of engineering graduates in comparison to other countries. Whilst engineering graduates in Germany take up 24.2% of the national graduating class and Japanese engineering graduates comprise 18.5% of total graduates per year, only 8.2% of graduates in Australia graduate with an engineering degree.[22] Throughout the analysis of skills requirements indicated by each job advertisement, it was clear that many jobs that fell under the umbrella of product development skills also fell under project management and business skills. The doubling up of themes in a singular job can be seen across multiple MedTech jobs, including manufacturing and research technician roles, director roles, and research and development roles.

Desktop audit of current education and training offerings

Higher education

To gain a comprehensive understanding of the current education and training offerings being provided in relation to MedTech nationally, over 170 national higher education courses being offered in Australia have been analysed for this report. These courses were selected based upon their perceived relevance to the medical technologies sector, with courses chosen from major universities in each state and territory across Australia.

The team individually examined each of the 170 courses for alignment to the eight identified skill groupings of:

- Advanced manufacturing
- Project management and business/communication skills
- Clinical trials
- Health data and cyber security
- Regulatory affairs
- Product development and commercialisation
- Trades and technical skills; and
- Specialist technical skills.

This included searching through each publicly available courses identified within the project timeframe, as well as examining and mapping each unit that related to any of the eight themes. This process resulted in a comprehensive listing of courses that had clear alignment to the MedTech sector, as well as the evident educational gaps that currently exist within the education and training sector.

It is important to note that some courses dive much deeper into certain MedTech-specific topics, in comparison to others which may only lightly cover a relevant subject. Additionally, many courses offered by the same educational institutions often utilise the same units across different qualifications. Approximately 40 qualifications were removed altogether due to a perceived lack of direct relevance to the eight skills and training themes identified, which does not indicate that the course has no relevance whatsoever to the MedTech sector.

The mapping of qualifications for the higher education sector has been visually represented in Appendix A.

Analysis of research results

The detailed analysis of over 170 nationally available higher education courses resulted in the discovery of 128 courses with relevance to the eight skill groupings identified for the purposes of this report.

Analysis of the many higher education courses available across Australia revealed that whilst these courses do have relevance to varying subsectors and industries found within MedTech, no one specific course was found to focus on the specific nuances of the medical technologies sector.

Internship case study

Of the 30 courses identified by Swinburne University of Technology to have content that relates to MedTech, 24 courses (80%) have implemented a structured Work-Integrated Learning (WIL) component or work placement. Worth 50 to 100 credit points, these internships vary from course to course and can last from 6 to 12 months.

These qualifications do tend to provide graduates with a strong foundational knowledge of different sectors that have relevance to medical technologies. However, no course provides students with a deep and overarching understanding of the complex landscape, requirements, and key skills currently required across the sector. As reflected in this report's consultation and survey results, the needs of the sector at more than a basic, fundamental level are not currently being met by a qualification that specifically focuses purely on the MedTech industry. Therefore, this indicates a need for the development of a highly nuanced and targeted qualification in the near future.

One unit offered by the University of Technology Sydney – 91369 Biobusiness[23] – found within multiple courses provides participants with a strong understanding of the business aspects within the medical technologies sector. This unit covers innovation and entrepreneurship, career development and management, clinical trials management, quality control, and quality management. Similarly, the BME30001 MedTech Design and Innovation[24] unit offered by Swinburne University of Technology covers highly relevant information related to the MedTech sector. These units provide a strong foundation for what a MedTech-specific qualification may be able to build upon; however, these are single units provided as part of larger qualifications.

A comparative analysis to other courses found nationally and internationally, can be found later in this report, which detail where Australian higher education offerings could base potential MedTech-specific courses in the future. The detailed analysis of research results with relevance to the eight skill groupings can be found below.

Advanced manufacturing

Of the 128 higher education courses found to be relevant to the eight skill groupings, 40 courses were found to have some relevance to the advanced manufacturing sector. Most courses found to contain content pertinent to the advanced manufacturing sector were varying streams within a Bachelor of Engineering. These streams include robotics, mechatronics, electrical, electronic, mechanical, product design, biomedical, and biotechnology.

12 of these 40 qualifications include units that focus predominantly on selecting appropriate materials for the manufacturing process. 11 of the 40 qualifications were found to provide students with an understanding of CAD, CAE, and other cutting-edge technologies used throughout the advanced manufacturing process, including providing students with a foundational knowledge of Industry 4.0. Other topics covered include robotic systems, product design, sustainability, circuits and electronics, and bioinstrumentation.

Consultation and research indicated that the most in-demand skills requirements for graduates entering the MedTech workforce were knowledge of GMP and quality management systems, process design expertise, understanding regulatory requirements, and expertise in specialised devices. The analysis of relevant courses has highlighted that only five courses provided information on quality management systems, with an additional four focusing on quality control.

A relatively high number of courses provided information on process design, with research indicating that 12 of the 40 courses covered this topic. Despite higher education courses lacking information regarding GMP, a high number of short courses and micro-credentials were found to focus on content surrounding good manufacturing processes. More information on these short courses can be found later in this report.

Whilst a relatively high number of courses do provide vital information on advanced manufacturing, graduates require more targeted and relevant subject matter that relates more closely to the MedTech sector. Additionally, the key areas in which the MedTech sector currently faces skills shortages in are underrepresented, which is indicative of the need for specialised courseware that focus on advanced manufacturing.

Project management, professional and communication skills

44 out of 128 higher education qualifications provided information pertaining to project management skills, as well as the development of professional and communication skills.

Many units relating to project management provide participants with a general understanding of the skills required when undertaking project management responsibilities. This includes solving challenges, planning, research, executing projects, and understanding the requirements of real-world projects. Other topics covered include considering issues throughout a project's lifecycle, understanding responsibilities, and working with organisations from the commencement phase of a project through to its conclusion.

Of the 40 courses with units that relate to project management, 23 provided targeted information surrounding communication and professional business skills. This includes facilitating an environment that supports teamwork, solving complex problems, maintaining professionalism, mitigating risks, working in multi-disciplinary teams, utilising communication skills, and undertaking group projects.

As mentioned earlier in this report, whilst units provide vital information relating to responsible and professional project management techniques, they lack specific information regarding the the medical technologies sector. Consultation and research have indicated that this is a vital skills requirement to ensure that project managers with MedTech-specific backgrounds are able to support project, start-ups, and spin-offs; therefore, future development of MedTech-specific project management skills through specialised qualifications is required.

Clinical trials

Higher education courses that provide information pertaining to clinical trials was found to be the least prevalent throughout the research into relevant qualifications, with only 12 out of 128 courses providing information on the subject. Of these 12 courses, eight were offered by the University of Technology Sydney through the same unit – 60002 Clinical Trials: Evidence and Design. Another unit offered by the University of Technology Sydney – 91705 Medical Devices and Diagnostics – teaches students how to run clinical trials of medical devices and the issues relating to the implementation of trials.

The clinical trials units found in these courses provided information relating to managing trials, understanding different elements of clinical trials, the factors that can influence the quality of evidence, how to design a research study, and issues relating to clinical trials.

With consultation and research indicating that the strategic design of clinical trials is a key skills requirement within the MedTech sector, it is evident that this is reflected in the discovery of a relatively low number of higher education courses that address the subject. It is also worth noting that many higher education institutions do offer the capacity for students and industry to undertake clinical trials. However, this study focused on which units within qualifications provide students with the foundational knowledge of how to implement clinical trials and meet regulatory needs.

Health data and cybersecurity

Higher education qualifications relating to health data and cybersecurity were highly represented across the 128 courses examined, with 72 courses providing information on the subject. This discovery indicates that the implementation of course content pertaining to health data, big data, AI, and health informatics is prevalent across MedTech-related higher education courses.

Science-related courses often provide students with a foundational knowledge of data, including how it is collected and how to draw scientific conclusions from it. Additionally, many data-related units within these qualifications examine how computer-based tools can be utilised to support the data collection and control process, as well as how systems programming can be implemented.

Through the analysis of this research, these skills gaps are the most highly represented subject throughout the 128 courses, with content appearing to provide the highest relevance to the medical technologies sector. This is likely due to the highly transferrable nature of skills in understanding emerging statistical analysis techniques, including artificial intelligence, big data and IT. Whilst only ten courses contain units that relate directly to artificial intelligence, the subject matter information provided indicates that they are highly relevant to medical technologies, with these units covering the use of AI for future engineering technologies and similar technology-related concepts.

Conversely, only four of the 72 courses identified provide information pertaining to cybersecurity; furthermore, these courses only provide a basic overview of the uses and techniques involved in cybersecurity, and do not provide specific reference to the MedTech sector.

Regulations and standards

With a lack of regulatory framework awareness and knowledge being prevalent across the sector according to consultation and surveys, only 14 of 128 courses touch on the highly complex subject matter. When referring to regulatory affairs, these 14 courses similarly cover content such as standards, the design and manufacturing environment, regulations, risk management, compliance, and frameworks.

Despite the low number of higher education qualifications touching on regulatory affairs, the trend in this space appears to be similar to GMP; there are several short courses available that do examine this subject matter. Evidently, in order to reflect the vital requirements of the sector, the development of MedTech-specific qualifications would be beneficial should they provide targeted information on the industry's complex regulatory environment.

Product development and commercialisation

Of the 128 courses examined throughout the research process, 17 courses provided specific information relating to product development and commercialisation. The discovery of relevant courses was mapped to the industry requirements indicated by consultation and reporting, including commercialisation, understanding market needs, industry collaboration, securing funding and reimbursement.

Nine of these 17 qualifications indicated that they related most to product development through fostering innovation, including idea generation, and overcoming innovation challenges. Five of these 17 courses provide information pertaining to intellectual property and commercialisation, including supporting students to understand laws and ethics surrounding intellectual property and its commercialisation as a business asset for new businesses, as well as a source of income for existing enterprises.

As a vital step in the product development process, eight courses were found to include information surrounding concept design and development for technological prototypes. Four courses include information surrounding entrepreneurship, which has been highlighted through consultation as a highly important skill for the future growth of the MedTech sector in Australia.

Trades and technical skills

Despite trades and technical skills typically relating more to vocational education and training qualifications, 13 courses provided information pertaining to trades and technical skills. Much of this information was found to cross over with the advanced manufacturing skill gap, with manufacturing featuring heavily throughout trades-related units. This includes the use of materials, machinery, and systems, as well as design and other technical skills that are required throughout the MedTech industry.

Specialist technical skills

With the medical technologies industry being highly diverse and innovative in its nature, it is difficult to identify all specialist technical skills gaps that exist across the sector. Consultation and research indicated that specialist technical skills relating to informatics and genomics are a vital area for growth in the MedTech sector. Other specialist technical skills discovered throughout the analysis of higher education qualifications include diverse and highly specialised subjects such as molecular science, medical imaging, neuroscience, laboratory techniques, renewable energy, thermos fluid systems, sustainable design, and diagnostics.

Of the 128 higher education courses examined, 42 courses provided information on specialist technical skills; 24 contained content that pertained specifically to bioinformatics and genomics.

Additional courseware

BioDesign Innovation

Whilst many higher education courses have been found to lack total relevancy to the nuances and specifics of the Australian MedTech sector, the University of Melbourne currently offers a course that supports participants to understand the requirements of the existing MedTech landscape. BioDesign Innovation (BMEN90030)[25] is a year-long course that gives participants the opportunity to experience a real-world course relating to the creation successful medical devices.

Many of the eight skills gaps identified throughout the research and analysis of the MedTech sector are addressed throughout this course, with participants studying clinical needs, concept creation, commercialisation, product development, communication, teamwork, and technical skills. Additionally, students gain vital skills in experiencing the industry through practical training.

Whilst this course is not a full higher education qualification, it does provide a comprehensive basis for the development of specialised MedTech-related courses and units. By demonstrating the complex and diverse requirements to meet the need of adequately prepared graduates, similar qualifications could build upon the subject matter and structure and be guided by a competency framework for the future needs of the sector.

Comparative analysis – Irish MedTech Skillnet

Whilst it is important to note that international medical technologies requirements are different to those prevalent across the Australian MedTech landscape, it is pertinent to examine the courses offered by the Irish MedTech Skillnet[26]. This learning network provides education and training for companies that are associated with the medical technologies and engineering sectors, with training ranging from short courses to higher education courses.

Desktop research into the Irish MedTech Skillnet indicates that some higher education courses have been developed with full relevancy to the MedTech sector. The Masters in Medical Technology Regulatory Affairs[27] is a 2-year course that explores the highly complex nature of the

regulations across the MedTech sector, provided specifically to enable regulatory affairs personnel in MedTech to work within the MedTech regulatory environment.

The Certificate in Management for the MedTech and Engineering Sector[28] is a one-year course that supports employees who aspire to become managers within the sector through the provision of skills-based training. This includes understanding managerial principles and theories in relation to the MedTech sector, understanding the relevant MedTech Competency Framework, and using communication skills to work in a team environment.

The introduction of similar-type courseware would be highly beneficial to Australian MedTech sector. The development of similar higher education courses that relate to the MedTech sector across Australia would be highly beneficial, with key skills gaps being identified and filled through the provision of targeted content.

Comparative analysis –Drug Design and Development

Throughout the qualification discovery phase, it was found that a unit offered by the University of Queensland – Drug Design and Development (BIOT3002)[29] – has a model that is structured similarly to what is required for medical technologies. Delivered as part of higher education courses such as the Bachelor of Biomedical Sciences, this unit focuses on identifying compounds for drug development, as well as the process of selecting compounds and developing them into drug products.

Whilst not specifically relating to the MedTech sector, it is worth noting that this unit provides students with a vital and substantial understanding of the drug production process. Therefore, its structure could provide a useful model for a similar unit for the MedTech sector to support those taking medical devices from the research and development stage to the market.

As this report has identified, the gaps that exist in the higher education training offerings currently available across Australia in relation to medical devices predominantly relate to research, trialling, manufacturing, and understanding regulatory bodies. The unit Drug Design and Development (BIOT3002) covers many of these important phases, including discovery, design, development, patenting, intellectual property, product formulation, clinical trials, testing, the role of pharmaceutical companies, and the role of regulatory bodies.

The content and structure of this unit could potentially provide a strong foundation and framework for the development of similar training offerings that are based upon MedTech, given the comprehensive overview of the research, development and production landscape.

Jobs advertised & higher education qualifications

Jobs are displayed above the line for each section of the value chain, with higher education qualifications displayed below. This chart is based upon the research conducted by the discovery team, detailed in this report.

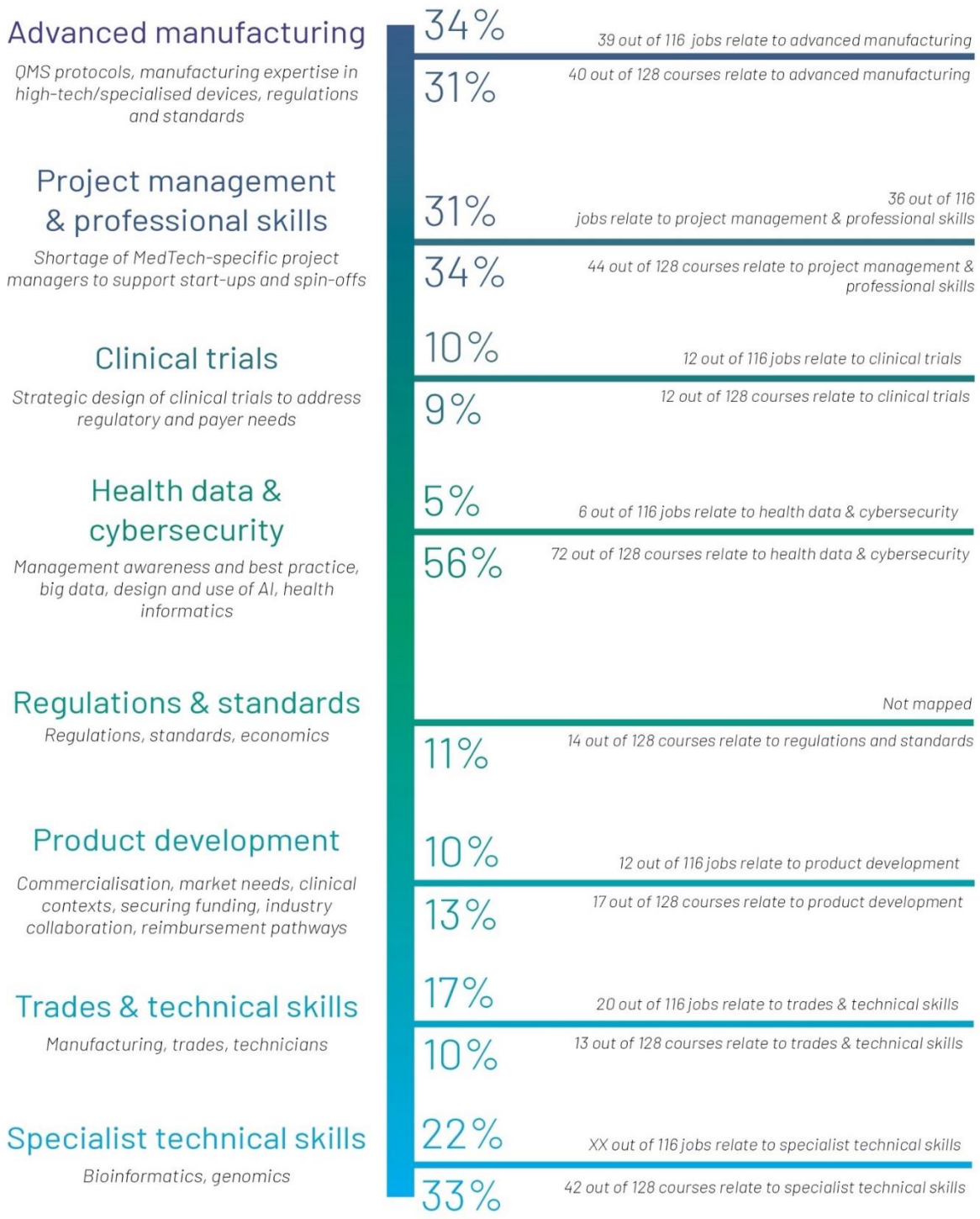

Figure 9: Job roles advertised across the MedTech value chain

Vocational education and training (VET)

The discovery team focused on 11 identified National VET and Victorian accredited courses that offer content relevant to MedTech sector skill requirements. These courses, belonging to four training packages, are listed below.

Laboratory operations training package

- MSL30122 Cert III in Laboratory Techniques
- MSL40118 Cert IV in Laboratory Techniques
- MSL50118 Diploma of Laboratory Technology
- MSL60122 Advanced Diploma of Laboratory Technology
- MSL60122 Advance Diploma of Laboratory Management

Manufacturing and engineering training package

- MEM20105 Certificate II in Engineering
- MEM30219 Certificate III in Engineering - Mechanical Trade
- MEM50119 Diploma of Engineering – Advanced Trade
- MEM50622 Diploma of Engineering-Prototyping
- MEM60122 Advanced Diploma of Engineering

Electrotechnology training package

- UEE62220 Advanced Diploma of Electrical - Engineering -
- UEE61720 Advanced Diploma of Engineering Technology - Electronics

Health training package

- HLT37415 Certificate III in Pathology Assistance
- HLT33115 Certificate III in Health Service Assistance
- HLT54121 Diploma of Nursing
- HLT55118 Diploma of Dental Technology
- HLT65015 Advanced Diploma of Dental Prosthetics

The mapping of vocational education and training qualifications to skill groupings of advanced manufacturing, project management, clinical trials, health economy, product development and trades and technical skills has been visually represented in Appendix B. Please note that these have been mapped to topic criteria listed within the units and may not reflect the full suite of skills training offered throughout each qualification.

Analysis of research results

VET is a competency-based pedagogy where successful learning outcomes are achieved through the application of knowledge and the performance of industry skills. All VET courses encompass and implement a work experience component, where students have the opportunity to practice their skills. Traditionally, because of this, graduates are more job ready and prepared to hit the ground running when entering the workforce. This provides a stark comparison to feedback provided on higher education graduates, who typically undertake a heavily weighted theoretical knowledge-based curriculum and often lack hands on skills.

There were 20 VET Trades courses identified in the job search analysis. These traditional trades jobs were not highlighted as a skills shortage in the consultations and desk top audits. The qualifications that were identified in the VET mapping may be more relatable to skills gaps in manufacturing and design in comparison to higher education qualifications.

This includes the Diploma of Dental Technology, as well as the prevalent use of computer aided design and the construction of appliances using a range of materials, which can be transferable across to some MedTech devices. Pathology assistants can perform calibration and maintain clean room environments, whilst laboratory operations graduates offer more clinical skills and VET trained engineers have introductory skills for MedTech manufacturing.

During the consultation stage of the roadmap study, a shortage of mechanical engineers was indicated twice, and nurses were cited as being utilised as field workers and in clinical trials. In the VET sector, Jobs and Skills Councils[30] provide leadership to address skills and workforce challenges by working with industry to identify ways to address training package development. Collaboration with the relevant Jobs and Skills Councils may provide opportunity for contextualising and developing VET courses targeted to the MedTech industry, resulting in a valuable pipeline for MedTech into the future.

Lowered entry scores: students channelled from VE into HE

Consultation with a nursing and health education specialist at Swinburne University of Technology revealed a significant issue facing the vocational education and medical technologies sectors as a result of the COVID-19 pandemic. Following restricted and reduced student numbers during the pandemic, many higher education degrees (including those relating to medical technologies) have lowered their entry score requirements for enrolment. This has resulted in students – who would have likely enrolled in vocational education courses prior to the COVID-19 pandemic – being offered the opportunity to undertake higher education courses relating to the medical technologies industry.

The issue that arises from this opportunity, however, is the now prevalent increase in numbers of students who are dropping out of these higher education degrees due to the additional workload and other difficulties. This is causing a flow-on effect throughout the vocational education sector, with increased difficulties arising from the inability to entice these students back into the vocational education and training space.

As this poses a significant challenge to the medical technologies pipeline for the near future, it is evident that more opportunities for development are provided to those undertaking vocational education courses. These development opportunities would strengthen the ability to entice these students to undertake vocational education courses should they be interested in pursuing a career in medical technologies, without the current relatively essential requirement of undertaking a higher education degree.

Short courses and micro credentials

In the discovery process of national education and training offerings for the MedTech sector, the team also found 64 short courses from a variety of publicly available international sources. As most short courses do, these short courses focus predominantly on highly specialised and specific areas of the MedTech sector and are offered by different companies internationally. These areas of expertise include trades and technical skills, digital data and cybersecurity, project management and leadership, regulatory requirements, and more.

Desk top research undertaken for the study identified short courses relating to the following MedTech areas:

- 15 courses focus on good manufacturing processes (GMP) for a range of participants, including managerial roles. These short courses provide information on a variety of sub-topics, including understanding why people don't follow GMP, how to implement GMP in the workplace, how to understand GMP data and more.
- 16 courses provide information on quality management systems (QMS) and understanding how to meet regulatory requirements, how to demonstrate organisational commitment to quality, and applying fundamental risk management activities.
- 8 courses focus on artificial intelligence, industry 4.0, big data, software training, and cloud computing for the MedTech sector.
- 7 courses provide participants with a general insight into the MedTech sector, such as an overview of the sector's perceived growth and how the sector operates.
- 7 courses highlight clinical functionality and relevant regulations throughout the sector.
- 3 courses focus predominantly on risk management, including how MedTech businesses can improve their risk management and decision-making processes.
- 2 courses provide specialist information on project management within the MedTech industry
- 1 course provides information on the medical device commercialisation process.
- 5 courses are focused on other specific areas within the sector.

Despite a range of short courses available nationally, many industry stakeholders expressed difficulty in identifying suitable training opportunities that address many of the key skill areas covered in these course offerings.

A full list of the 64 short courses identified can be found in Appendix C.

Key findings

The Australian MedTech industry spans diverse and highly technical areas that encompass research and development, clinical trials, manufacturing, commercialisation and IP, sales and marketing, health, and allied sector implementation. These skill groupings cross over with other sectors which adds further complexity and the need for a nuanced approach to navigating sector workforce skills and education requirements.

MedTech Competency Framework

The establishment of a MedTech Competency Framework that defines key competencies required to work within the sector would support organisations to establish standardised skill sets, attributes and behaviours required, valued, and recognised in specific occupational roles. A framework would provide consistency across human resource practices such as developing role definitions and remuneration benchmarking and inform future course development.

Education and Training for MedTech

To better address skills requirements of the MedTech industry, existing qualifications need to include a greater level of MedTech specialised streams, units, and content across the Australian Qualifications Framework for both VET and higher education courses. Courses need to better align with industry standards, practices, and tools such as industry recognised software and digital platforms.

Key skills and knowledge areas required for greater alignment with industry requirements include:

- Commercialisation and IP
- Regulatory frameworks and quality management systems
- Project management and business skills
- End-to-end product design process
- Advanced manufacturing and applied technologies
- Digital and data management including cyber security.

Micro-units and micro-credentials form an important part of upskilling existing workers and graduates through just-in-time learning options and should be recognised as being complimentary to formal qualifications, certifications and work integrated learning experiences such as internships and work placements. Scaffolding learning options to competencies, job roles and responsibility areas within the sector would offer a range of learning opportunities tailored to the various specialisations required across the expansive MedTech sector.

Work Integrated Learning

While VET courses have applied learning embedded and work placement opportunities, higher education courses tend to be more knowledge based and practical skills application opportunities are less common or vary greatly across institutions and courses.

Feedback from industry suggests longer internships or industry placements would be welcomed by MedTech sector employers, however this would require an increased commitment from organisations to invest in the development of their future talent pipeline of job ready graduates for a growing MedTech sector.

Value of vocational education and training

The role of vocational education and training is currently not being fully recognised or utilised across the MedTech sector. The design of VET curriculum is informed and guided by criteria of training packages, as well as ongoing structured industry consultation that embeds industry requirements into the applied learning model of VET curriculum. Working with the VET sector a unit for MedTech regulatory frameworks and QMS could be developed to form part of engineer and management diplomas as well as other MedTech specific but non-technical subjects.

The experience gap for undergraduate students could be filled by introducing a higher apprenticeship model where a VET diploma is extended up to a university degree, through a vocational pathway. This could, for example, include Diploma of Management units which could be included within an engineering degree for future leaders, or support the acquisition of skills through an applied VET engineering qualification into an engineering degree.

Recommendations

To meet the immediate and long-term needs of the MedTech industry, a number of recommendations are outlined below that involve collaboration between all stakeholders including governments, regulators, industry and tertiary institutions.

1. A National MedTech Competency Framework would inform industry and education institutions of the job roles, functions and standards required for working in the MedTech industry.
2. Higher education courses that address advanced manufacturing and engineering to include offerings of specialised content involving GMP, QMS and MedTech related regulatory frameworks.
3. A higher education subject to address the design and development of MedTech devices including the phases of discovery, design, development, patenting, commercialisation, intellectual property, advanced manufacturing sales and marketing to the end user.
4. Exploration of VET courses to further identify transferrable skills that could be developed further into MedTech skill sets and provide pathways into the MedTech industry.
5. Industry, university and VET collaboration to develop sustainable skills and training offerings for the MedTech industry which will lead to industry-led units and content.
6. Utilise existing platforms such as Wilam.com to build MedTech sector collaboration and consultation by sharing collective insights, information and resources for the MedTech industry.

The MedTech industry is undergoing a significant developmental stage where new ways of thinking and doing are vital for its success. Training and education that keeps abreast of regulatory frameworks and standards, quality management systems, intellectual property, commercialisation and competitive markets, will support and enhance the substantial life sustaining work that MedTech delivers.

Developing targeted education and training offerings that enable and inspire a skilled and globally competitive Australian workforce spanning the MedTech value chain will help to drive the growth of the burgeoning MedTech ecosystem.

Appendices

Appendix A: Higher education qualifications mapped to skills groupings

No.	Qualification	Adv. Man.	Proj. mgmt.	Clinical trials	Hlth. data	Reg. affairs	Prod. devel.	Trades	Spec. tech.
1	BEng (Honours) (Biomedical)								
2	MEng (Research)								
3	BICT								
4	BICT - Software Technology								
5	Master of Information Technology								
6	Graduate Diploma of Information Technology								
7	BHSc (Biomedical Science)								
8	MSc (Biotechnology)								
9	Graduate Diploma of Science (Biotechnology)								
10	BSc								
11	BEng/BSc								
12	BSc/Bachelor of Applied Innovation								
13	BHSc/Bachelor of Media and Communication								
14	BSc (Professional) (Biochemistry)								
15	BSc (Biotechnology)								
16	BSc – Biochemistry								
17	BHSc (Clinical Technologies)								
18	BEng (Honours) (Robotics and Mechatronics)								
19	BHSc (Prof.) (Public Hlth & Hlth Promotion)								
20	BHSc/Bachelor of Business								
21	BEng (Honours) (Mechanical)								
22	BDSc								
23	BCompSc								
24	BEng (Honours) (Product Design)								
25	BEng (Honours) (Mechanical Engineering)								
26	BEng (Honours) (Electrical & Electronic Eng)								
27	BEng (Honours) (Software Engineering)								
28	BEng (Honours) (Biomedical Engineering)								
29	BBioMed (Biotechnology)								
30	BBioMed (Biomedical Engineering Systems)								
31	BSc (Mechanical Engineering Systems)								
32	BDes (Computing and Software Systems)								
33	BBioMed (Pathology)								
34	MMed								
35	BBioMedSc (Laboratory Medicine)								
36	BMedSc								
37	Bachelor of Molecular Biotechnology								
38	BSc (Biotechnology)								
39	BAdvSc (Quantum Technology)								
40	BDes (Product Design)								
41	BEng (Honours)/BMedSc								
42	B. of Creative Intelligence and Innovation								
43	BMedSc (Honours)								
44	BSc (Honours) (Medical Science and Biotech)								
45	BDes (Honours)								
46	BEng (Electronic)								
47	BEng (Mechanical)								
48	Bachelor of Artificial Intelligence								
49	Master of Medical Biotechnology								
50	Master of Medical Biotechnology (Extension)								
51	MPhil in Medical Biotechnology								
52	Master of Medical Science Leadership								
53	MSc								
54	MSc (Extension)								
55	BMedSc (Genomics and Medical Informatics)								
56	BIT (Artificial Intelligence)								

No.	Qualification	Adv. Man.	Proj. mgmt.	Clinical trials	Hlth. data	Reg. affairs	Prod. Devel.	Trades	Spec. tech.
65	MEng (Bioengineering)								
66	Masters of Biotechnology								
67	B. of Medical Laboratory Science								
68	BBioMedSc								
69	BAdvSc (Honours)								
70	BSc								
71	BSc (Honours)								
72	Master of Health Economics								
73	Master of Magnetic Resonance Tech.								
74	Graduate Certificate in Bioinformatics								
75	BEng (Honours) (Medical)								
76	Bachelor of Medical Imaging (Hnrs)								
77	BBioMedSc								
78	BBioMedSc								
79	BAdvMedSc (Honours)								
80	Bachelor of Laboratory Medicine								
81	BSc								
82	BBioMedSc								
83	BSc (Clinical Laboratory Science)								
84	BSc (Biomedical Science)								
85	Bachelor of Laboratory Medicine								
86	BEng (Hnrs) (Biomedical Engineering)								
87	Masters of Biotechnology								
88	Masters of Biomedical Science								
89	B. Medical Laboratory Science (Hnrs)								
90	BBioMedSc								
91	BSc (Data Science)								
92	Bachelor of Laboratory Medicine								
93	Bachelor of Medical Research								
94	Bachelor of Medical Science								
95	B. of Science (Biomedical Science)								
96	B. Medical Laboratory Science (Hnrs)								
97	Master of Medical Laboratory Science								
98	BSc (Biotechnology)								
99	GrDip in Medical Biotech								
100	GrDip in Medical Laboratory Science								
101	GrDip. Good Manufacturing Practice								
102	GrCert in Medical Biotechnology								
103	GrCert in Medical Laboratory Science								
104	GrCert in Medical Science Innovation								
105	BEng (Honours) (Biomedical)								
106	BEng (Hnrs) (Biomedical Engineering)								
107	BioDesign Innovation								
108	GrCrt in Hlth Informatics and DigHlth								
109	BSc (Mechanical Eng Systems)								
110	Master of Mechanical Engineering								
111	BDes (Mechanical Engineering Systems								
112	MSc (Bioinformatics)								
113	BSc (Biotechnology)								
114	BSc (Data Science)								
115	MDSc								
116	GrCrt in Data Science								
117	AssocDeg in Digital Technology (Adv Manufacturing)								
118	AssocDeg in Engineering Technology								
119	BEng (Adv Man and Mechatronics) (Honours)								
120	GrCrt in Mechatronics Engineering								

Appendix B: Vocational education qualifications mapped to skills groupings

Name of course	Institution	Adv. man	Proj. Mgmt.	Clin. trials	Hlth. data	Reg affairs	Prod devel.	Trades	Spec. tech.
MSL30122 Cert III in Laboratory Skills	34 RTO Nationally deliver this course								
MSL40122 Cert IV in Laboratory Techniques	24 RTO Nationally deliver this course								
MSL50122 Diploma of Laboratory Technology	19 RTO Nationally deliver this course								
MSL60122 Advanced Diploma of Laboratory Management	4 RTO Nationally deliver this course								
MEM20105 Certificate II in Engineering	64 RTO Nationally deliver this course								
MEM30219 Certificate III in Engineering - Mechanical Trade	61 RTO Nationally deliver this course								
MEM50119 Diploma of Engineering – Advanced Trade	17 RTO Nationally deliver this course								
MEM50622 Diploma of Engineering – Prototyping	0 RTO Nationally deliver this course								
MEM60122 Advanced Diploma of Engineering	12 RTO Nationally deliver this course								
UEE62220 Advanced Diploma of Electrical - Engineering	3 RTO Nationally deliver this course								
UEE61720 Advanced Diploma of Engineering Technology - Electronics	0 RTO Nationally deliver this course								
HLT37415 Certificate III in Pathology Assistance	9 RTO Nationally deliver this course								
HLT33115 Certificate III in Health Service Assistance	103 RTO Nationally deliver this course								
HLT54121 Diploma of Nursing	46 RTO Nationally deliver this course								
HLT55118 Diploma of Dental Technology	13 RTO Nationally deliver this course								
HLT65015 Advanced Diploma of Dental Prosthetics	2 RTO Nationally deliver this course								

Appendix C: List of available short courses

Organisation	Name of short course	Weblink
BSI	Intro ISO 13485	https://www.bsigroup.com/en-AU/Medical-Devices/training/Introduction-to-ISO-13485/
	ISO 13485: Senior Management Briefing	https://www.bsigroup.com/en-AU/Medical-Devices/training/ISO-134852016-Senior-Management-Briefing/
	ISO 13485: Clause by Clause	https://www.bsigroup.com/en-AU/Medical-Devices/training/ISO-13485-Clause-by-Clause/
	Medical Device Single Audit Programme (MDSAP) Fundamentals and Readiness	https://www.bsigroup.com/en-AU/Medical-Devices/training/Medical-Device-Single-Audit-Programme-MDSAP-Fundamentals-and-Readiness/
	ISO 14971 Risk Management for Medical Devices: Requirements training	https://www.bsigroup.com/en-AU/Medical-Devices/training/iso-14971-2019-risk-management-for-medical-devices/
	Clinical Evaluation for Medical Devices	https://www.bsigroup.com/en-AU/Medical-Devices/training/Clinical-evaluation-for-Medical-devices/
	Introduction to Medical Device Software Training	https://www.bsigroup.com/en-AU/medical-devices/training/introduction-to-medical-device-software-training/
UNSW SYDNEY	Evaluating Digital Health for Impact	https://shortcourses.health.unsw.edu.au/courses/digital-health
	Project Management Within Healthcare	https://shortcourses.health.unsw.edu.au/courses/project-management-within-healthcare-july-2023
JEM MED ACADEMY	Professional Medical Device Industry	https://academy.jemmed.com.au/course/medical-rep
MTAA	Code of Practice Training course	https://www.mtaa.org.au/course-catalogue
FUTURE LEARN	AI and Big Data in Global Health Improvement	https://www.futurelearn.com/courses/ai-and-big-data-global-health-improvement
	Application of Digital Health Interventions	https://www.futurelearn.com/courses/consciousness
MEDTECH MASTER	MedTech Evolution General Practice - Clinical	https://www.medtechmaster.com/lms/elearning/productdetail.php?id=58
	MedTech Evolution General Practice - Practice Manager	https://www.medtechmaster.com/lms/elearning/productdetail.php?id=59
	Manage My Health	https://www.medtechmaster.com/lms/elearning/productdetail.php?id=29
	Allied Health Clinical	https://www.medtechmaster.com/lms/elearning/productdetail.php?id=48
COURSERA	Pharmaceutical and Medical Device Innovations	https://www.coursera.org/learn/pharma-medical-device-innovations#instructors
	Medical Technology and Evaluation	https://www.coursera.org/learn/healthcare-medical-technology#enroll
SEER PHARMA	Good (Quality Control) Laboratory Practices (G(QC)LP / GQCLP)	https://www.seerpharma.com/services/qa-and-gmp-training/on-site
	Process Development for Therapeutics	https://www.seerpharma.com/services/qa-and-gmp-training/on-site
	Behavioural GMP - Good Manufacturing Practice	https://www.seerpharma.com/services/qa-and-gmp-training/on-site
	Product Quality Reviews	https://www.seerpharma.com/services/qa-and-gmp-training/on-site
	Supply Chain Management	https://www.seerpharma.com/services/qa-and-gmp-training/on-site
	Quality Risk Management: Process Risk Assessment	https://www.seerpharma.com/services/qa-and-gmp-training/on-site
	Risk Assessment : Quality and compliance	https://www.seerpharma.com/services/qa-and-gmp-training/on-site
	Cloud Computing for Life Sciences	https://www.seerpharma.com/services/qa-and-gmp-training/on-site
	GMP - What you need to know	https://www.seerpharma.com/services/qa-and-gmp-training/on-site
	Supplier Quality Assurance (QA) - A Strategic Approach	https://www.seerpharma.com/services/qa-and-gmp-training/on-site
	Internal Audits - A Key to your quality system	https://www.seerpharma.com/services/qa-and-gmp-training/on-site

	Computing System Validation	https://www.seerpharma.com/services/qa-and-gmp-training/on-site
	Post Market Monitoring and Pharmacovigilance	https://www.seerpharma.com/services/qa-and-gmp-training/on-site
	Validation - A Roadmap to getting it right first time	https://www.seerpharma.com/services/qa-and-gmp-training/on-site
	ISO 13485: A Practical Approach to QMS for Medical Devices (2 days)	https://www.seerpharma.com/services/qa-and-gmp-training/on-site
	ISO 13485: A Practical Approach to QMS for Medical Devices (4 days)	https://www.seerpharma.com/services/qa-and-gmp-training/on-site
	Good Aseptic Practices (GAP)	https://www.seerpharma.com/services/qa-and-gmp-training/on-site
	Data Integrity (DI) – Identify and Address Your Vulnerabilities	https://www.seerpharma.com/services/qa-and-gmp-training/on-site
	Good Warehouse Practice	https://www.seerpharma.com/services/qa-and-gmp-training/on-site
	Good Writing Practices for Efficiency and Error Proofing	https://www.seerpharma.com/services/qa-and-gmp-training/on-site
	Annex 1 Changes (PIC/S Guide to GMP) - Manufacture of Sterile Medicinal Products	https://www.seerpharma.com/services/qa-and-gmp-training/on-site
	GMPs for Tissue Banks	https://www.seerpharma.com/services/qa-and-gmp-training/on-site
	Out of Specification (OOS) Handling	https://www.seerpharma.com/services/qa-and-gmp-training/on-site
	Cleaning Validation	https://www.seerpharma.com/services/qa-and-gmp-training/on-site
	GMP for Engineering	https://www.seerpharma.com/services/qa-and-gmp-training/on-site
	Contamination Control	https://www.seerpharma.com/services/qa-and-gmp-training/on-site
	How to Prepare for an Inspection / Audit	https://www.seerpharma.com/services/qa-and-gmp-training/on-site
	MTP 4.0 - Industry 4.0 for MedTech, Biotech & Pharma	https://www.seerpharma.com/services/qa-and-gmp-training/on-site
	ISO 14971 - Risk Management for Medical Devices	https://www.seerpharma.com/services/qa-and-gmp-training/on-site
BIOTECH COMMERCIALISATION SKILLS	Medical Research - Creating Real Impact	https://biotechcommercialisationskills.com.au/events/
ARCS AUSTRALIA *ARCS AUSTRALIA* *ARCS AUSTRALIA* *ARCS AUSTRALIA* *ARCS AUSTRALIA* *ARCS AUSTRALIA* *ARCS AUSTRALIA* *ARCS AUSTRALIA* *ARCS AUSTRALIA*	Interest Area Clinical Research	https://www.arcs.com.au/eventdetails/16680/interest-area-clinical-research-cross-functional-covering-investigational-site-cro-and-sponsors
	The importance of Critical Thinking in Regulatory Intelligence	https://www.arcs.com.au/eventdetails/16681/the-importance-of-critical-thinking-in-regulatory-intelligence
	Approaches to Clinical Evidence for Medical Devices	https://www.arcs.com.au/eventdetails/19333/approaches-to-clinical-evidence-for-medical-devices
	Effective communication and negotiating skills for CRAs	https://www.arcs.com.au/eventdetails/16706/effective-communication-and-negotiating-skills-for-cras
	Introduction to Regulatory Affairs of Medical Devices	https://www.arcs.com.au/eventdetails/15735/introduction-to-regulatory-affairs-of-medical-devices
	Overview of the MTP sector	https://www.arcs.com.au/career-development/pathways/
	Introduction to regulations of In Vitro Diagnostic Medical Devices	https://www.arcs.com.au/career-development/pathways/
	Project Management Essentials	https://www.arcs.com.au/career-development/pathways/
	Overview of the Medical Technology and Pharmaceutical Sector	https://www.arcs.com.au/career-development/pathways/
	Essential Documents and Good Documentation Practice	https://www.arcs.com.au/career-development/pathways/

Appendix D: List of job roles advertised

Product specialist	Project Manager	Entry Level Clinical Specialist
Associate Clinical Specialist	Associate Product Specialist	Warehousing and Distribution officer (Medical Devices)
Full Stack Java Engineer	Medical Devices Product Specialist	Maintenance Fitter
Application Support Specialist (Technical)	Critical Care Sales Specialist	Fitter and Turner
Clinical Project Manager	Front End Vue Developer	Warehouse Operator - Mechanical Device
Quality Assurance Engineer	Team Leader Laboratory Technician	Mechanical Device Assembly
Advocacy and Communications Manager	Pathology Laboratory Assistant/Technician	Dental Technician
Clinical Measurement Scientist	Line Repair Technician – Medical Technology	Operations Engineer – Manufacturing
Medical Laboratory Scientist	Field Service Engineer	Machine Operator – Plastics Manufacturing
Clinical Technologist	Project Engineer – Medical & Scientific Equipment	Manufacturing & Research Technician
Manufacturing Manager	Clinical Account Specialist - Peripheral Vascular Devices	Technical Officer – Biomedical Engineering
CSIRO Postdoctoral Fellowship in AI Driven Polymer Synthesis	Sales Representative - Medical Devices	Service Technician, Medical
Entry Level Warehouse Team Member (Medical Devices)	Software Quality Engineer - Medical Devices	Medical Laboratory Scientist
Software Engineer	Production Technician	Process Engineer
Digital Surgery Technical Specialist	Medical Device Assembly - Manufacturing	Project Manager
Field Clinical Engineer	Assembler - Hiring in world class medical device manufacturer	Production-Associate-Cleanroom and Processing areas.
Advisor, Medical Equipment Technology	Software Development Test Lead	Production Worker - Advanced Manufacturing
Assistant Director (Medical Imaging Technology)	Product Tester - Wearable Medical Smart Device	Production Operators
Medical Device Engineer	Medical Device Loan Kit Coordinator	Production Technician - Precision Manufacturing
Electrical Engineer - Radiology Medical Devices	Clinical Territory Manager - Medical Solutions Division	Production Assembly Team Member
Quality Assurance Manager	Technical Support - Medical Equipment	Sheet Metal Trades Assistant
Field Service Engineer and Systems Network Specialist	Senior Quality Assurance Associate - Medical Devices	Production Operator (Electronic Assembler)

Consulting Applications Consultant	Research & Development Engineer - Mechanical	Field Service Engineer
Senior Clinical Project Manager	Biomedical Engineer	Technical Support Engineer - Medical Devices
Lead Sustaining Engineer	Biomedical Engineer	Service Engineer - Medical Devices
Customer Service Representative	Electronics Engineer - Intern	Senior Mechanical Design Engineer - Implantable medical devices
CSIRO Postdoctoral Fellowship in Machine Learning for the Control of Additive Manufacturing Process	Engineering Data Support	Regulatory Affairs Associate
Engineering Technologist	CRA II (Clinical Research Associate	Field Service Engineer
Logistics Manager	CRA II- SCRA (Clinical Research Associate)	Installation & Service Technician
Marketing & Communications Associate	Senior Project Manager E&I (Electrical Infrastructure) – Manufacturing Lines	Field Service Engineer
Director, Regulatory Affairs	Commissioning & Qualification Expert	Project Engineer - Supply Chain Operations
Regulatory Affairs Officer	Field Service Engineer	Regulatory Affairs Engineer
Senior Automation Scientist	Clinical Support Specialist	Quality and Regulatory Compliance Associate
Associate Scientist	Quality Control Inspector	Warehouse Assistant
Territory Manager	Clinical Specialist	Electrical Engineer - Radiology Medical Devices
Change Lead	Biomedical Product Specialist	Robotic Product Specialist
Clinical Research Associate	Vigilance & PMS Coordinator (post market surveillance)	Quality Manager - Medical Devices
Field Service Engineer	Manager, Innovation & Strategy Market Access	Product Manager- Medical Devices

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