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REPORT

Knowledge Transfer in Australia:

Is there a Route to Professionalisation?

Client: Knowledge Commercialisation Australasia

Attention: Melissa Geue

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TAKING **NEW IDEAS** TO MARKET

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EXECUTIVE SUMMARY

Project Description

This report describes a project that was conducted in 2015 for Knowledge Commercialisation Australasia (KCA) and funded by the Professional Standards Councils (PSC). The project's primary objective is to provide a framework for a professional competency (capability) standard for the knowledge transfer sector in Australia. Herein, knowledge transfer is synonymous with technology transfer from publicly-funded R&D organisations, and it includes commercialisation.

This report may also be useful as a case study for the early stages of professionalisation for other occupational sectors that are on a similar professionalisation journey to that of the knowledge transfer sector.

The project involved:

- Conducting a literature review.
- Conducting research via a series of workshops and interviews, including detailed survey questions; participants included Technology Transfer Professionals (TTP) and their stakeholders (e.g. R&D staff and industry recipients of Intellectual Property (IP) rights).
- Analysing the research interactively with its conduct and drafting compilations of TTP capabilities, including groupings and sub-groupings of capabilities (capability clusters and sub-clusters).
- Identifying skills gaps, i.e. the disparity between the capability clusters perceived to be required of the TTP and the capability clusters perceived to exist.
- Creating a detailed TTP Capability Framework based loosely on a Job Family Model developed by the Australian Public Service Commission. The framework in the current project describes almost 200 capabilities desired of TTP. It incorporates seven capability clusters and sixteen sub-clusters as rows in a spreadsheet and three TTP seniority levels (early-career, mid-career and senior level) as columns in the spreadsheet. It also lists several professional values for some ethical considerations.
- Conducting further consultations and analyses in order to finalise recommendations for the implementation of the framework and for addressing the skills gaps.

Recommendations

The framework developed in this project should assist KCA, TTP and stakeholders to:

- Provide a benchmark against which capability and performance, both of individual TTP and of TTP teams, can be measured
- Use as a Human Resources tool, e.g. TTP workplace planning and TTP recruitment tool
- Identify and better understand the various TTP stakeholders
- Assess and manage the risks in serving stakeholders
- Assess the professional obligations of TTP
- Assess KCA's role in establishing a profession
- Develop a more complete model for professionalisation.

KCA and similar organisations should be encouraged to bring into existence in Australia:

- A Code of Ethics for the TTP individuals and for the TTP sector
- Targeted professional development education programs and similar training for identified skills gaps
- Development of industry secondment programs
- Formal mentoring programs internal to the Technology Transfer Offices (TTO) and external to the TTO with industry stakeholders
- A clear definition of the roles and expectations of TTP with increased focus on TTP performance management
- The development of a formal process to engage stakeholders in the performance of TTP via stakeholder feedback
- A TTP engagement study or survey to be implemented across the TTP sector
- A stakeholder satisfaction survey for the TTP sector
- A salary survey pertinent across the TTP sector

A future area of work recommended to be conducted for or by KCA in conjunction with the Association of Technology Transfer Professionals (ATTP) is to develop the Detailed Capability Framework of the current report into a version suited to a global context, and thereby eventually to make it into an Accreditation and Assessment Framework for the Registered Technology Transfer Professional (RTTP) recognition and the Continuing Education courses accredited by the ATTP.

TECHNOLOGY TRANSFER PROFESSIONALS IN Australia

Why is knowledge transfer SO IMPORTANT?

Economic Good | Public Good | Innovation | Job Creation | Competitiveness

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What does a TTP ACTUALLY DO?

- Identifies partners & collaborators
- Assesses market potential
- Educates on IP and commercialisation processes & requirements
- Negotiates commercial agreements
- Finds investors and R&D funding
- Commercialises IP
- Arranges IP protection for research
- Forms spin-off, start-up companies

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Over **315** TTPs in Australia (in 2013)

26 Registered TTPs

11 Certified Licensing Professionals

TTPs are located in:

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TTPs are commonly known as:

BDM Accountant *Senior Commercial Engagement Manager* Analyst *Director* Leader Business Development Chief Operating Officer **Commercialisation Manager** Legal Counsel *Deputy Director* IP Manager CEO Business Development Manager *Corporate Lawyer* *Commercialisation Associate* Associate Director

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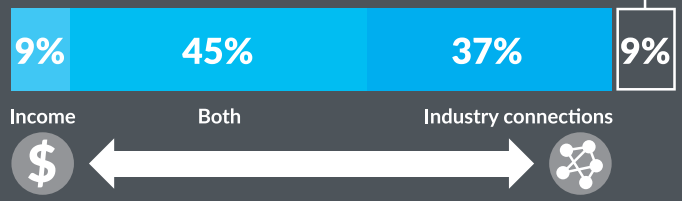
Why organisations commercialise



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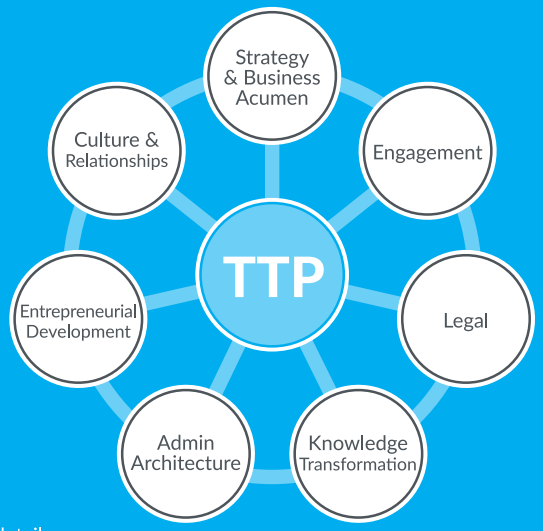
Competencies to commercialise research



More detail outlined in report

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TTP career stages

Early	Mid	Senior
<3 Years experience Part of a team Working to guidelines & policies	Responsible for team Scopes & manages projects Manages deals & assesses risk	Leadership of TTO or teams Responsible for decision making Mentors teams

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How we measure up

	Current Strengths	Areas for Development
Observed by TTPs	Teamwork Qualifications & Experience Strategy & Results	Social Media Marketing & Relationships Legal
Observed by Stakeholders	Intellectual Property Qualifications & Experience Knowledge Transfer	Communication & Influence Business Acumen Strategy & Results

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For further information please refer to the report

Knowledge Transfer In Australia: Is there a Route to Professionalisation?

Page numbers as referenced

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INTRODUCTION

Knowledge Commercialisation Australasia (KCA) is the peak body for organisations and individuals associated with knowledge commercialisation (technology transfer) and exchange between public sector research organisations and business and government entities. KCA seeks to link, enable and inspire its members, and provide the necessary tools and opportunities to spur on greater translation of research for economic and community benefit, and create a more vibrant and productive Australasian economy. In order to better serve their membership, KCA look at ways to better understand and foster the professional development of the Knowledge Commercialisation sector.

To facilitate the exchange of knowledge and effectively enable publicly funded research to be put to use, the knowledge exchange/ technology transfer sector requires commercially astute professionals who are well networked and understand the differences between the researchers they serve and the industry and business partners they engage with. As this is a relatively new occupational sector, there are no clearly defined or documented standards as to what specific skill sets are required to identify opportunities and to close commercial deals. There is also a lack of definition around career stages and what career progression looks like in this field. Further to this, the association members have not yet explored issues pertaining to accountability and responsibility for consequences occurring as a result of this role being undertaken ineffectively, as well as potential strategies for developing the practice into a profession.

Professionalisation may be considered to be the social process by which a trade or occupation transforms itself into a true profession of the highest integrity and competence. The professionalisation process tends to establish the group norms of conduct and qualification of members of a profession and tends also to insist that members of the profession achieve conformity to such norms and abide with the established procedures and any agreed code of conduct. Different professions are organised differently.

KCA received grant funding from the Professional Standards Councils (PSC) to arrange conduct of a project, the subject of this current report.

> “We are the **peak body** for **knowledge commercialisation** and **exchange**.
>
> We **link**, **enable** and **inspire** our members.
>
> We are a strong **advocate** for **public research organisations** and **university** commercialisation and exchange activities”
>
> Melissa Geue, KCA Executive Officer

Project Scope and Objectives:

As background to this current report, the agreed scope of the project is described in the Project Scope of Works as follows:

The scope of the project is to provide a framework for professional development for individuals whose job it is to facilitate the transfer of research outcomes from publicly funded research organisations, and to determine options and their feasibility in relation to the professionalisation of the practice in Australia. This framework will identify what skills are required to undertake the role, and will highlight where the current skills gaps are within public sector research organisations in Australia. In addition to this, research undertaken within this project will also seek to identify what more could be done on the industry partner side to better put research to use. The final report produced, which summarises the research findings, will suggest recommendations as to how to address these skills gaps and offer solutions to help develop a more clearly defined career pathway for early career technology transfer professionals (TTP).

The project scope did **not** include providing a **complete** guide to professionalisation for the knowledge transfer sector; for example, there was no focus on developing a code of conduct.

The Scope of Works defined the project objectives as follows:

- Determine the requirement for professional standards within the knowledge transfer practice in Australia, and outline any associated recommendations for the implementation of such a strategy if deemed appropriate.
  - Document the models of other similar associations nationally and globally. (Here, "models" refers to the association models; KCA is an association.)
- Design a framework outlining the skills and competencies necessary to facilitate the successful transfer of knowledge between the research sector and business and government entities, to be used as a baseline tool for the professional development of practitioners.
  - Document skills and competencies of technology transfer professionals

Content of this Current Report:

The content of this report reflects the scope and objectives described immediately above. The key deliverable for this current report is defined as follows:

Provide the Framework for a professional competency standard, identify the skills gap and provide recommendations for closing the skills gap.

PSC also requested that the report was to be a case study inclusive of methodology that would be of use to other occupational sectors that were on a similar professionalisation journey to that of the knowledge transfer sector.

Project Contractor

KCA engaged gemaker pty ltd to conduct the year-long study; gemaker is a company specialising in assisting in the commercialisation of technologies. Several of its senior staff are former technology transfer practitioners.

> "We are a network of commercially savvy professionals, connecting people to expertise as required across the full innovation process of taking new ideas to market."
>
> Natalie Chapman, gemaker Managing Director

Acknowledgments

We at gemaker would like to acknowledge the contribution and guidance provided by the project Steering Committee members, Rupert Grayston (PSC), Mary McCrudden (PSC), Alastair Hick (KCA) and Melissa Geue (KCA), and for their advice and support throughout this project.

We would also like to express our appreciation to the organisations that participated in the national workshops, interviews and surveys associated with this project. The research conducted throughout this project would not have been possible without their willingness to participate, their expertise and their candor.

List of Participating Organisations can be found in **Appendix 1**.

Disclaimer

While gemaker endeavored to make this report as comprehensive and as accurate as was reasonably possible, the resources and time available were not unlimited. Despite substantial efforts by gemaker, KCA and the PSC, the scope and objectives of the project inevitably remained open to various interpretations to some extent. The results are not intended to be irreversibly conclusive or exhaustive. The information provided is believed to provide a good basis for building towards a standard framework.

BACKGROUND

Clarification on some terminology

"Professionalisation": To repeat what was said in the Introduction here: Professionalisation may be considered to be the social process by which a trade or occupation transforms itself into a true profession of the highest integrity and competence. The professionalisation process tends to establish the group norms of conduct and qualification of members of a profession and tends also to insist that members of the profession achieve conformity to such norms and abide with the established procedures and any agreed code of conduct. Different professions are organised differently.

"Profession": In this report, the expressions "knowledge transfer profession" and "technology transfer profession" are considered to refer to the same occupational sector, and the sector may be considered in casual terminology to be a "profession" even though most observers would agree it has not yet undergone professionalisation in Australia or overseas. According to the Professional Services Councils (PSC), for a profession to exist there needs to be a professional body that can **(18)**:

- Develop, educate and ultimately enforce the sector's professional standards,
- Allow individuals to come together in a sense of community commitment, and
- Bind individual practitioners to each other through these commitments.

Almost by definition, the technology transfer profession in this report refers to the transfer profession within publicly-funded R&D organisations (PFRO) because privately-funded R&D organisations have little interest in transferring intellectual assets except as part of the broader commercial activities they normally conduct; such is currently the case particularly in Australia.

"Technology Transfer Professional (TTP)": Technology transfer professionals (TTP) are those persons employed in a non-peripheral sense in the technology transfer profession. In view of the fact that the knowledge transfer sector has not yet been professionalised, the alternative term "technology transfer practitioner" would perhaps be more appropriate, but the meaning of TTP should nevertheless be clear.

"Technology Transfer Office (TTO)": This is an expression used herein to describe any entity that employs one or more TTP.

"Commercialisation": Very often, but not always, attempts to commercialise a technology are conducted and are then part of the technology transfer process. In the context of this report, commercialisation is an attempt to arrange that, over time, a financial profit will be realised by the owner of the intellectual property (IP) rights for the relevant technology in a manner that can be directly attributed to the commercialisation effort, at least to a significant degree. By contrast, non-commercialisation technology transfer efforts are conducted to benefit the community non-financially, for the public good, or they may indirectly result eventually in diffuse financial benefits.

"Stakeholders": Stakeholders are herein considered to be any persons or organisations (any entities) with an active interest in, or commitment to, the technology transfer activities, apart from the technology transfer professionals (TTP). Stakeholders may be internal to the profession in which case they are occupied to some extent in creating technologies or in the transfer processes but they are not TTP; in particular they may be researchers or inventors who have developed the technologies, or they may be administrators within the research organisations. Alternatively, stakeholders may be external stakeholders; these are entities not actually employed in the transfer processes and they include recipients of the rights to commercialise the technologies, and entities that fund the relevant research activities or commercialisation activities. The words "customer" or "client" have at times also been used in the relevant literature to describe some internal and external stakeholders. In some cases, an entity may be considered to be either internal or external to the technology transfer sector at different stages of the transfer process.

"Competency" and **"Capability"**: In this report, "competency" is defined as possessing the skills, knowledge, behaviours and values required to perform the activities within an occupation, function, position or role to the standard expected in employment.

"Capability" is herein used interchangeably with the word "competency", and "capability" is the word choice favoured throughout this report. However, many Human Resource (HR) personnel make a distinction between the two words basically along the following lines: "Capabilities" are abilities which may not yet be developed and as such represent potential competencies that can be achieved with further experience or training. Such a distinction is not of interest to the current report because it is more confusing than helpful to a reader.

"Capability Framework": This is an information tool to be developed in this report to assist professionalisation by identifying the capabilities required by TTP. It can be envisaged as a matrix, or a spreadsheet, or a graphic representation; regardless, the capabilities are partitioned into appropriately labeled groupings so that it is readily comprehensible and usable. Once developed, the framework has several uses; for example, it can be used to assess TTP performance.

In attempting to design a capability framework for the technology transfer profession, important initial considerations involve attempting to understand who a technology transfer professional (TTP) currently is, and the current characteristics of their occupation. What is their role? How well do they perform it? What do the stakeholders perceive this role to be? And how well do the stakeholders perceive that role is being accomplished? This section addresses those considerations.

"Capability Clusters" and **"Capability Sub-Clusters"**: In this report, capabilities are grouped under capability headings called "capability clusters". A second tier of grouping is used which produces sub-headings referred to as "sub-clusters". The existence of such grouping and sub-grouping facilitates the development of the detailed capability framework produced during the current project, and enhances understanding of it, making it more readily usable.

General Characteristics of the Knowledge Transfer Sector in Australia

Australia has 37 active research universities, a number of public research organisations (e.g. CSIRO, Data61, DST Group, and ANSTO), 33 active co-operative research centres **(1)**, a number of medical research institutes (MRI), and Rural R&D Corporations (RDCs). They are spread across Australian States and Territories with a concentration on the east coast; refer to **Figure 1**. There are also more than 200 active spinouts/startups from these institutions that have R&D as a primary activity.

Usually the knowledge transfer entity, often known as a technology transfer office (TTO), or commercialisation office, business liaison office or partners' office, is the interface between the R&D organisation and the external entities with which the R&D organisation engages on commercial matters. Most research organisations in Australia have established dedicated units or companies wholly owned by the organisation to facilitate technology transfers and commercialisation. These entities take a variety of forms and have differing responsibilities.

As a general summary, the responsibilities of a knowledge transfer entity in Australia involves some or all of the following activities:

- educating and creating awareness of intellectual property (IP) processes and requirements amongst researchers;
- assisting researchers with their IP protection, e.g. arranging patent protection;
- assessing market potential;
- identifying potential industry partners and collaborators;
- arranging IP licence agreements;
- forming start-up (spin-off) companies;
- finding investors for commercialising IP; and
- assisting R&D groups to obtain R&D funding

In some cases, knowledge transfer may be conducted without the knowledge transfer entity being directly concerned with commercialising that knowledge or IP; for example, this often happens if the R&D organisation that produced the knowledge or IP has a policy of not asserting any ownership rights to that knowledge or IP.

The knowledge transfer entities use various operating models to enable their chosen responsibilities to be met. Examples of such models include open innovation models and easy access models.

Number of Technology Transfer Professionals (TTP) in Australia

As stated earlier, technology transfer professionals (TTP) are herein defined to be those persons who are employed in the technology transfer profession in a non-peripheral manner. Inevitably, various interpretations can exist as to who is a TTP and who is not. However, an exact determination of the number of TTP in Australia is not important to this report provided that the number is sufficiently large to justify professionalisation of the TTP sector. As indicated immediately below, the number of TTP justifies professionalisation; on the other hand, the number is not so large that professionalisation can be regarded as long overdue.

In full-time-equivalent (FTE) terms, there are at least 315 dedicated TTP working in Australia within publicly funded research agencies (PFRA), medical research institutes (MRI) and the university sector **(3)**, refer to **Figure 2**.

Figure 1. Australian public-sector R&D organisations

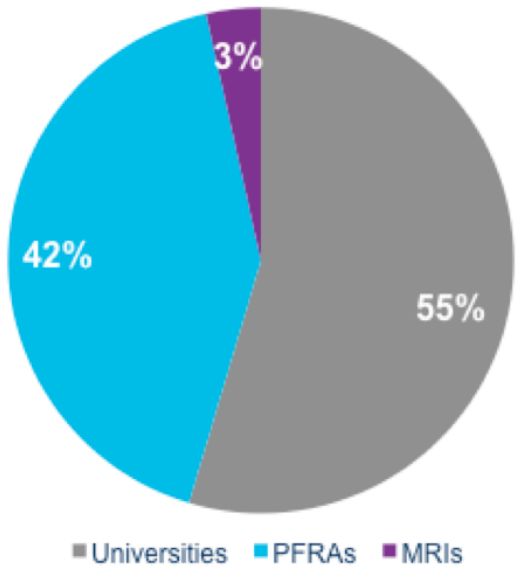

Figure 2. The total estimated number of dedicated Commercialisation staff by FTE in 2013 was 315 (4)

This number does not include persons employed to directly support the knowledge transfer activities but who do not actually conduct the core transfer activities. When a broader scoping is applied to include legal and marketing staff the estimates are somewhat higher: 724 staff (3). The number would be higher if co-operative research centres (CRC) were included in the estimate.

TTP Job Titles

When researching the data relevant to the number of TTP in Australia, it became clear that a huge variation existed in the job title descriptions for the TTP across the range of TTO, as loosely illustrated in **Figure 3**. For example, TTO staff members who are responsible on a daily basis for core technology transfer activities at junior and mid-range seniority levels are variously referred to as Business Development Managers, Commercialisation Managers, IP Managers, Business Liaison Officers, Commercial Engagement Managers, etc.

This inconsistency in job titles is a good illustration of the need for a capability framework, as developed in the current project, in order to assist understanding of the relevant workforce capability requirements and eventual professionalisation of that occupational sector. Technology transfer requires a demanding and complex set of capabilities, not necessarily at the individual level, but certainly across the TTP workplace sector.

Figure 3. Technology Transfer Professionals Job Titles across Australia in 2015

Existing Standards in Knowledge Transfer

The existence of professional standards (or more correctly, stamps of recognition of some competency) relevant to the technology transfer sector does not constitute professionalisation of the sector, but it is a relevant development. There are two key standards adopted by Technology Transfer Professionals in Australia: The Registered Technology Transfer Professional (RTTP), and the Certified Licensing Professionals (CLP). **Appendix2** lists and briefly describes organisations, both within Australia and overseas, that are directly concerned with oversight activities in the technology transfer sector. Some of these organisations are concerned with formal professional standards in the sector.

Alliance of Technology Transfer Professionals

The Alliance of Technology Transfer Professionals (ATTP) was established in 2010 to provide a global standard of professional recognition. ATTP is a member association-based body comprised of nine national or regional technology transfer ptactitioner-led associations from around the globe. KCA is a founding member of this Alliance **(19)**.

The Registered Technology Transfer Professional (RTTP) recognition

The Registered Technology Transfer Professional (RTTP) designation is ATTP's recognition that you meet the minimum requirements expected of a TTP. In essence it is a designation that reflects the highest quality expectations defined by the profession – it is a recognition that is earned by TTP who have demonstrated competency within their role in a TTO. There are three routes by which an individual can earn their RTTP accreditation. These three routes have been designed to recognise the different ways in which an individual may have gained the knowledge and experience necessary to be a successful TTP **(20)**.

To date there are 300 RTTP globally, including 26 in Australia **(5)**. Thus approximately 8 % of Australia's 315 TTP working in core technology transfer roles are RTTP. This percentage is high compared to the corresponding percentage in larger communities such as the USA and the UK. For example, USA has approximately 3,200 TTP (in 2012) of whom only 3% are RTTP **(6)**. **Figure 4** indicates the global numeric distribution of RTTP, with Australia's 26 RTTP (9% of the total) highlighted in white.

However, despite this global accreditation process, the standard lacks theoretical underpinnings, and is poorly defined in relation to the specific capabilities that are explicitly required in order to successfully undertake the TTP role, particularly when viewed from an Australian perspective. Nor is it well understood what is required for a TTP to progress from the role implied by the initial accreditation standard to a higher role. **Figure 5** illustrates the RTTP application process.

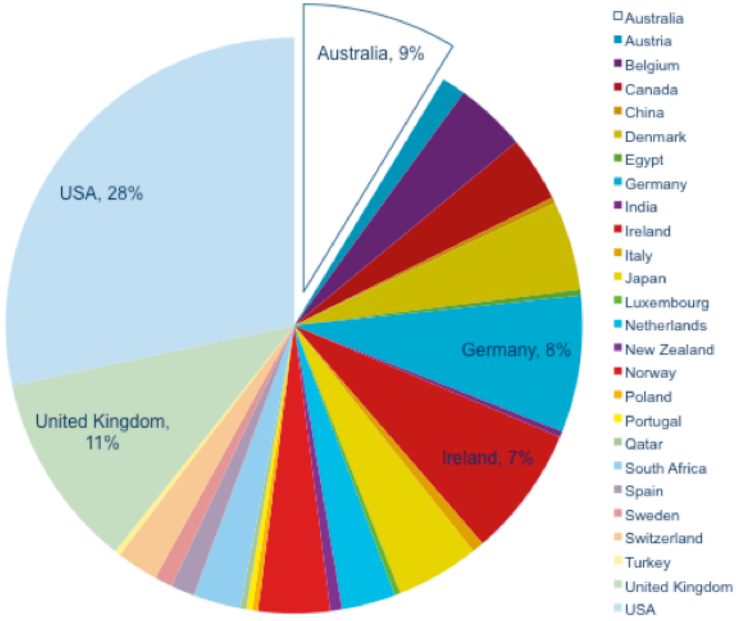

Figure 4. Geographical distribution of RTTP in 2015

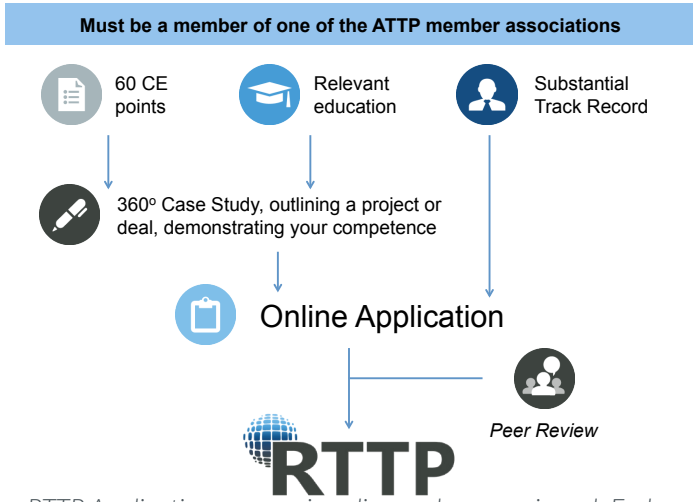

Figure 5. RTTP Application process is online and peer reviewed. Early and mid career professionals require 60 Continuing Education points and/or relevant education, as well as a case study. A senior professional must demonstrate a substantial track record.

It may be prudent to note that this "lack of theoretical underpinning" is similar for a number of professional recognitions except that, in many cases, these have a base qualification on which experience is built. For example, professional engineering registration is based on subjective descriptions of experience - which can vary widely - to demonstrate competency; the difference is that registration as a professional engineer also requires an engineering degree. In technology transfer the underlying qualification can vary widely.

Certified Licensing Professionals

There also exists the Certified Licensing Professionals (CLP), a program that recognises professionals who have demonstrated their experience and proficiency in the commercialisation of intellectual property via licensing **(21)**. There are currently 779 practicing CLP designees worldwide **(21)** involved in patenting, marketing, valuations, IP law, negotiation, and intellectual asset management. The program is administered by a US-based foundation and built on internationally applicable standards of practice, knowledge and ethics to recognise licensing professionals who have met examination and other requirements necessary to become certified. The professionals are required to undertake recertification every three years. Currently, there are 11 Australians with the CLP designations, including those in supporting roles such as legal. This program is an initiative in 2008 of the Licensing Executives Society (LES) (USA and Canada).

Why RTTP or CLP?

The notable difference between CLP and RTTP is that RTTP goes beyond pure licensing and recognises that technology transfer is multi-faceted and encompasses a broader skill-set. Unlike CLP, RTTP is attempting to establish technology transfer as a profession in its own right, with a clearly defined entry criteria and a recognised professional development pathway. An additional difference is that CLP extends the scope of the professionals considered to include lawyers or law firms providing services that mainly play a supporting role in licensing.

Other International Frameworks

There are two other international associations that, in terms of recognising certain standards, focused on the perceived roles of employees rather than on their capabilities These associations are the European Knowledge & Technology Transfer Society (EuKTS) and the Association for University Research and Industry Link AURIL. (For more detail refer to **Appendix2**)

Australian R&D Funding/Expenditure

For the purposes of this report, it is instructive to understand general aspects of the working environment experienced by the TTP in Australia. That environment is significantly affected by funding considerations. Data that specifically quantifies the aggregated funding or expenditure of Australian TTOs is lacking or is unreliable or is difficult to interpret with confidence. Instead, in order to understand the funding environment in which TTP are employed, it is sufficient for present purposes to look at the R&D funding in Australia that is directly relevant to TTO activities.

Referring to **Figure 6 (31)**, it can be seen that total funding (which is very similar to total expenditure) for R&D activities in Australia has been approximately A$9.5 billion per annum in absolute terms (i.e. no allowance for inflation) for the past five years or so. This R&D funding picture has implications for the funding available to the associated knowledge transfer sector.

Pressure has been increasing in recent years on the publicly-funded R&D organisations, particularly universities, to obtain a higher percentage of their income for R&D purposes from external sources such as private organisations. This pressure flows on in part to the knowledge transfer sector which is now being subject to closer scrutiny on performance and budgeting. Exacerbating this pressure on this sector have been generally unfavourable appraisals of the value to the Australian economy and its society of its R&D expenditure and even its higher-education expenditure (particularly on STEM education). Various innovation reports have concluded that Australia performs poorly compared with comparable OECD countries in terms of commercialising its R&D outcomes and in educating its workforce on innovation aspects. **(4)(7)(8)**

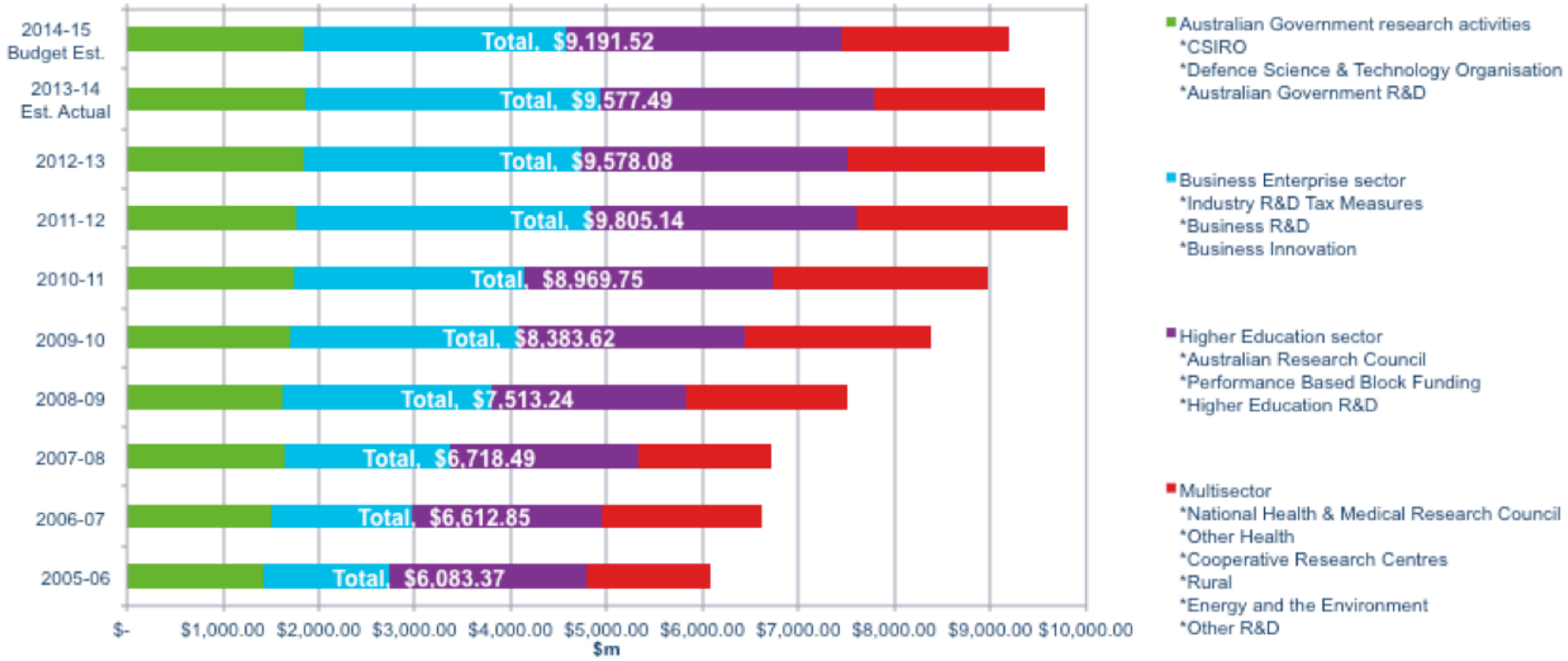

Figure 6. Summary of Australian Government expenditure support for science, research and innovation by sector **(31)**.

Australian TTP Key Performance Indicators (KPIs)

Besides funding considerations, another significant influence on the working environment for any Australian TTP is the method used for assessing the performance of the TTP. While the assessment criteria vary considerably between the technology transfer entities, and between the various levels of TTP, they are usually based on personal key performance indicators (KPIs) which in turn are based on the KPIs for the entity, the technology transfer office (TTO).

Such KPIs may appear to be highly relevant to the objective of developing a capability framework for the TTP, but such KPIs are highly variable across the knowledge transfer sector and the issue of performance assessment is highly complex. Thus in this report, KPIs are not used as the basis for a model for developing the capability framework. (Instead, a broader Job-Family Model, described in a later section, is used.)

For illustrative purposes, **Figure 7** shows four common KPIs aggregated for all relevant Australian TTOs. The trend in dollar terms is shown for the four KPIs for the period 2000 to 2013 inclusive. One feature to note is the relatively steep income increase in university income from industry; this is consistent with the remark made in the sub-section immediately above about the pressure in recent years to seek such an increase.

A similar graphic, **Figure 8**, shows the situation for another four KPIs, all different from those in **Figure 7**. In the second graphic, the KPIs are not measured in dollar terms.

Other KPIs exist or can be formulated. Most, if not all, KPIs (including those shown in **Figure 8** and **Figure 7**) are far from trivial to construct and to interpret accurately.

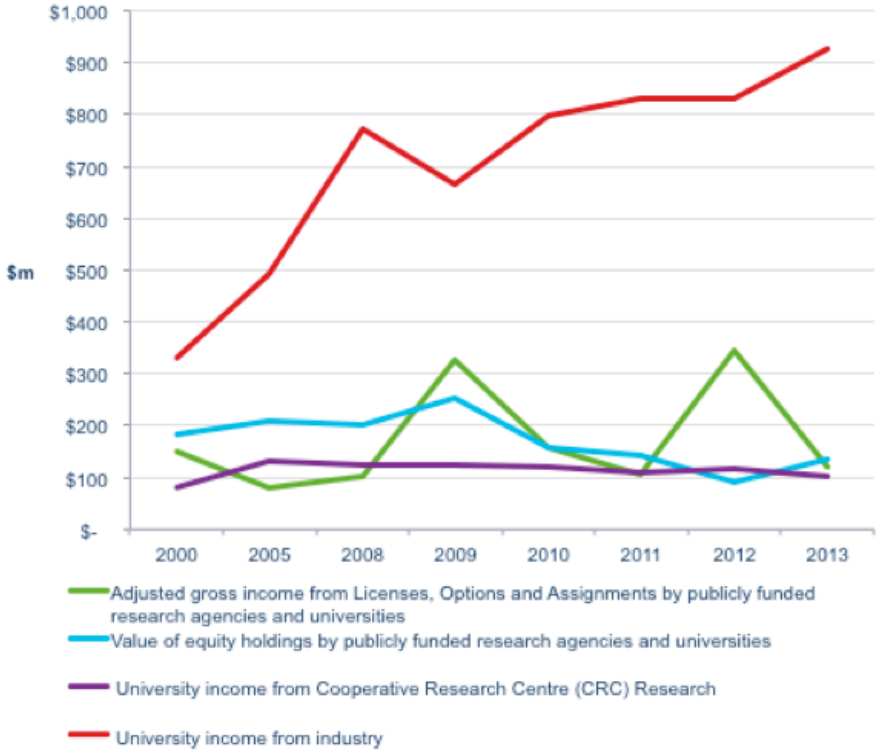

Figure 7. Australian Government KPIs relating to dollar terms from 2000 to 2013 **(4)**

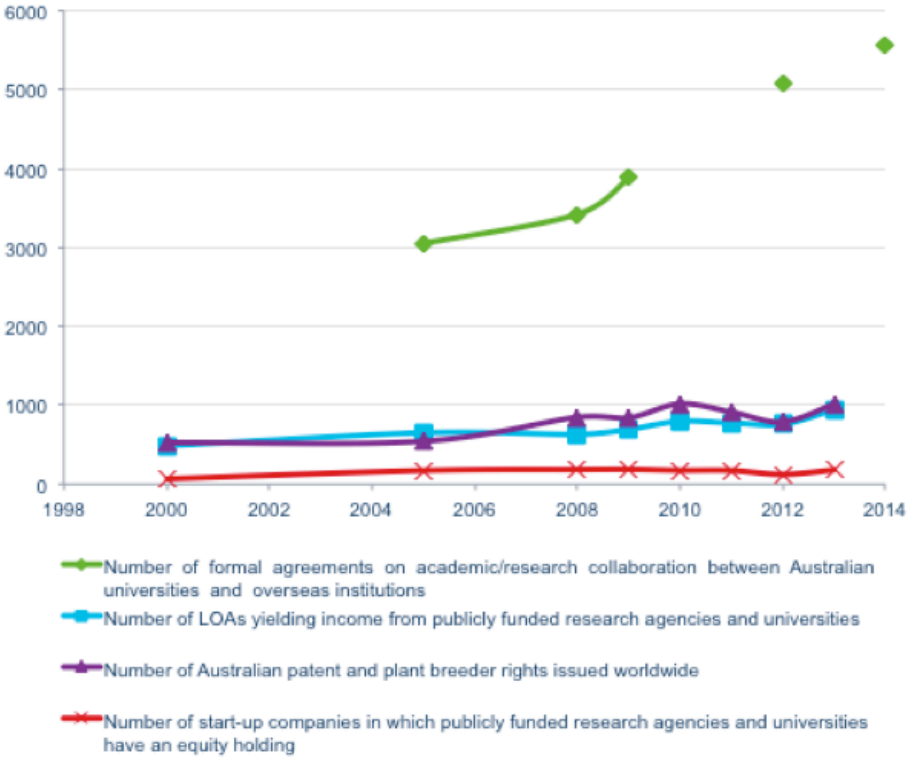

Figure 8. Australian Government KPIs relating to activities from 2000 to 2013 **(4)**

Importance of Knowledge Transfer

Central to understanding the role of a TTP is to understand why his/her work output is valuable, or perceived to be valuable.

There is a clear case for the importance of the commercialisation of Australian knowledge, innovation and entrepreneurship that is longstanding and widely endorsed **(9)(10)(11)(12)**. Rationales include: enhancing national economic competitiveness, facilitating commercialisation of research for the public good, establishing closer ties between publicly-funded R&D organisations and industry, enticing and retaining researchers of the highest quality, and providing another source of income for the R&D organisations **(page 47, 10)**.

Compared to countries with similar economies, Australia has a lower percentage of its researchers working in business enterprises and a relatively higher percentage working in higher education organisations **(13)**. This means businesses in Australia have a greater reliance on public sector research than is the case in many comparable economies, and in turn there is now pressure on Australian public sector researchers to produce more commercialisable outcomes.

Indeed, the current national governments in Australia and the UK, at least, have signalled recently even greater pressure on universities to work with industry **(12) (14).** Several Australian government reports have recommended greater collaboration between Small and Medium Enterprises (SMEs) and universities. SMEs are being encouraged to develop a culture that looks outside their own business for research, and universities are being induced to develop a culture that provides incentives for researchers to engage with industry **(4)(15)(14)**. There is no doubt as to the government's concern with the application of research, to "achieve the Australian Government's priorities for applied science and research … to put industry front and centre … establishing and supporting industry-led and outcome-focused collaborative research partnerships between industry and research organisations" **(page 9, 14)**.

These government policies have clear and positive implications for the importance of the role of TTPs.

PROJECT METHODOLOGY

Project Management

The current project may be considered to have had three contributors: gemaker (contracted to conduct it), KCA (the contract principal), and PSC (the funder). Given the nature of the project, the first of its kind in Australia for Knowledge Transfer, and the differing roles of the three contributors, a project steering committee was formed. It comprised of at least two people from each contributing organisation.

Although the scope and objectives (deliverables) of the project were listed in the project contracts, those contracts included the requirement that a clarifying scoping document be produced as an early deliverable. Thereafter, following its acceptance by the steering committee, this scoping document was used by the committee to keep a tight project focus and minimise creep. Subject to formally-agreed changes, it clarified the fundamental aspects of the project such as the scope of work, contributor roles, risks, resources, deliverables, milestones and liaison arrangements.

Phases of the Project Methodology

The current project included three phases of work, not including the production of the final report herein:

- Conducting a Literature Review
- Researching and Drafting Compilations of TTP Capabilities (including capability clusters and sub-clusters)
- Consulting and Creating a Final Detailed TTP Capability Framework, plus Analysing (i.e. identifying capability "gaps").

The methodology used in these three phases will be described in the following sections.

Methodology: Literature Review

A literature review was conducted at the commencement of this project. This brief section focuses on the methodology adopted; results are reported in a later section herein (and more fully in **Appendix 3**).

This literature review provided information essential to the design and development of the workshops and interviews that were later conducted in the current project, and it was therefore an important component of this project.

The transfer of knowledge, including the bringing of innovations to market, clearly requires a demanding composite of expertise, knowledge, skills, attitudes and values. Because of this complexity, the first part of the method adopted in the review was to assess how well the existing literature addressed such questions as: What do people who work in knowledge transfer actually do? How does knowledge transfer actually work? Subsequently, the review work focused on the more detailed aspects relating to the roles and capabilities of technology transfer professionals.

In addition to the review of publications and papers, the project team conducted a review of position descriptions and organisation charts for knowledge transfer work in a selection of universities and other public sector research organisations. This was used to compile a list of twelve to fourteen initial capability clusters to be used as discussion stimulus materials at the national workshops.

Methodology: Research and Draft Compilations of TTP Capabilities

Methodological Approach

The key deliverable of the project was a Detailed Capability Framework for TTP. The general approach taken to achieve this framework was to proceed in steps, commencing with a draft list of capability group headings, herein called capability clusters, and then progressively increasing the relevance, accuracy and completeness of this list by creating a matrix inclusive at least of capabilities partitioned within the various clusters.

Inherent in this approach was the conduct of research in order to create the various drafts of the framework. Research was generally of two types:

- Information was extracted from existing written sources, not just from the initial literature review (refer **Appendix 3**), but also was extracted throughout the course of the project; and
- Information, particularly in the form of opinion and comment, was also obtained from a reasonably large number of TTP and stakeholders via workshops, surveys and interviews conducted specifically for the current project; this data was collected from the participants interactively with the gemaker staff, and the data was deliberately allowed to evolve iteratively, thereby progressively creating more refined versions of the desired framework.

The results of the literature review provided the initial input to this research process. The literature review included searching of traditional sources, web-based sources, job advertisements and position descriptions. An initial categorisation of capabilities extracted from the literature review was made based on key words, sometimes used in the sources, resulting in twelve "first draft" capability clusters, as follows:

- Business acumen and analysis (15 items from the literature review)
- Communication and influence (6 items)
- Information technology and social media (29 items)
- Innovation (5 items)
- Knowledge transfer (80 items)
- Legal (18 terms)
- Marketing and relationships (54 items)
- Organisational administration and development (33 items)
- Qualifications and capabilities (60 items)
- Strategy and results (25 items)
- Student entrepreneur development (21 items)
- Teamwork (8 items).

Figure 9. Participants at national workshops identifying capabilities

Figure 10. Participants at Melbourne workshop identifying capabilities

Numerous TTP and many of their internal and external stakeholders were invited to participate in national workshops in their local locations. Workshops were held in NSW, VIC, QLD, SA and WA.

During the facilitation of these workshops, TTP participants were asked to identify role capabilities that they perceived to be the best fit to their work as a TTP. Stakeholders were asked a similar question regarding their perception of TTP work. Workshop participants could work either in a group or as an individual.

Using the twelve "first draft" capability clusters listed immediately above the participants were asked to:

- Add/ remove/ modify/ create capabilities that in their experience need to be included in the TTP work
- Collate them into roles or career levels
- Have input into roles outside their current role

Participants also discussed their thoughts around:

- Sharing a common language or terminology
- Naming the Job Family "Knowledge Transfer" or instead "Technology Transfer" or "Commercialisation"
- The type of capability framework (or matrix) that these capabilities could be framed under

Their discussion and choices were documented and collated at the end of each workshop. Upon completion of all of the national workshops, responses from all workshop participants were combined and the data was coded by provisional categorisation.

This data from the workshops formed the basis for a first draft of the Capability Framework, and further drafts evolved from subsequent surveys and interviews.

Such data required a general model (or rationale) for its transformation into a capability framework. The model may be considered to be a rationale for partitioning or grouping the list of all the TTP capabilities in a structured manner. Several potentially suitable models exist. The model chosen, the APSC Job-Family Model, is described in the next section.

Basis for the TTP Capability Framework – the Job Family Model

For the current project, the capability framework for technology transfer professionals was developed based on the APSC Job Family Model (APSC = Australian Public Service Commission) This model grew out of a symposium held by the APSC in 2011 which focussed on ways to improve workforce planning within the APS **(page 3, 16)**.

The APS Job Family Model:

- Groups functionally similar positions that have related skills, tasks and knowledge blocks;
- Does not reflect work level; and
- Is hierarchical and has four tiers

The four tiers are:

1. **Job family:** The highest tier in a hierarchy of job segmentation within a workforce. The purpose is to split the workforce into logical and practical segments to allow deeper workforce analysis to occur. A job family is a grouping of similar jobs at the highest level that usually consists of several job functions. For example, a possible job family might be 'Administration, facilities and property'.
2. **Job function:** The second tier in a hierarchy of job segmentation within a workforce. A job function is a subgroup of jobs within a job family that require similar skills, capabilities, knowledge and training. For example, one job function within the job family of 'Administration, facilities and property' might be 'Executive assistants, secretaries and receptionists'.
3. **Job role:** A job role is a subgroup of jobs within a job function that allows for further refining and grouping of required skills, capabilities, knowledge and training. For example, a job role within the job function of 'Executive assistants, secretaries and receptionists' (in the 'Administration, facilities and property' job family) might be 'Personal/Executive assistants'.
4. **Job title:** The name given to a job that provides a meaningful description of the role. Job titles are generally agency specific and may indicate the classification level of the position. For example, a job title within the 'Personal/Executive assistants' Job role might be 'Executive Assistant to General Manager Corporate'

Guiding principles of the Job Family Model are:

- The Job Family model aims to be inclusive rather than exclusive.
- Roles aim to group positions that have similar core skills or knowledge blocks.
- The complexity within a role is defined by the work level standards not by separate roles.
- Where a position undertakes a number of job roles, it may be helpful to identify the core purpose of the position, key accountability or criticality to business.
- Roles within Strategic Policy are considered separate from internal policy roles which are performed within a specific subject matter. For example, a position that deals with advising an organisation or writing HR policy would sit within the People Family.
- Should suit roles that exist now but also have a view to the workforce of the future.

Thus the TTP Capability Framework needs to be one which can be read broadly, as a family of functions, roles and possible job titles, and not as the scope of the work of a single person. The framework is intended to apply across the entire technology transfer sector.

Methodology: Consulting, Creating and Analysing the Final TTP Capability Framework

The first draft of the framework was tested to see what was relevant within TTP roles. This was done by means of a survey of the TTP and a separate survey of their stakeholders. Note that these surveys were additional to the research conducted earlier as a literature survey and as workshops (described herein in two of the three sections immediately above).

The two surveys also provided the opportunity to determine what the skills gap in Australia is for TTP across different career levels. Here, the skills gap refers to the disparity between the capabilities that are perceived to be required in Australia and those that are perceived to exist currently in Australia. By necessity, to avoid confusion and unhelpful complexity, the skills gap was surveyed only at the level of thirteen or fourteen initial capability clusters (essentially the same list of clusters), not at the level of the much more numerous individual capabilities.

For the TTP participants in the survey, their inputs were collected through two different means: an online survey, and a manual entry that was collected at KCA's 2015 annual conference. In both cases, the questions put to the TTP were the same.

The survey questions for the TTP participants are presented in **Appendix4**.

In the case of the stakeholders, targeted phone interviews were conducted on a one-on-one basis, supported by an online survey with the same questions for those unable to attend interviews. This was useful as it provided different perspectives from those of the TTP. Refer to **Appendix5** for a description of the stakeholder interview questions.

The survey data from the TTP and the stakeholders was analysed and reviewed to assess:

- capabilities missing from the draft capability framework
- that the capabilities were not simply tasks or evidence of those capabilities
- that the language and perspective used was consistent for TTP and their stakeholders
- that the grouping of capabilities into capability clusters and sub-clusters were accurately represented priority areas for TTP

Based on the project research and drafts of the capability framework, the framework that was considered to be most appropriate for the final framework was one that partitioned the capabilities under two tiers of clusters, namely clusters and sub-clusters, and in addition the capabilities were also partitioned under three career seniority levels that were considered in the surveys, defined as follows:

- Early Career TTP: Generally has less than 3 years technology transfer experience. Responsibility for one's self; being part of a team, not leading a team; working within guidelines and policies developed by others.
- Mid Career TTP: Responsible for a team, such as a project team; leading a project; scope for discretion, judgment and decision-making regarding a project.
- Senior TTP: Responsible for leadership of the TTO and/or interacting directly with the senior leadership of the parent organisation of the TTO; having responsibility for the overall policy, budget, resourcing and staffing decisions of the TTO.

PROJECT RESULTS

Summary of Literature Review

An early deliverable in the current project was a self-contained report specific to the literature review, and this is reproduced herein as **Appendix3**. This current section summarises the key findings of that review. These findings significantly affected the inputs and conduct used in the workshops, surveys and interviews later conducted during the current project:

- Although the review gave a detailed picture of the work that is conducted by TTP, it did not convincingly provide the definitive and complete picture. This deficiency existed partly because the information available referred to a sample of TTO and similar organisations which was not convincingly representative of the full population of such organisations, and also partly because the very nature of the technology transfer sector means that some of the information may have been outdated; the sector is relatively new and dynamic.
- The TTP activities described in the position descriptions and organisation charts were not described in uniformly-consistent terms across the various TTO. Most obviously, some TTO have a large number of people – dozens – designated as doing this work, while others have only a handful. The larger TTO characteristically have much more specialisation of tasks, while the smaller TTO are more likely to have people multitasking and more likely to outsource specialist work, such as for specialist legal advice. The TTO vary in other fundamental respects. Numerous versions of job titles exist for similar positions. Organisational structures, reporting lines and relationships (formal and informal) with stakeholders all vary considerably.
- In addition, it was noted that a fundamental factor such as the TTO's mission can affect knowledge transfer work in different ways between TTO; the primary emphasis on innovation might be economic at one TTO and be for broader social benefit at another. Through this review process the project team determined that even the very name of this type of work is not agreed: wording and phrases such as knowledge transfer, innovation, commercialisation and entrepreneurship feature in titles and appeared to be used interchangeably. This is not to argue that rigid uniformity is necessary, but the current piecemeal approach clearly needs attention if the sector is to respond effectively to increasing pressure from stakeholders and developing national government innovations policy. This situation clearly supports an argument for the professionalisation of the knowledge transfer sector.
- No uniform career structure or progression pattern or career path exists for TTP. This deficiency was particularly clear in the case of university TTO for which a clear contrast exists in these career parameters between those for TTP and those for academics and general administration staff.
- The work conducted by TTP is highly valued. One reason for this, especially in recent times, is that such work is perceived to be a fundamental contribution to national economic prosperity and competitiveness. However, according to recent Government policy announcements, the work of TTP in Australia is often not done well when compared with accomplishments in other comparable countries.
- Finally, the literature on knowledge transfer contains very little about those who work in the TTO of universities or similar publicly-funded R&D organisations, particularly in the Australian context. Instead, the focus in the literature is on entrepreneurial academics or on managers of innovation start-up companies.

As well as being valuable to the subsequent conduct of the current project, these findings strongly support the rationale for the project.

Research Participation Numbers

Research participants included TTP individuals and stakeholder individuals (either internal or external stakeholders). Those individuals who attended the workshops were not the same persons who later participated in the surveys, except for eight persons (seven TTP and one stakeholder) who participated in both a workshop and a survey.

Stakeholders were surveyed mainly by targeted phone interviews (27 stakeholders) while the remainder responded via online survey (4 stakeholders).

Appendix1 lists the names of the organisations that contributed one or more members as individual participants in a project workshop or a survey or both. Individual participants listed their affiliation to one organisation only.

Numbers for participation are:

- Total number of individual participations in a workshop or survey/interview = 134, made up of:
  - Total number of persons participating only in 1 workshop or 1 survey/interview = 126
  - Total number of persons participating in both a workshop and a survey/interview = 8
- Total number of organisations represented by the persons participating = 64

The breakdown of the numbers for participating persons is as follows:

- Workshops: Total persons = 53 , made up of:
  - Workshops: Total TTP persons = 43
  - Workshops: Total stakeholder persons = 10
- Surveys/Interviews: Total persons = 81 , made up of:
  - TTP Survey; Total TTP persons = 50
  - Stakeholder Survey/Interview: Total stakeholder persons = 31 , made up of:
    - Number of external stakeholders = **22**
    - Number of internal stakeholders = **9**

It should also be noted that the 50 TTP survey participants were reasonably well distributed across the three seniority levels (early career, mid career, and senior level); **Figure 11** shows the distribution.

Each stakeholder respondent was asked to comment and rank their last interaction with a TTP. These comments and rankings were recorded against capabilities for specific career levels (i.e. Early Career, Mid Career and Senior).

Figure 12 illustrates the distribution, as follows:

- Only 4 % of stakeholders (i.e. one stakeholder) assessed an Early Career TTP; this may infer that early career TTP have very limited interaction with stakeholders.
- 48 % of respondents assessed a Mid Career Technology Transfer Professional and
- 48 % of respondents assessed a Senior Technology Transfer Professional.

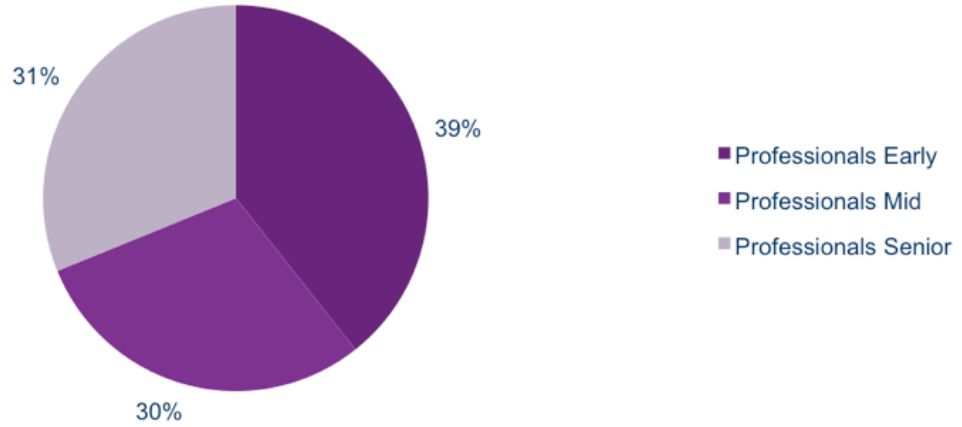

Figure 11. Distribution of surveyed TTP across the three career levels

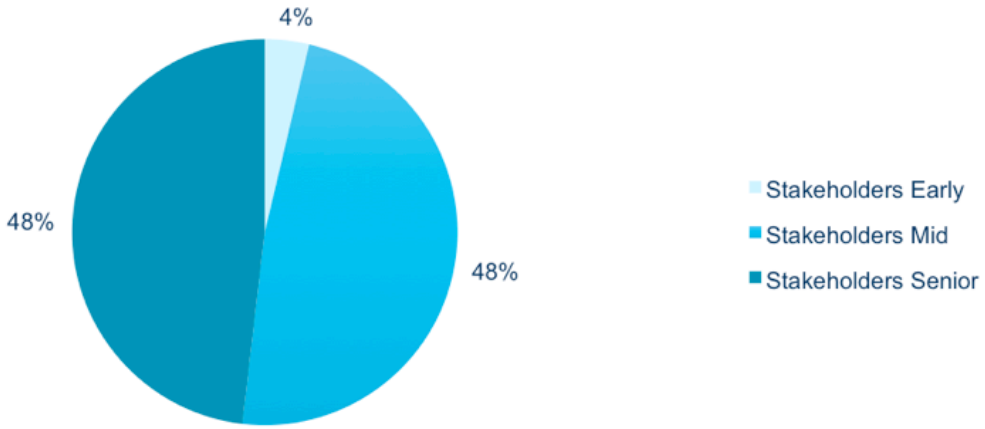

Figure 12. Distribution of surveyed Stakeholders across the three career levels

Identification and Analysis of Initial Set of TTP Capability Clusters; Skills Gap

During the course of the current project, and prior to the creation of a final detailed capability framework, the following elements of the project effectively proceeded in parallel:

- Consideration of TTP capabilities generally that were perceived to be required, leading to the identification of an initial set of capability clusters. After minor changes to a first draft set, an initial set of fourteen clusters was chosen.
- Identification of the "skills gap" using this initial set of capability clusters. The skills gap is the disparity in Australia between the TTP capabilities perceived to be required and the TTP capabilities perceived to be existing (at the level of the initial capability clusters, not at the level of the later detailed list of final capabilities).
- Creation of a high-level (basic) capability framework consisting of capability clusters and capability sub-clusters, together with a definition of the sub-clusters.

The results of these elements of the project are presented in the sub-sections immediately below.

The Initial Set of Capability Clusters

Through the national workshops, a large number of capabilities were identified across all three TTP seniority levels (early career, mid career and senior-levels). The following initial set of fourteen capability group headings, referred to as "capability clusters", were chosen, at least tentatively, as being suitable to accommodate the large number of TTP capabilities. This set was also used to identify the skills gap.

- Business Acumen and Analysis
- Communication and Influence
- Culture
- Information Technology
- Social Media
- Intellectual Property (IP)
- Knowledge Transfer
- Legal
- Marketing and Relationships
- Organisational Administration and Development
- Qualifications and Experience
- Strategy and Results
- Student Entrepreneurial Development
- Teamwork

TTP Job Titles

During the course of the project, it became clear that the language terminologies relevant to describing the technology transfer sector were far from uniform, even if interest is focused only on Australia. A leading example of this lack of uniformity exists in the various job titles used for TTP. These job titles were identified through KCA's contact database, parts of the literature review (particularly job profiles and job advertisements), the workshops, and the TTP survey.

For example, TTP who are responsible on a daily basis for core technology transfer activities at early career and mid career seniority levels are variously referred to as Business Development Managers, Commercialisation Managers, IP Managers, Business Liaison Officers, Commercial Engagement Managers, etc.

Consequently, significant effort was made in the project workshops and surveys/ interviews to ensure that participants appreciated that the lack of uniformity in terminology required their attention. It would have been inefficient in the current project to attempt to establish uniform terminologies, but it was possible in the case of TTP job titles to partition the TTP roles under ten headings in order to reduce confusion for the project participants. (Note that these headings of job role areas are not capability clusters.)

The following list shows the ten headings and it also provides in each role area some indication of the three seniority levels (senior, mid career and early career)

- Business Development: Manager/ Officer
- Marketing: Manager/ Officer/ Coordinator
- Executive: Officer/ Secretary/ Assistant
- Finance: CFO/ GM/ Manager/ Officer
- Commercialisation: IP Director/ Deputy/ Manager/ Technology Senior Manager/ Senior Officer
- Projects: Senior Manager/ Manager/ Officer
- Engagement: Senior Director/ Director/ Associate Director/ Senior Manager/ Manager
- Relationships: Manager
- Law: Senior Counsel/ Legal Counsel/ General Counsel/ Lawyer/ Contracts Lawyer/ Contracts Manager/ Executive Manager
- Business and Innovation: Senior Director/ Director/ Deputy/ Manager

A Fundamental TTP Perspective ~ Generarting Income versus Relationship Building

Creating an initial set of capability clusters required firstly that general factors influencing the choice of capabilities be considered.

It was assumed that TTP in Australia would perceive their role and work priorities in the light of their TTO's philosophy on knowledge transfer regarding the importance of generating financial income from the activities of the TTO. Globally, it was already known that some TTO consider financial income to be very important while other TTO place more emphasis on the achievement of less tangible returns on effort, such as creating new or enhanced relationships for the long-term welfare of their larger parent organisation. The TTP attitude towards this issue can be described as being across a spectrum in which the range of focus can be broadly described as 'to generate an income' or 'to generate relationships'.

The TTP survey (**Appendix4**) captured the views of TTP regarding this issue, as follows:

- 9% of respondents identified with the statement "Commercialisation is seen as a way of generating income for the organisation"
- 37% of respondents identified with the statement "Commercialisation is seen as a way of generating relationships with industry and other stakeholders"
- 45% of respondents identified with the statement "Commercialisation is seen as a way to generate both income and relationships"
- 9% of respondents were unable to articulate their TTO's philosophy on knowledge transfer. This may suggest an unclear position by the TTO or inconsistency in communication of the knowledge transfer strategy.

Regardless as to how these results may be interpreted, it was nevertheless clear that for Australian TTP considered as a sector, the TTP regarded work outcomes that were not distinctly financial as being a significant component of their work.

TTP views were across the spectrum, as reflected in **Figure 13.**

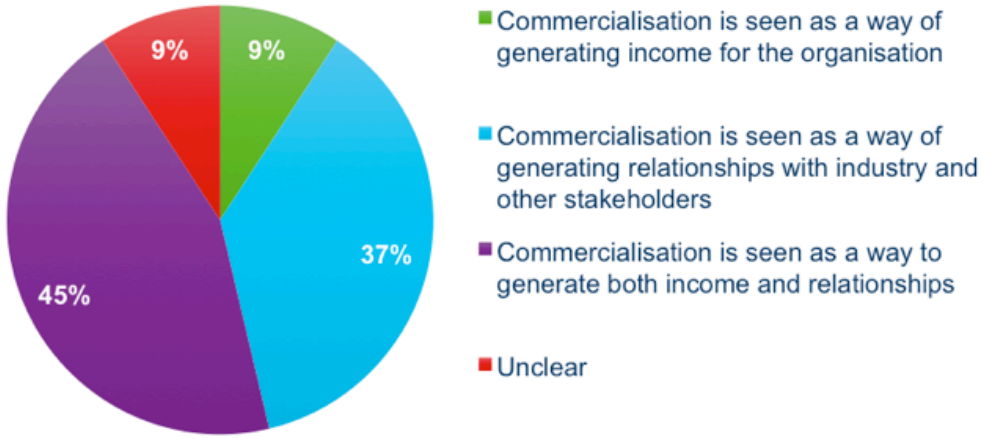

Figure 13. TTP response to the survey question "What would you say your organisation's philosophy of commercialisation is?"

TTP Ranking of Some Key Draft Capabilities

TTP were asked (**Appendix4**) to rank some draft capabilities (or potential capability clusters) that they felt were either critical, important, unimportant, or irrelevant to the role of Technology Transfer Professionals. The results are tabulated in **Table 1**.

It can be seen that the highest ranking capability of importance for TTP was Strategic Thinking with 73% citing it as critical and 27% deeming it to be important. The second highest rating capability of importance to TTPs was that of resilience: 64% of TTPs surveyed deemed it to be a critical capability for success and 36% stating it is important. Ability to adapt to change and strong project management skills were also ranked highly by the surveyed TTP.

Table 1. TTP Survey question results "Rank the following capabilities according to importance for a Technology Transfer Professional"

Answer Options (Draft Capabilities)	Critical	Important	Unimportant	Not relevant to the role	Response Count
Ability to identify opportunities and think strategically	**73%**	27%	0%	0%	45
Resilience	**64%**	36%	0%	0%	44
Ability to adapt to change	**61%**	39%	0%	0%	44
Commercial Entrepreneurial experience	19%	**69%**	12%	0%	43
Commercial/ Industry experience	23%	**70%**	7%	0%	43
Project Management Skills and Experience	39%	**61%**	0%	0%	44
Experience conducting Research Projects	2%	**53%**	40%	5%	43

TTP Ranking of Satisfaction and Constraints

TTP were also asked (refer **Appendix4**) to rank their satisfaction against four questions relating to their sense of achievement and level of engagement within their current role. Lack of satisfaction can indicate constraints negatively affecting work performance. The results are presented in **Table 2**.

It can be seen that the majority of those surveyed are satisfied with their sense of accomplishment, their opportunities to engage their skills and their level of engagement with their peers and the wider technology transfer community. The results highlighted concern regarding access to resources to assist the TTP in achieving outcomes.

Table 2. TTP Survey question results "How do your rate the following?"

Answer Options	Excellent	Satisfactory	Poor	Unsatisfactory	Response Count
Your satisfaction with opportunities to use your skills and capabilities in your role	37%	**57%**	4%	2%	46
Satisfaction with your sense of accomplishment in your role	33%	**63%**	2%	2%	46
Satisfaction with accessible resources to accomplish your role	7%	**48%**	**39%**	7%	46
Satisfaction with your overall level of engagement with your peers and the technology transfer community	26%	**59%**	15%	0%	46

Survey Responses Summarised Under Initial TTP Capability Clusters: Skills Gap

Obtaining the views of the stakeholders on TTP capabilities was a very significant part of the project research. As will be seen in this sub-section, their viewpoints were often dissimilar to those of the TTP, and therefore they helped to clarify and enlarge upon the choices made in constructing the capability framework. Further, they were very useful to the identification of the TTP skills gap. Further still, the stakeholders provided invaluable insight relevant to the recommendations made later in this report regarding reducing the skills gap.

The questions involved in the TTP survey are presented in **Appendix4**, and those for the separate similar survey for the stakeholders are in **Appendix5**

The detailed results obtained from collating and analysing data from both surveys is presented in **Appendix6**.

Figure 14 and **Figure 15** form a two-part graphic that summarises the surveyed opinions of the TTP and their stakeholders. The size of each pie in the graphic indicates the number of respondents with the opinion indicated at the left. The colours in each pie represent weightings for up to six opinions: up to three TTP opinions (early, mid, and senior TTP) and up to the three corresponding stakeholders' opinions of early, mid, and senior TTP.

Overall, the graphic shows that the top three areas of strength for TTP, when including all survey respondents, are:

- Qualifications and Experience
- Teamwork
- Intellectual Property

Overall, the graphic also shows that the top three areas for improvement or need for development for TTP, when including all survey respondents, are:

- Business Acumen
- Communication and Influence
- Social Media

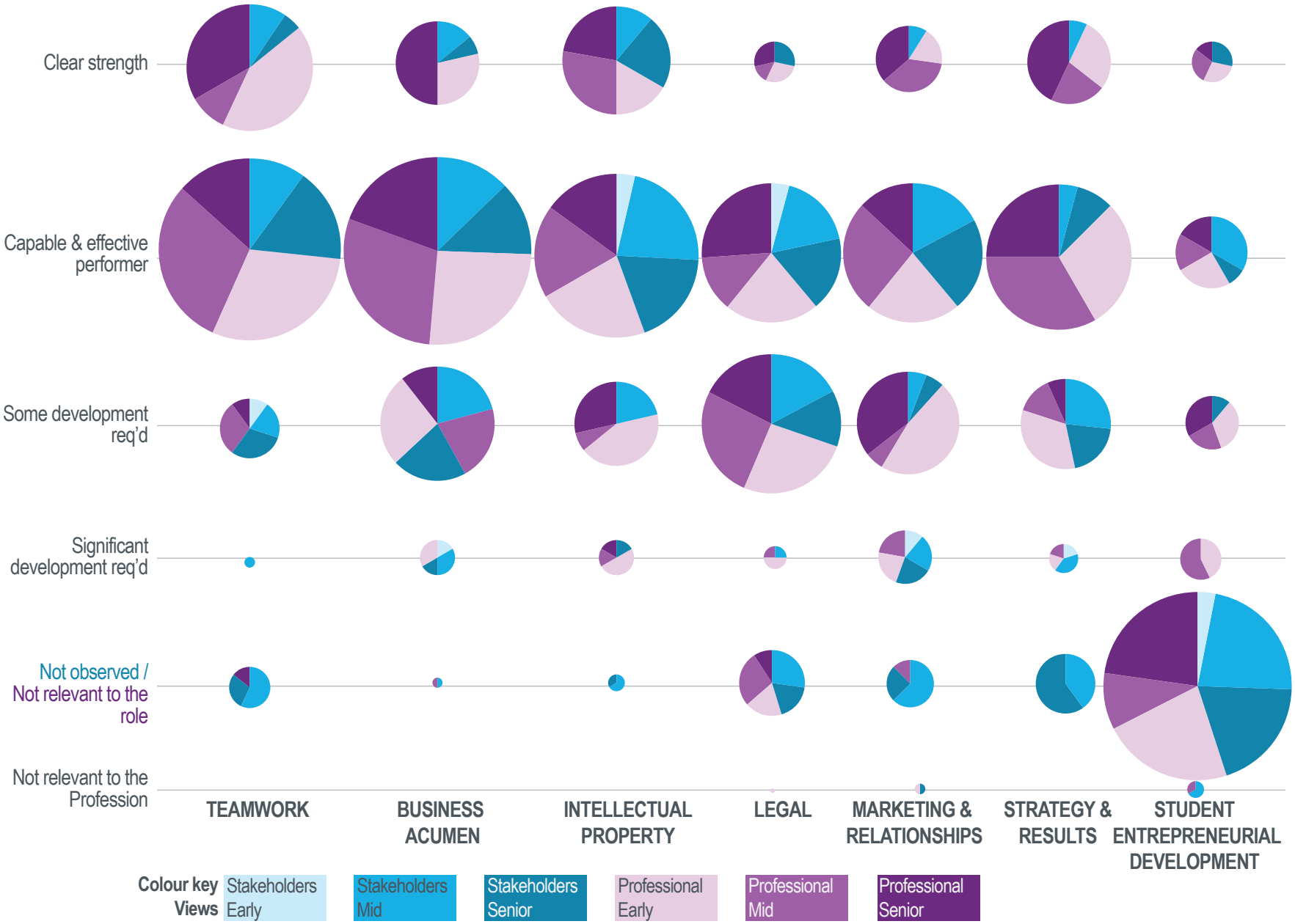

Figure 14. Part 1 showing TTP and Stakeholder interviews/survey results combined across the intiial Capability Clusters for 7 of 14, refer to part 2 for the other 7.

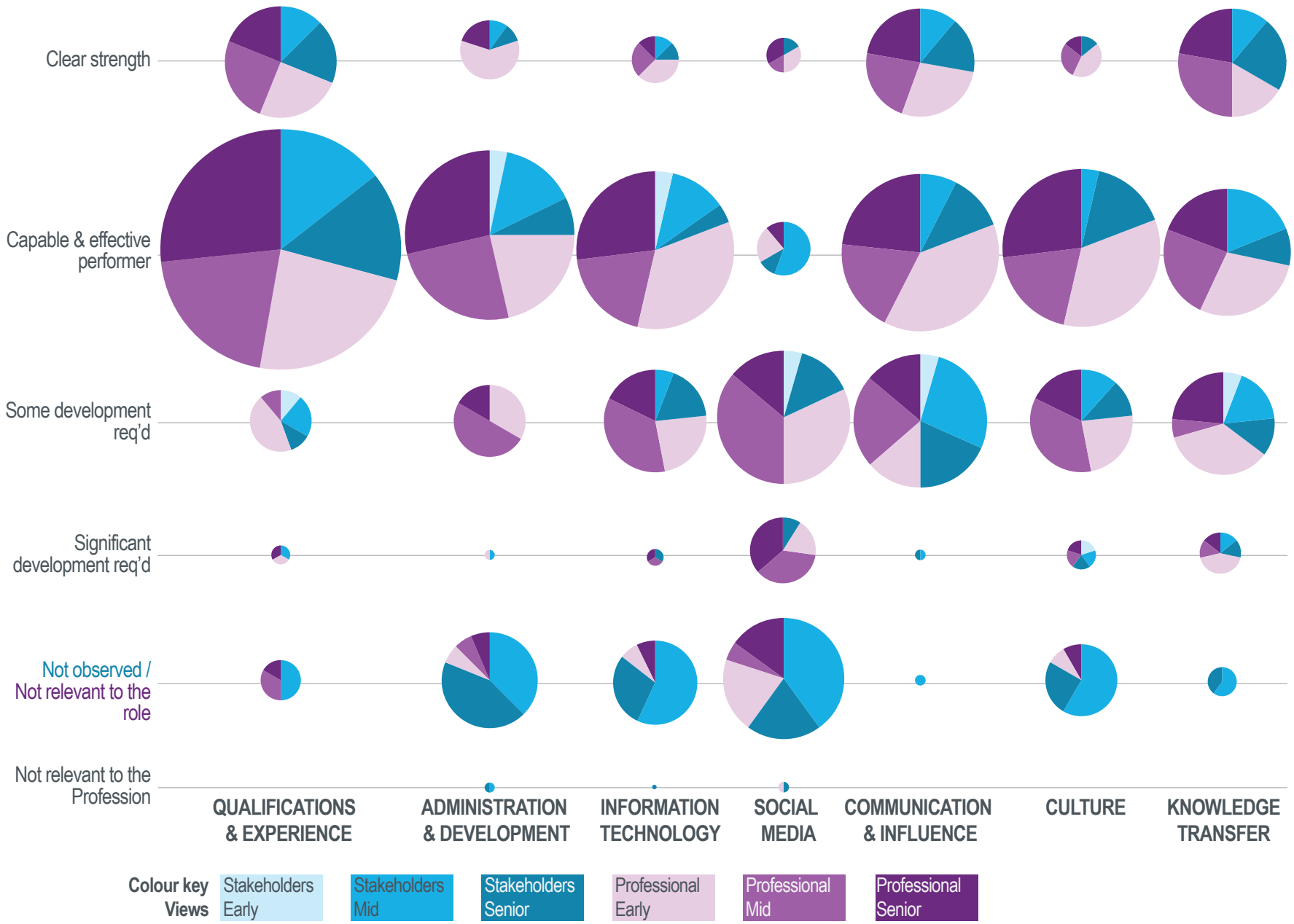

Figure 15. Part 2 showing TTP and Stakeholder interviews/survey results combined across the intiial Capability Clusters for 7 of 14, refer to part 1 for the other 7.

Some of the results in the graphic can be presented differently to show how TTP viewed themselves, and directly compared with how their stakeholders viewed them.

The results are listed immediately below and are also presented as "Star Graphs" in **Figure 16** and **Figure 17**, due to the larger number of TTP over the number of stakeholders surveyed, the TTP number of responses was normalised.

TTP views:
TTP saw themselves as most strong in:

- Teamwork
- Qualifications and Experience
- Business Acumen
- Communications and Influence, and
- Strategy and Results

Yet, needing most development in:

- Social Media
- Legal
- Marketing and Relationships

Stakeholder views:
By contrast, their Stakeholders viewed the biggest strengths of the TTP to be in:

- Intellectual Property
- Qualifications and Experience
- Knowledge Transfer

Yet needing the most development in:

- Business Acumen
- Communications and Influence
- Strategy and Results

Skills Gap

The capability clusters perceived to require the most development represent the skills gap. Interestingly (but perhaps not completely surprisingly), each of the three clusters identified by the TTP as a skills gap is different from any identified by the stakeholders. This report takes the view that these different viewpoints are complementary, not conflicting. Consequently, all six of the capability clusters are considered to represent the skills gap.

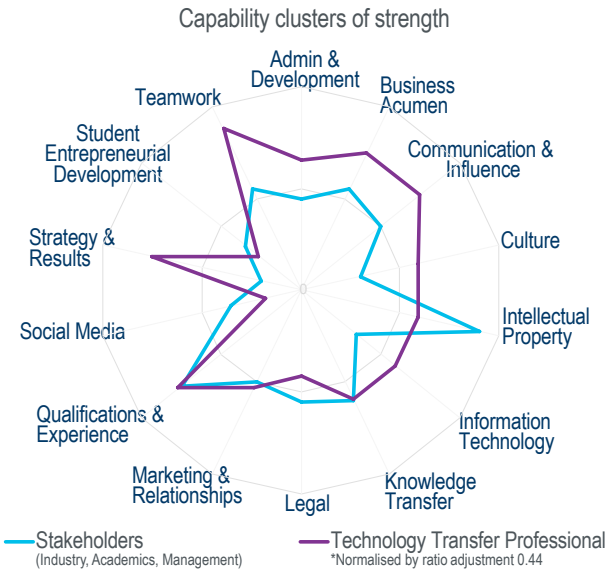

Figure 16. Strength capability clusters for TTP, contrasting Stakeholder and TTP views.

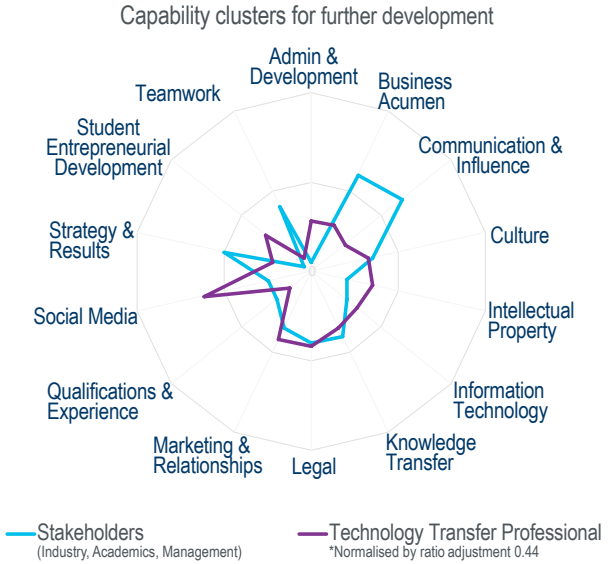

Figure 17. Further development capability clusters for TTP, contrasting Stakeholder and TTP views.

Stakeholders' Additional Comments

Some representative comments received from stakeholders during the conduct of this project are shown in **Figure 18**. Overall, in comments beyond those specifically for the survey questions, the stakeholders saw the role of a Technology Transfer Professional as challenging given the academically-inclined culture of the R&D organisations in Australia, the inherent globally-recognised difficulties involved in technology transfer generally, and perceived resource limitations for TTOs. Generally, stakeholders identified a need for:

- More clarity in communication,
- More focus on having a clear technology transfer philosophy within each TTO,
- Improved initial market research and market positioning of technologies,
- Greater experience across a breadth of business and social environments,
- Culture alignment with industry,
- Review renumeration structures, consider incentive based models.

Stakeholders did not view Technology Transfer Professionals as conducting 'true commercialisation', alluding to the incomplete or peripheral nature of most commercialisation efforts by TTOs. Nevertheless, stakeholders viewed TTP as often being catalysts for creating useful partnerships between R&D organisations and business entities. Given this perspective, several external stakeholder respondents indicated they wanted to be treated as partners, in the truest sense, and to have recognition for the level of risk which they were undertaking in order to progress with implementation of the innovation.

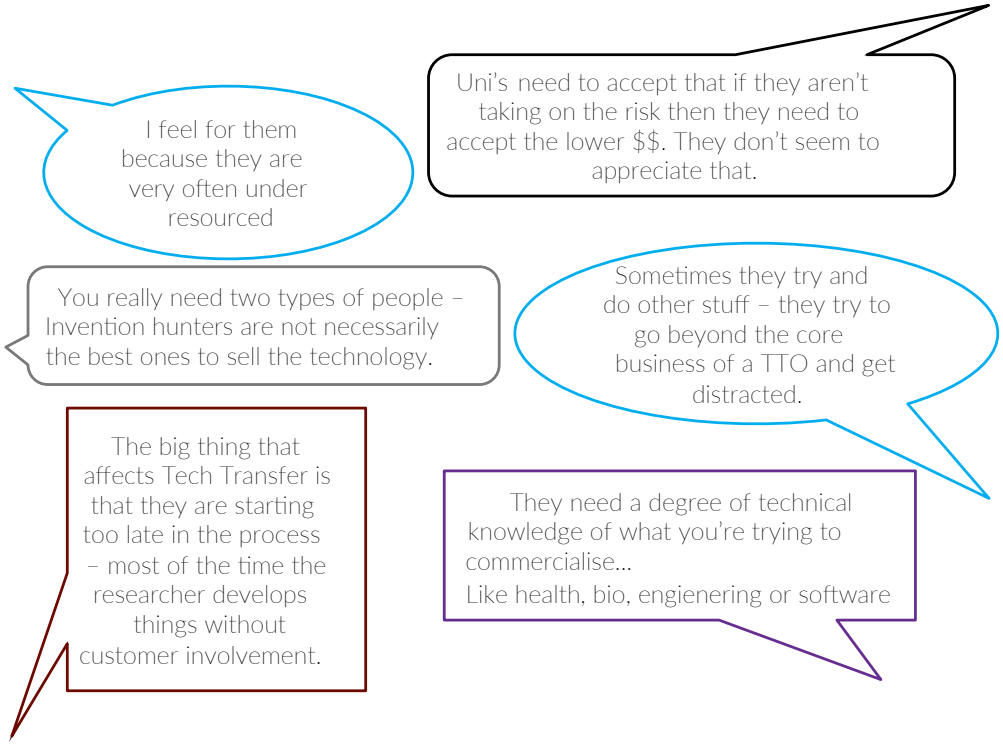

Figure 18. A selection of comments taken from the Stakeholder interviews

TTP CAPABILITY FRAMEWORK

Basic TTP Capability Framework

In the process of developing the final detailed version of the TTP capability framework, an intermediate much less-detailed framework was first produced, herein referred to as the high-level, or basic, TTP Capability Framework. This high-level capability framework does not contain a listing of the TTP capabilities; instead it contains group headings (herein called "clusters") and sub-headings ("sub-clusters") for the capabilities, and a brief definition of the sub-headings (sub-clusters).

The data collected in the current project from TTP and their stakeholders allowed for the development of both the basic and the detailed TTP capability frameworks. This present sub-section of the report focuses on the basic framework. The following sub-section herein describes the final Detailed TTP Capability Framework.

In part, the basic framework evolved from the initial set of fourteen capability clusters that were chosen and which were based mainly on the views collected from the project participants. The fourteen initial capability clusters were regrouped into seven capability clusters and numerous sub-clusters as shown in **Figure 19** and **Table 3**, in a manner which follows that in the APSC Job Family Model.

As a result, the major changes to the initial set of fourteen capability clusters were:

- 'Qualifications and Experience' was absorbed across the framework, acknowledging that possession of a degree or working industry experience provides evidence for being competent, rather than those attributes being actual competencies.
- 'Student Entrepreneurial Development' was re-imagined more generally under "Entrepreneurial Development" to acknowledge that it was not just students for whom these competencies were required.
- Other initial capability clusters became sub-clusters (rather than clusters), for example "Teamwork" was replaced by the sub-cluster "Collaboration" within the cluster "Culture and Relationships", while "IP" was included in the sub-cluster "IP and Compliance" within the cluster "Legal".

The clusters are not intended to directly represent tier 1 ("Job family") of the APSC Job Family Model (refer the earlier section under Project Methodology), and the sub-clusters are not intended to directly represent tier 2 ("Job function"). However, the same type of four-tier consideration was used in choosing the two-tier arrangement of clusters and sub-clusters shown in the diagram and table below. This approach is entirely consistent with the guiding principles of the Job Family Model.

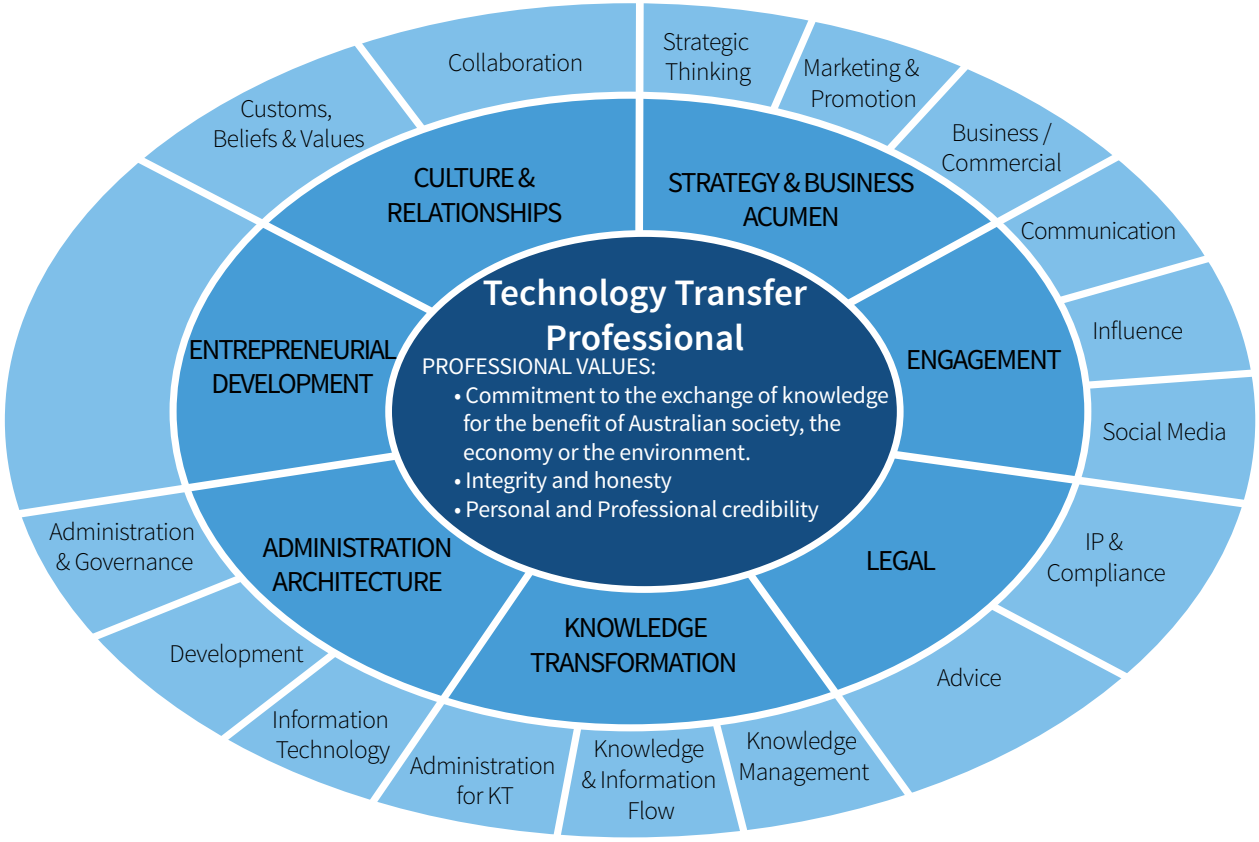

Figure 19. High level view of the TTP Capability Framework illustrating at its core the TTP values and surrounded by the capability clusters and sub-clusters.

Table 3. The basic TTP Capability Framework

KNOWLEDGE / TECHNOLOGY TRANSFER		
Professional Values		
The capabilities for professional knowledge transfer are underpinned by, and enacted through, several fundamental professional values: ▪ Commitment to the exchange of knowledge for the benefit of Australian society, the economy and/or the environment. ▪ Integrity and honesty ▪ Personal and professional credibility		
Capability Cluster	**Sub-Cluster**	**Definition**
Entrepreneurial Development		Promotes and supports the development of entrepreneurial capability in researchers, R&D administrators and students.
Culture and Relationships	Customs, beliefs and values Collaboration (teamwork)	Shares customs, beliefs and values of the Unit. Works in collaboration with others towards shared goals.
Strategy and Business Acumen	Strategic thinking Marketing and promotion Business/ commercial	Conducts analysis, develops strategy, and transforms strategy into action and results. Translates market knowledge into commercial opportunities and manages promotion Manages budgets, decisions and handling information
Knowledge Transformation	Administration for knowledge transfer Knowledge and information flow Knowledge Management	Administers the efficient capture, storage and dissemination of knowledge. Ensures that information flows efficiently, with objectives of the knowledge transfer in mind. Manages knowledge from its creation or capture through to the completion of the objectives.
Engagement	Communication Influence Social Media	Connects and interacts with others to enable knowledge transfer Networks, negotiates, persuades and builds rapport Uses and supports the application of Social Media to engage non-traditionally
Legal	IP and Compliance Advice	Manages the creation, protection, assignment and enforcement of IP legal rights. Manages IP licensing and other knowledge transfer legal agreements .
Administration Architecture	Administration and Governance Development Information Technology	Manages the performance and enhancement of the Organisational Unit and its work. Conducts professional development, growth, mentoring and coaching Uses and supports the application of information and communication technology

Final Detailed TTP Capability Framework

The final Detailed TTP Capability Framework that was produced during the current project contained without modification all the information presented in the high-level (basic) framework, and it also contained all the capabilities that had been identified and defined.

Capabilities were partitioned under clusters and sub-clusters and further partitioned under the three levels of seniority of TTP chosen for consideration: Early Career, Mid-Career and Senior. The detailed framework is presented in **Table 4.**

Table 4. Final detailed Capability Framework

KNOWLEDGE / TECHNOLOGY TRANSFER			
Professional Values The capabilities for professional knowledge transfer are underpinned by, and enacted through, several fundamental professional values: ▪ Commitment to the exchange of knowledge for the benefit of Australian Society, the economy and/or the environment. ▪ Integrity and honesty ▪ Personal and Professional credibility			
Capability Clusters	**Early Career**	**Mid-Career** In addition to Early Career level	**Senior** In addition to Mid-Career level
Entrepreneurial Development Promotes & supports the development of entrepreneurial capability in researchers, administrators & students	▪Promotes an entrepreneurial culture in the broader organisation: faculties, research staff & students	▪Actively promotes & supports entrepreneurship & commercialisation to partners & potential partners ▪Encourages & enables the development & promotion of start-up businesses ▪Researches, plans, supports & hosts events & activities to develop entrepreneurial knowledge, skills & opportunities	▪Stimulates & optimises a culture of innovation, knowledge exchange & entrepreneurship, by raising the profile of the Commercialisation Unit, developing a mentoring network & facilitating start-ups, programs & funding ▪Develops & promotes best practice application of entrepreneurial-developed IP to maximise its commercial, economic & societal potential

Capability Clusters	Early Career	Mid-Career In addition to Early Career level	Senior In addition to Mid-Career level
Culture & Relationships			
Customs, beliefs & values Shares customs, beliefs & values of the Unit	▪Uses initiative & generates workable solutions to basic work problems ▪Seeks ways to improve own tasks & processes ▪Understands & communicates the value proposition of new ideas to the team ▪Supports culture of action & readiness to commercialise ▪Develops a customer & market focus ▪Adapts to change ▪Behaves honestly, ethically & with respect ▪Demonstrates knowledge of Work Health & Safety Employment Opportunity & complies with associated Organisation policies	▪Fosters continuous improvement & innovation to enhance team efficiency & effectiveness ▪Creates & supports a culture that generates & harnesses innovative ideas, products & services ▪Supports culture change amongst colleagues/ researchers/ management/ students ▪Displays resilience & fosters resilience in others ▪Manages a range of orientations to risk among innovation & commercialisation partners ▪Maintains focus across partnerships for the mission of the institution & the client/ customer/ partner	▪Creates, manages & supports a culture that generates & applies innovative ideas, products & services ▪Creates, manages & supports a culture that embraces risks associated with innovation & knowledge transfer, & that responds & manages this effectively
Collaboration Works in collaboration with others towards shared goals	▪Works well in teams & with others, demonstrating sound interpersonal skills, working collaboratively in sharing & generating ideas, towards common objectives ▪Works autonomously ▪Responds appropriately to conflict & the day to day pressure of work ▪Communicates effectively & openly in the workplace ▪Shares knowledge & information appropriately & participates in activities to facilitate sharing ▪Demonstrates excellent interpersonal skills	▪Builds team commitment ▪Partners with multi-disciplinary teams & diverse workforces both internally & externally ▪Inspires knowledge sharing & capture to enable continuous learning & knowledge creation ▪Navigates complexity & conflict with patience & resilience ▪Manages sometimes disparate expectations	▪Leads & inspires others ▪Provides leadership, training & support to create & maintain high performance teams able to deliver the organisation's strategic objectives ▪Builds diverse & capable teams ▪Demonstrates exemplary emotional, social & interpersonal skills

Capability Clusters	Early Career	Mid-Career In addition to Early Career level	Senior In addition to Mid-Career level
Strategy & Business Acumen			
Strategic thinking Conducts analysis, develops strategy, & transforms strategy into action & results	▪ Works towards set goals ▪ Works to meet deadlines ▪ Analyses situations & solves problems ▪ Maintains & strengthens existing relationships with strategic partners to increase the impact of organisation inventions in society	▪ Understands the relationship between own work & the business strategy ▪ Assesses technological & commercial scenarios ▪ Shapes vision & strategy by setting goals & direction & developing systems & plans to deliver ▪ Scopes & manages projects to deliver results on behalf of team, on time & within budget ▪ Proactively applies strategic thinking to connect partners & opportunities	▪ Integrates systems & organisational structures that support Unit & Organisational initiatives & compliance needs ▪ Contributes to the strategic decisions of the management team & the Board ▪ Provides high level contributions to the management team including the development of Unit/Organisation strategy & annual budgets ▪ Proactively develops high level opportunities in partnerships, networking, policy, resourcing & capacity
Marketing & Promotion Translates market knowledge into commercial opportunities & manages promotion	▪ Understands & applies the basic principles of marketing (eg the 4 Ps) ▪ Plans, designs, develops & maintains marketing strategies (publications, events, seminars, presentations, press releases, divisional newsletters & online & e-marketing strategies) to help meet project objectives with multiple stakeholders ▪ Provides marketing advice & support to the business development team ▪ Maintains an up-to-date knowledge of developments in technology & markets	▪ Manages the creation & dissemination of appropriate content for Unit & Organisation publications, including current methods of promoting new ventures such as social media, student networks & academic forums ▪ Develops innovative marketing & branding strategies & initiatives in conjunction with marketing teams to ▫ raise the profile of the Commercialisation Unit, its work & the value it adds to the Organisation ▫ develop new industry collaborations ▪ Positions the value of the technology/ innovation & communicates its impact	▪ Mentors & provides leadership to achieve the organisation's corporate marketing strategic objective & deliver the implementation plan ▪ Evaluates & validates the marketing of innovation & commercialisation activities
Business/commercial Manages budgets, decisions & handling information.	▪ Demonstrates sound knowledge of business based on experience and/or tertiary study ▪ Demonstrates a sound understanding of the research discipline ▪ Demonstrates a sound understanding of the relevant business & market when proposing solutions to issues or advocating new business opportunities ▪ Reviews the commercial potential of research & communicates the opportunity to management ▪ Considers multiple sources of information & identifies the most appropriate course of action ▪ Analyses & evaluates basic numerical, verbal & graphical data ▪ Works within budgets ▪ Analyses & evaluates complex & ambiguous situations when making decisions, or escalates ▪ Monitors & reports on assessments of, & responses to, identified risks	▪ Seeks additional pathways for funding (such as ARC Linkage grants) ▪ Manages deals being generated by research ▪ Assesses risk & responds appropriately ▪ Delivers value through a deep knowledge of current markets & market trends & connects this to realise commercial opportunities ▪ Maintains new businesses, partnerships or opportunities to optimise company growth ▪ Analyses complex cause-effect relationships & evaluates their impact on the organisation & the wider community & understands the impact decisions will have on the various parties/ players ▪ Manages budgets ▪ Controls costs on behalf of the department/ business unit ▪ Applies business & social models to evaluate & communicate commercial opportunities, & brings together resources to capitalise on the opportunities ▪ Makes difficult, unpopular or sensitive decisions ▪ Makes decisions that create value for the organisation ▪ Navigates ambiguity, complexity & multiple, competing demands	▪ Creates & manages the evaluation & analysis of multiple alternatives according to their business/ social/ environmental impact ▪ Creates & maintains networks of internal & external partners & potential partners of high strategic value to the organisation ▪ Creates new businesses, partnerships or opportunities to optimise company growth ▪ Secures requests for invention from innovation partners & coordinates responses using relationships between the Unit & other entities ▪ Creates budgets ▪ Manages & creates systems for controlling costs of the department/ business ▪ Advises others on navigating ambiguity, complexity & multiple, competing demands to make decisions that create value for the organisation ▪ Negotiates & approves commercial opportunities on behalf of the organisation

Capability Clusters	Early Career	Mid-Career In addition to Early Career level	Senior In addition to Mid-Career level
Knowledge Transformation			
Administration for knowledge transfer Administers the efficient capture, storage & dissemination of knowledge.	▪Retrieves, stores & disseminates knowledge & data effectively	▪Manages & optimises technology transfer & information management systems, raising capital, sourcing government funding, promoting enterprises, completing transactions	▪Appraises the organisational culture with respect to innovation & commercialisation & develops a plan for an effective response ▪Develops & implements information management policies
Knowledge & information flow Ensures that information flows efficiently & with objectives of knowledge transfer in mind.	▪Understands the knowledge & information relevant to their role & the value this brings to the Unit ▪Uses knowledge & information management processes & resources to help achieve objectives ▪Develops & supports processes, tools & standards for knowledge sharing & capture	▪Develops the knowledge & information capacity of the organisation ▪Develops & successfully closes transactions in technology licensing & commercialisation ▪Develops, supports & manages a range of strong relationships & networks that enable knowledge & information flow ▪Transfers deep knowledge of a relevant field, (such as innovation, marketing, commerce, business, science or technology), commensurate with successful work experience and/or tertiary study, to a commercial or social project.	▪Designs & implements processes & systems for effective knowledge & information dissemination
Knowledge Management Manages knowledge from its creation or capture through to the completion of the objectives.	▪Takes responsibility for discrete elements of projects to ensure their timely & efficient completion ▪Manages individual projects	▪Manages knowledge transfer projects from inception through to implementation, using tailored approaches to specific business processes, & constant review of the impact of knowledge & information strategies ▪Pulls together & manages knowledge transformation projects efficiently to agreed completion ▪Manages multiple projects across team	▪Manages multiple project teams ▪Oversees the ongoing creation, execution, resourcing, administration & completion of multiple knowledge transformation projects

Capability Clusters	Early Career	Mid-Career In addition to Early Career level	Senior In addition to Mid-Career level
Engagement			
Communication Connects & interacts with others to enable knowledge transfer.	▪Demonstrates excellent verbal & written communication skills in a clear & appropriate manner ▪Adapts verbal & written communication to engage & persuade a variety of audiences ▪Communicates with confidence	▪Applies superior verbal & written communication skills to persuade or influence a wide variety of audiences ▪Develops, supports & manages a broad range of relationships across the organisation & externally, including partners, prospective partners & others	▪Coordinates the Commercialisation Unit's service delivery & communications with key research managers ▪Applies advanced verbal & written communication skills to persuade & influence a wide variety of high level/ senior audiences, e.g. Board, Government, Media
Influence Networks, negotiates, persuade & builds rapport.	▪Seeks acceptance of ideas using appropriate interpersonal skills & behaviours ▪Gains agreement & commitment from others using negotiation, persuasion & influence in line with authorities & using appropriate interpersonal skills & behaviours	▪Shows superior interpersonal, influencing & leadership skills with a wide variety of audiences, e.g. board, government, industry, media, researchers ▪Persuades & influences others, leading to acceptance or action ▪Negotiates for strategic advantage using appropriate interpersonal skills & behaviours, including external agencies	▪Advocates innovation & commercialisation to a wide range of audiences & decision-makers
Social Media Uses & supports the application of social media to engage non-traditionally.	▪Monitors trends in social media tools & applications ▪Uses social media for marketing, promotion & communication ▪Creates & maintains internal & external networks with researchers, research faculties, industry, financial providers & potential collaboration partners	▪Assists in monitoring presence in social networking sites, posting on relevant blogs & seeding content in social media spaces ▪Helps social media strategies to evolve in a timely fashion by feeding back insights gained from social media monitoring	▪Manages & measures the effectiveness of social media campaigns ▪Advocates for the Unit/Organisation in social media spaces, engaging in dialogue & answering questions as appropriate

Capability Clusters	Early Career	Mid-Career In addition to Early Career level	Senior In addition to Mid-Career level
Legal			
IP & Compliance Manages the creation, protection, assignment & enforcement of IP legal rights.	▪Maintains compliance with the Unit's responsibilities under its IP policy ▪Monitors & reports on patent regulations & procedures in Australia ▪Ensures patent matters are considered well in advance of major gates ▪Ensures the correct & timely payment of patent fees ▪Assists with legal, drafting & management of IP licence agreements, research services agreements & legal & commercial correspondence to facilitate contract compliance ▪Conducts IP due diligence ▪Maintains an accurate & current patent database system ▪Assesses the commercial viability of intellectual property notifications & provides advice on commercial pathways ▪Reviews & drafts documents for the provision of collaborative research services & the commercialisation or transfer of the resulting IP	▪Monitors & reports on patent regulations in the US, EU & other jurisdictions ▪Conducts IP due diligence & signs-off documents ▪Advises Organisation inventors, Business Development Managers, Patent Attorneys & Organisation Licensees during patent prosecution process ▪Makes early identification of potentially valuable IP ▪Provides patent portfolio data reports on patent data, deadlines, forecasts, budget expenditure & reporting metrics. ▪Manages, with legal staff, the administration, monitoring & compliance requirements of contracts related to IP ▪Instructs & manages patent service providers as the primary interface ▪Manages contract administration & compliance in a commercial environment, and/or manages maintenance & improvement of departmental systems & processes in an IP driven business	▪Provides advice to Senior Management on legal aspects of the knowledge transfer work, including IP, compliance & business contractual matters ▪Supports the Senior Management in the development & implementation of a strategic intellectual property/ patent portfolio management team
Advice Manages IP licensing & other knowledge transfer legal agreements.	▪Provides timely, effective, practical advice to the legal team ▪Applies a general understanding of general, commercial, contract & intellectual property law	▪Applies understanding of corporations law & its application to privately held companies ▪Assists in the negotiation of agreements to support the Unit's commercialisation & activities ▪Facilitates provision of sound, practical, strategic legal advice to the Unit ▪Provides broad, high level commercial & legal advice & support to the wider organisation, based on successful work experience and/or tertiary study	▪Oversees systems that ensure the efficient & effective provision of legal advice & diligence for the knowledge transformation work done in the Unit

Capability Clusters	Early Career	Mid-Career In addition to Early Career level	Senior In addition to Mid-Career level
Administration Architecture			
Administration & Governance Manages the performance & enhancement of the Organisational Unit & its work	▪Understands the governance of the Unit ▪Works within authorised & regulatory systems ▪Demonstrates excellent administrative skills ▪Manages records ▪Creates timely, accurate, concise & comprehensive documents in accordance with the relevant standard operating procedures to support the business ▪Initiates, researches & prepares specific data & information ▪Contributes to administration efficiencies ▪Manages complexity: multiple strategies, cross-functional project teams, complex relationships & networks, diverse internal & external clients & working with diverse teams	▪Enables effective knowledge & information architecture, measurement & benchmarking ▪Develops & maintains the Unit's (non-financial) risk management & corporate governance mechanisms ▪Provides governance within the Unit (eg. content, project type or stakeholders) ▪Manages compliance with internal & external audit & regulatory authorities ▪Coordinates internal & external communications between the Unit & its multiple stakeholders, (eg. by representing the project, fielding inquiries & making appropriate referrals) ▪Leads, coaches & mentors staff to ensure compliance with business processes relating to contract creation & records to manage associated risk ▪Manages the provision & administration of data (eg. for company reporting, performance management, & requests) ▪Influences organisational administration to improve efficiencies	▪Provides the governance & direction for the Unit ▪Determines the required personnel & budgetary resources, including preparing annual budgets, forecasts, metrics & targets, from relevant data ▪Manages the Unit records management program in compliance with Organisation policies, best practice & legislative requirements ▪Prepares & presents regular reports to Organisation management, & specific reports/ Board papers as requested ▪Participates as a board member on start-up companies ▪Develops & implements corporate policy
Development Conducts professional development growth, mentoring & coaching.	▪Proactively seeks ways to improve systems & own capability, including self-directed learning & required professional development	▪Coaches & mentors staff to develop administrative capability (eg., writing procedures, providing data, managing knowledge & information, responding to requests, records management, & using the Unit's technology resources)	▪Enables the training & education of all employees in appropriate knowledge & information competencies, including contracting processes & record management
Information Technology Uses & supports the application of information & communication technology.	▪Manages data expediently in an electronic environment ▪Advises on the technical direction of the Commercialisation Unit website	▪Leads initiatives to maintain & improve the Unit database & related knowledge management ▪Manages, supports & creates value from the Commercialisation Unit's technology resources ▪Provides technical direction & support to the Unit's key events & seminars	▪Champions the creation & enhancement of knowledge management systems & processes ▪Manages the Commercialisation Unit software, system requirements, website, & intranet ▪Manages the relationships & collaboration between organisational systems & external strategic ICT suppliers ▪Ensures corporate memory through the input & fidelity of the database ▪Leads & supports initiatives to improve the management of technology committees & the resultant technologies

Some Opinions Received on the Detailed Capability Framework

After completion of the Detailed Framework, criticism of it was sought from a few international organisations with oversight in the technology transfer sector. Two responses are presented below.

"For the individual aspiring technology transfer person I think the framework is great because it helps you to assess what you're doing now and what new level of responsibility you need to take on in order to get to the next stage. It creates more objectivity for career progression and vectors personal development."

Jeff Skinner RTTP,
Deloitte Institute of Innovation and Entrepreneurship Executive Director
&ATTP Chair of RTTP review committee

"The framework is the most relevant that I've seen - and I've seen a few."

Alison Campbell OBE PhD RTTP,
Knowledge Transfer Ireland Director & ATTP Board Member

RECOMMENDATIONS

Background to the Recommendations

KCA is founded on a community of technology transfer professionals. Creation of the final Detailed Capability Framework should provide a catalyst for KCA to determine the requirements within the medium to long term future in regards to Australia's technology transfer sector becoming more professional. The Framework should enable KCA to assess more closely:

- Identification and enhanced understanding of the various TTP stakeholders
- The risks in serving the stakeholders
- Management of the risks
- Professional and ethical obligations of TTP
- KCA's role in establishing a profession
- The model for professionalisation

Recommendations for Implementing the Detailed TTP Capability Framework

Technology transfer offices (TTO) in Australia vary enormously in structure and function. For example, some attempt to have all their functions internal to the TTO, while others outsource capabilities from external entities. The external entities may, or may not, be physically sited at the TTO site.

Regardless, the important point to note here is that these variations in the structure and functions of TTO have little effect on the usefulness of the Detailed TTP Capability Framework.

This is mainly because individual TTP are not required to possess all capabilities within the framework. It is designed to be a broad framework across the entire TTP occupational sector, but one which nevertheless can be used to address various and specific:

- TTO organisational structures, functions, processes, limitations, and objectives
- Team and individual TTP roles, capabilities and limitations

Typically, implementation (use) of the framework involves:

- Engagement of a human resources (HR) team (if available) that has experience with capability frameworks, and preferably also that has experience with workplace development practices and job design.
- Sharing the adopted capability framework and its intended purpose with the wider team and with the internal and external stakeholders.
- Assessment of staff via use of the framework by managers, and self-assessment by those staff members so that they can identify development needs.
- Appreciation by stakeholders that they can use this matrix to understand where an individual's job starts and finishes and what that job involves. Improved understanding of the dimensions of a person's role can improve transparency and improve openness regarding communication and expectation management.

The purposes for using the capability framework differ depending on who is using it, and who they are assessing. Some examples are:

Use by Individual TTP:

- Improve their understanding of what is expected of them at their current career level, and assess what capabilities are required for their progression to the next career level.
- Self-assess against the relevant capabilities and take responsibility for identifying and planning their own development needs and career progression.
- Measure their performance against relevant capabilities and assist them during performance management discussions.
- Understand, and be accountable for, the behaviour required of them and their colleagues.

Use by Stakeholders

- Improve understanding of the dimensions of the TTP role and job accountabilities.
- Use the framework as a communications tool with TTP in order to improve accountability and transparency.
- Provide a benchmark against which capability and performance (both individual and collective team performance) can be measured.

Use by TTO Managers

- Review TTO strategy and prioritise the skills needed across the workforce to achieve identified goals and linking capability to organisational/ team performance; i.e. workforce planning and management.
- Assist with writing or updating position descriptions.
- Identify current skill gaps within the team/TTO.
- Assess current team performance against a well-defined and unbiased set of behaviours, skills and knowledge.
- Develop selection criteria, interview questions and objective measures by which to assess candidates when recruiting.
- Identify learning and development needs (both team and individual).
- Address individual staff development needs and performance & support individual career planning.
- Clarify and communicate behaviours that are expected of team members within their position.
- Identify the capabilities required of themselves as managers.
- Form basis of discussions with internal/ external training providers about course outcomes.
- Use as a tool to demonstrate to stakeholders the breath and scope of work conducted by TTO.
- Develop objective workforce and succession planning.
- Assist with job design and team structure reviews/ design.

Project Action Recommendations

Separate to the recommended activities contained in the section immediately above, the project leads to recommendations for a number of activities that may benefit KCA members in the future. In particular, these recommendations describe how the skills gap may be reduced, and how a more clearly defined career pathway may be developed for Early Career TTP.

Recommendations focused on TTP as individuals:

KCA and similar organisations should be encouraged to bring into existence:

- A Code of Ethics for the TTP individuals
- Targeted professional development education programs and similar training for identified capability gaps eg Social Media
- Development of industry secondment programs
- Formal mentoring programs within the TTO and external to the TTO with industry stakeholders
- A clear definition of the roles and expectations of TTP with increased focus on TTP performance management
- The development of a formal process to engage stakeholders in the performance of TTP via stakeholder feedback

Recommendations focused on TTP as a community (sector): Australia

KCA and similar organisations should be encouraged to bring into existence:

- A Code of Ethics for the TTP sector
- A Technology Transfer Professional Engagement study or survey to be implemented across the sector
- A stakeholder satisfaction survey for the sector
- A salary survey pertinent across the sector

Recommendations focused on TTP as a community (sector): International

The recommendations here are based on feedback solicited by gemaker and received from the Association of Technology Transfer Professionals (ATTP) after completion of the project's Detailed Capability Framework. The ATTP acknowledged that the Framework would be of benefit to the global technology transfer profession. The ATTP considered that it could at least be used as a guiding tool:

- for mid career TTP to use in developing the writing of their case studies as part of the job application process
- for training providers to develop training course material

A future area of work recommended to be conducted for or by KCA in conjunction with the ATTP is to develop the Detailed Capability Framework of the current report into a version suited to a global context, and thereby eventually be made into an Accreditation and Assessment Framework for the Registered Technology Transfer Professional (RTTP) recognition and the courses accredited by the ATTP for the continuing education route.

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APPENDIX 1. LIST OF PARTICIPATING ORGANISATIONS

This Appendix lists the names of the organisations that contributed one or more members as individual participants in a project workshop or a survey or both. Individual participants listed their affiliation to one organisation only.

The only exceptional listing below is that of the "Alliance of Technology Transfer Professionals"; this organisation participated only via making valuable comments on the final detailed capability framework, upon gemaker's request.

(Alliance of Technology Transfer Professionals)

Alternate Futures

3M

Adelaide Research & Innovation

ANSTO

ATP Innovation

Aureae Portae

Aurora BioScience Pty Ltd

AusIndustry

Australian Synchrotron

Australian National University

Big Blue Digital

BioSA

Callaways Executive Selection

Ceramisphere Pty Ltd

CSIRO

Curtin University

Department of Industry, Innovation & Science

Diagnostic Solutions

Dibbs Barker

DST Group

Flinders Partners

Future First Partners

Gardiner Foundation

Griffith Enterprise

Innovative Research Universities (IRU)

Kiwi Net

La Trobe University

Merck

MiniFAB

Monash University

Murdoch University

NearMap

NICTA Limited

Planet Innovation

Pork CRC

Powerhouse Ventures Ltd

Queensland University of Technology

qutbluebox Pty Ltd

Rail Manufacturing CRC

ResMed

RMIT University

Sammitr Australia

Sanofi

Scale Investors

SIRCA

Strategiize

Swinburne Knowledge

Swinburne University of Technology

Telethonkids

University of South Australia

University of Sydney

UniQuest

University of Melbourne

University of Southern Queensland

University of Technology Sydney

University of Western Australia

University of Western Sydney

University of Wollongong

University of New South Wales

UNSW Innovations

UWS REDI

Virtual Power Plant

Wei

APPENDIX 2. ORGANISATIONS DIRECTLY INVOLVED WITH OVERSIGHT OF TECHNOLOGY TRANSFER

Australian or Australasian (in addition to KCA)

Australasian Research Management Society (ARMS)

The Australasian Research Management Society (ARMS) is the professional society for specialists in management and administration of research. ARMS is an international organisation dedicated to the professional development of research managers and administrators, the promotion of the profession of research management and the enhancement of the research enterprise.

Australasian Industrial Research Group (AIRG)

The Australasian Industrial Research Group (AIRG) is the professional body for managers responsible for technological innovation and R&D in companies operating in Australia & New Zealand. The AIRG also has affiliate members who come from public research agencies, universities and service groups, each with interests in R&D and innovation.

AusBiotech

AusBiotech is Australia's Biotechnology industry organisation, working on behalf of members for more than 27 years to provide representation and services to promote the global growth of Australian biotechnology. AusBiotech is a well-connected network of over 3,000 members in the life sciences, including therapeutics, medical technology (devices and diagnostics), food technology and agricultural, environmental and industrial sectors. AusBiotech is dedicated to the development, growth and prosperity of the Australian biotechnology industry, by providing initiatives to drive sustainability and growth, outreach and access to markets, and representation and support for members nationally and around the world.

Cooperative Research Center Association (CRC Association)

CRC Association, a not-for-profit organisation, was established in December 1994. Its members are CRCs, Affiliate and Associate that participate in the Australian Government R&D CRC program. It supports members through, Advocacy for better support for the Program, forums and events, website and resource materials **(29)**. The CRC program supports industry-led collaborations between researchers, industry and the community **(30)**.

LES Australia and New Zealand (LESANZ)

The Australian chapter of Licensing Executives Society (LES) was established in 1974 to support professionals involved in licensing and transfer of technology (all forms); Technology development, acquisition and transfer; Copyright licensing (industrial and cultural); Trademark merchandising; Franchising and distribution of goods and services and Protecting and valuing intellectual property **(24)**.

Manufacturing Excellence Taskforce Australia (META)

Manufacturing Excellence Taskforce Australia (META) is the first national, cross-industry innovation network established to nurture the art of manufacturing for the future growth of the sector. META is a collaborative network of high potential manufacturing businesses and researchers aiming to advance Manufacturing.

International

Association for University Research and Industry Link (AURIL)

The Association for University Research and Industry Link (AURIL) is a professional association representing 1600 practitioners involved in knowledge creation, development and exchange in the UK and Ireland **(27)**. They have developed a Professional Development framework for Business & Community Engagement (BCE) in partnership with Jisc (a digital technologies services not-for-profit organisation for UK teaching, learning and research). A BCE is described as an emerging profession, and is broadly defined as the management of partnerships and the delivery of services to externals including knowledge and technology transfer, workforce development and support for student employability and community engagement. They describe the BCE practioner as "working across disciplines and acting as translators and boundary-spanners inside their organisations and with external stakeholders, whether in business, public, third or community sectors" **(28)**.

Association of European Science and Technology Transfer Professionals (ASTP-Proton)

Association of European Science and Technology Transfer Professionals (ASTP-Proton) is a founding member of the ATTP – a pan-European association for professionals involved in knowledge transfer between universities and industry. ASTP-Proton has more than 800 members, covering 41 countries **(19)**.

Association of University Technology Managers (AUTM)

Association of University Technology Managers (AUTM) is a founding member of the ATTP. Based in the US it has a global network of members that come from more than 350 universities, research institutions, teaching hospitals and government agencies as well as companies involved with managing and licensing innovations derived from academic and non-profit research **(19)**.

Licensing Executives Society (LES)

An international organisation that operates with chapters across the world **(25)**, there is an Australian Chapter - LES Australia and New Zealand (LESANZ) **(24)**. One of their initiatives is the Certified Licensing Professionals (CLP) **(21)**, a program that recognises professionals who have demonstrated their experience and proficiency in the licensing and commercialisation of intellectual property.

European Knowledge & Technology Transfer Society (EuKTS)

European Knowledge & Technology Transfer Society (EuKTS) provides an accreditation and certification system, originally funded by the European Commission during 2007 – 2013 **(26)**. The accreditation is for training providers and course, whilst the certification is for individuals. They have developed a framework which includes a Curriculum, based on eight core competencies, that they believe to be necessary for all practitioners, irrespective of the country or sector in which they operate.

PraxisUnico

PraxisUnico is a founding member of the ATTP, a UK-based not-for profit organisation set up to support innovation and commercialisation of public sector and charity research for social and economic impact **(19)**.

Swedish Network for Innovation and Technology Transfer Support (SNITTS)

A member of the ATTP, SNITTS is an association for those engaged in knowledge and technology exchange (Technology Transfer) in Sweden **(19)**.

Southern Africa Research and Innovation Management Association (SARIMA)

A member of the ATTP, SARIMA is a membership association for institutions and persons engaged in advancing research and innovation management in South Africa **(19)**.

TechnologieAllianz

A member of the ATTP, TechnologieAllianz is the commercialisation network for German academic inventions and combines patent marketing and technology transfer agencies in a single network, and offers professional technology transfer at the interface between science and marketplace **(19)**.

University Network for Innovation and Technology Transfer (UNITT)

A member of the ATTP, UNITT – Japan promotes development of partnerships between academia and industry, maintaining a close partnership between institutions of higher learning, Technology Licensing Organisaitonss, and the individuals and institutions that support their activities **(19)**.

Üniversite Sanayi İşbirliği Merkezleri Platformu (ÜSİMP)

A member of the ATTP, ÜSİMP supports a range of university-industry co-operations in Turkey and works with its members aspiring for a more professional level of co-operation. Its core focus is on universities, training, and promotion of the transfer of new technologies into society **(19)**.

APPENDIX 3. LITERATURE REVIEW

Introduction

This literature review provides information essential to the design and development of the workshops and interviews, and forms an important component of the current study commissioned by KCA. In short, there is very little literature on what people who work in knowledge transfer do, and more, but not enough, on how knowledge transfer works. Most of the literature on research in the area addresses cases in specific industries or firms or universities. However, much of this is not yet generalisable to a great extent, or addresses broader policy scopes like National Innovation Schemes and the contribution of innovation to national economic policy and competitiveness, which are beyond the scope of the present project (for example, see Collier, 2007). There is also some work in the literature on the lack of consensus over competing theoretical, methodological and policy frameworks and assumptions, which are also beyond the scope of the present project, except as a cautionary note about agreement among those who study this area.

Rationale for commercialisation

There is a clear case for the importance of the commercialisation of Australian knowledge, innovation and entrepreneurship that is longstanding and widely endorsed (for example, Melvin, 2001; DEST 2002; The Allen Consulting Group 2004; Mazzarol 2014). Rationales include national economic competitiveness, commercialisation of research for the public good, closer ties between universities and industry, to reward and recruit university researchers, and university income (DEST 2002, p.47).

Australian research is broad in scope. For example, in 2014-15 there are 35 active Cooperative Research Centres (CRCs) operating in Australia, which cover agriculture, forestry and fishing, manufacturing, mining and services (Australian Government 2015). However, Australian research is more concentrated organisationally. The four main types of organisations where Australian R&D takes place are higher education (mainly universities), business enterprises, government agencies, and private not-for-profit organisations (e.g. independent medical research institutes); however, their contributions to the total are not even. Compared to similar economies, Australia has a lower percentage of researchers working in business enterprises but a relatively high percentage working in higher education (Pettigrew 2012). This means business has a greater reliance on public sector research than many comparable economies, and in turn there is pressure on universities to produce commercialisable outcomes.

Indeed, the current national governments in Australia and the UK, at least, have signalled even greater pressure on universities to work with industry (Mazzarol 2014; Macfarlane 2015). The Australian Innovation System Report 2014 (Department of Industry 2014) recommends greater collaboration between Small and Medium Enterprises (SMEs) and universities: SMEs to develop a culture that looks outside their own business for research, and universities to develop a culture that provides incentives for researchers to engage with industry. Further, the recently released review of the CRC Programme (Miles 2015) leaves no doubt as to the government's concern with the application of research, to 'achieve the Australian Government's priorities for applied science and research … to put industry front and centre … establishing and supporting industry led and outcome focused collaborative research partnerships between industry and research organisations" (p.9) in just the first two of 18 recommendations. By extension, the focus of the current project on those who enable and effect that commercialisation is warranted and timely.

Competencies

The current project can be seen as part of a belated response to the 2004 report, Building Effective Systems for the Commercialisation of University Research (The Allen Consulting Group, 2004), which was commissioned by two key Australian research stakeholders, the Business Council of Australia and the Australian Vice-Chancellors' Committee. This 110 page report addresses commercialisation of Australian university research as at 2004, and identifies three key areas as needing improvement:

- Enhancing research commercialisation capabilities in universities;
- Building effective partnerships between universities, business and financiers; and
- Addressing areas of market failure requiring government action.

It makes a number of recommendations relevant to the current project which have been included in the checklists of competencies to be used in the project workshops to stimulate and shape discussions. The report argued that a commercialisation entity must be resourced adequately to operate optimally, to allow it to:

- manage the deals it generates
- maintain networks with industry and financiers
- maintain up-to-date knowledge of technology and market developments
- meet the costs of protecting IP
- access specialist services when necessary
- maintain an active presence in research faculties
- access capital to support the development of IP to an investment or customer ready stage.

The commercialisation of knowledge, or the bringing of innovations to market, clearly requires a demanding composite of expertise: knowledge, skills, attitudes and values. For the most part, however, the literature discusses these in relation to entrepreneurial academics and/or of entrepreneurial managers of start-up companies. There is a strong case made for the centrality of academic entrepreneurs, for example, to the successful commercialisation of innovations. In addition to their intelligence and research abilities, they are found to possess necessary entrepreneurial attitudes: typically they are creative, innovative, risk-taking, highly determined and self-confident (Noorlizawati et al 2015). The tacit knowledge of researchers or inventors can be a critical asset in the successful take up by start-up firms (Thorburn 2000). Likewise entrepreneurial managers in the high growth start-up sector need to have 'a blend of personal entrepreneurial attributes, business management skills and experience and knowledge of successful high growth ventures' (Prime Minister's Science, Engineering and Innovation Council {PMSEIC} 2002, p.1).

Sometimes such lists of attributes could be considered not just for an individual academic entrepreneur, but also for the academic and the commercialisation unit staff working hand-in-glove. However, the literature does not provide an equivalent list of attributes for those who would be working in a commercialisation unit to help the academic entrepreneur forge a productive partnership with business.

The list of capabilities given in Building Effective Systems for the Commercialisation of University Research makes it clear that subject matter expertise, a new idea and an entrepreneurial spirit are not sufficient to effectively take research to market. Universities require a critical mass of commercialisation expertise, ideally structured as a commercialisation unit, to enable effective commercialisation. Typical of such lists of capabilities, though more comprehensive than some, is this from the PMSEIC (2002, p.7):

Through analysis of information arising from the Focus Group discussions and personal interviews with experts, the Working Group has identified three core dimensions of the entrepreneurial manager:

- formal business skills
- transferable experienced based competencies
- personal attributes

Formal business skills are defined as those skills usually acquired through formal education either at University, TAFE or through a number of private sector providers. These skills include:

Financial Management

- business planning
- cash flow management
- raising capital

IP Management

- licensing
- IP portfolio management and creation

Marketing and Sales

- market research and analysis
- marketing strategies
- competition analysis
- sales process management

Human Resourcing

- ability to attract, motivate, lead and retain a strong multidisciplinary team

Transferable experienced based competencies are those skills that are normally acquired through on the job training, mentoring and networking. It is through this process that the formal business skills referred to above are effectively and efficiently applied to solve real life business issues.

Personal attributes refer to the personality traits of the entrepreneurial manager. Successful managers demonstrate strong and rapid decision making qualities, handle ambiguity effectively and universally demonstrate:

- perseverance
- courage
- vision
- enthusiasm
- leadership

Note firstly, that expertise in the science or technology of the innovation is not required; the academic individual or team will possess that. Note secondly, the list of attributes above includes not only knowledge and skills, but also attitudes and character traits, which the academic(s) will no doubt possess but which are also needed in the management of the commercialisation enterprise. University technology transfer managers typically embody the characteristics in the list above, typically being highly educated, recruited to the university from business or the public sector utilising these attributes, but are critical of the efforts regarding commercialisation from both university management and state and federal governments (Harman & Stone 2006; Anonymous, 2015, namely unpublished data collected as part of the initial work on this project).

Other findings from research on commercialisation of knowledge and innovation

More than lists of competencies, commercialisation units in universities and other places need to have knowledge of current research into commercialisation and new ventures, which can be used in assessing and guiding prospective commercialisation projects. For example, entrepreneurship and innovation are varied, complex, relationship dependent and context dependent, and need to be understood and managed as such (Hindle & Yencken 2004; Dumay, Rooney & Marini 2013; Plewa 2013). The progression of a project from the putative lab to a business requires adept management of the changing scientific and business agendas (Ireland & Hine 2007). Business, legal and other acumen come into play in many ways: innovation is a necessary but not sufficient prerequisite for a firm's competitive performance (Liao & Rice 2010) and firms often select universities based on expertise and social networks (Collier, Gray & Ahn 2011).

Industrial, social, strategic and entrepreneurial networks enable research, development, and commercialisation. Commercialisation can be supported by commercialisation tasks, facilitating adoption/diffusion, creating markets, and by network actors like customers, users, distributors, investors, associations, organisations and suppliers (Aarikka-Stenroos, Sandberg & Lehtimaki 2014). A common theme is the difficulties and barriers arising from the different cultures of academe and business (Collier, Gray & Ahn 2011). From a psychological perspective, scientists involved in commercial activity commonly adopt a hybrid role identity that typically is primarily academic and secondarily commercial, which has implications for policy, support and management (Jain, George & Maltarich 2009).

The literature is limited

Notwithstanding findings such as those above, there is a common cry that much more needs to be known about the commercialisation of knowledge in Australia. For example, in their recent review of the literature on university-industry relations, Perkmann et al (2013) cite research pointing to several aspects needing attention. **(1)** More needs to be known about whether and in what circumstances engagement leads to research or research leads to engagement, and therefore what policy settings need to be in place. **(2)** Formal mechanisms of commercialisation like patenting, licensing and entrepreneurship are not optimal means of fostering academic engagement, and, rather, in addition to these, universities need to support individual engagement and discretion. **(3)** Business also needs to be skilled in initiating and maintaining collaborations. **(4)** Both universities and businesses need to distinguish between differences in the way researchers work in their fields, such as whether they are working at the frontiers of new knowledge or away from the frontiers, working in large teams or essentially alone, and so on.

Other literatures: Professionalisation

The present project draws on other literatures also. Because the KCA project addresses the matter of the professionalisation of knowledge transfer in Australia, it is part of the wider issue of professionalisation. Professionalism brings with it a number of attendant issues, such as what is meant by the term, the pathways taken by other groups to become recognised as a profession, the codification of practices and standards, ethics and more besides. This is under the purview of the Professional Standards Councils, and an indication for the professionalisation of knowledge transfer can be seen in the recent Professional Standards Councils White Paper: Professionalisation of Financial Services (Sanders & Roberts 2015). The White Paper sets out the scope and content of the documentation for the professionalisation of financial services. It also makes a set of recommendations (p.26), which are instructive for the professionalisation process of the current project:

1. **General recommendations**

- Formally recognise, analyse and respond to internal and external barriers to professionalisation
- Reach general agreement on the definitional elements of professionalisation

2. **Specific recommendations for the industry to consider**

- Negotiate agreement on defining characteristics of professionalism
  - Standards of education and competence
  - Professional standards for advisors
  - Mechanisms for policing
  - Mechanisms for responsibility
  - Mechanisms for consumer protection
- Develop systems to establish obligation at an individual level
- Develop an association or regulation system for all participants
- Develop remuneration practices that incentivise
  - consumer protection
  - professional behaviours
  - no financial conflicts in professional roles
- Separate clearly expected professional and non-professional roles in dealing with consumers (e.g. sales vs. advice)
- Identify and support professionalisation and reach agreement on a self-regulatory entity structure
- Engage positively with a partnership approach to a regulatory environment

Clearly the process of achieving professional status is stringent and comprehensive. This affects the professionalisation of Knowledge Transfer project in two ways. One is that the accrediting body for professional recognition, the Professional Standards Councils, requires documentation and work similar to that completed for the Financial Services sector, set out in Sanders and Roberts' White Paper, above. The other is that among the competencies required of Knowledge Transfer professionals will be those entailed by the White Paper recommendations from Sanders and Roberts, above, or others that are similar. Thus, 'Standards of education and competence' or some wording very close to that will no doubt go into the Knowledge Transfer documentation, but the designated standard of education and competence will need to be demonstrated or held by an individual seeking professional accreditation. This is not to argue that the list in the Financial Services sector documentation (Sander and Roberts 2015) should be neatly transferred to the Knowledge Transfer documentation, but it deserves close reading because of how it is structured and what it contains to make its case for professionalisation. At the least it is arguably a good first approximation and starting

point for discussion. From there it is clear that there is value in setting out such things as standards of education, competence, ethics and behaviour, which is a good case for pursuing the goal of professionalisation.

Other literatures: Existing Competencies in Knowledge Transfer

There are, of course, people who do Knowledge Transfer already in universities and other research places in Australia and elsewhere. The premise of the Knowledge Transfer Professionalisation project is not that this work is not being done and we have to find out what to do. Rather, knowledge transfer work is being done, but not done uniformly and, it would seem from the literature, not done uniformly well. A review of position descriptions and organisation charts for knowledge transfer work in a selection of universities and other public sector research organisations was undertaken as part of the preparation of discussion stimulus materials in the workshops of the current project (Anonymous, 2015). No sources are identified here for this material, as the position descriptions are the property of the organisations concerned, and permission was given to use them as source material on the condition that neither the organisations concerned nor particular positions could be identified, and that the material was to be used only for the purposes of workshopping ideas for competencies applicable to knowledge transfer work.

Two important findings were made from the review of this material. First, it gives a comprehensive and detailed picture of what work is needed in knowledge transfer. It is not necessarily the definitive and complete picture, because the information is drawn from a sample, not the population of organisations, and because the very nature of the field means new possibilities emerge that might require fresh thinking. Also, responses from professional associations, both internationally and locally, were not as forthcoming as expected in time for this review. Further approaches will need to be made, and additional information could expand what is known at this stage.

Second, the work as described in position descriptions and organisation charts is not uniform across institutions. Mostly obviously, some organisations have a large number of people – dozens – designated as doing this work, while others have only a handful. The former group characteristically has much more specialisation of tasks, while the latter is more likely to have people multitasking and outsourcing of specialist work, for example specialist legal advice. Organisations vary in other respects also. Job titles for similar positions, organisational structures, reporting lines and relationships (formal and informal) to the wider university or organisation all vary. Such a factor as the organisation's mission can affect knowledge transfer work in different ways between organisations: the primary emphasis on innovation might be economic in one place and for broader social benefit at another. Even the very name of this work is not agreed: this report has been using knowledge transfer, but innovation, commercialisation and entrepreneurship also feature in other titles. Certainly there is no uniform career structure or progression pattern for this work, and from the documentation reviewed thus far, often not a clear career path for this work within organisations. At least, this is the case (in universities) when compared with those for academics and general administration staff.

Review of this material generated a list for workshop participants of dozens of competencies that were coded into 12 categories:

- Business acumen and analysis
- Communication and influence
- Information technology and social media
- Innovation
- Knowledge transfer
- Legal
- Marketing and relationships
- Organisational administration and development
- Qualifications and competencies
- Strategy and results
- Student entrepreneur development
- Teamwork.

These categories arose from the job descriptions, position statements, organisational competency frameworks and job advertisements reviewed. They are not mutually exclusive; there is some overlap and duplication of competencies according to the original statements. Competencies ranged from incumbents in junior roles to those in senior leadership roles. Examples from the first category on the list, Business Acumen and Analysis, are:

- Works within established budgets
- Creates and manages budgets
- Meets costs associated with the protection of IP.

The final list of competencies will be developed in the workshops from the list described above, and is expected to include some competencies verbatim from the list, some that will have been modified, and others generated in the workshops; not all members of the initial list provided will necessarily find their way into the final set.

Conclusions

In short, several conclusions can be made from a review of the literature addressing the transfer/commercialisation of knowledge/innovation in Australia.

First, this work is highly valued for several reasons, especially in recent times as a fundamental contribution to national economic prosperity and competitiveness. By extension, the people who do this work are valued and their contribution warrants attention.

Second, the process of bringing ideas from research or invention to market is complex, dynamic and requires specialist contributions from several fields. This work and its organisation, resourcing and management across the research-business sector is not done uniformly across Australia, not done with uniform purpose and, according to recent Government policy announcements too often not done well enough in an international context. This is not to argue that rigid uniformity is necessary, but the current piecemeal approach clearly needs attention if the sector is to respond effectively to increasing pressure from stakeholders and developing national government innovations policy. This would support an argument for the professionalisation of knowledge transfer work, by setting out best practice, standards or training and conduct and so on.

Finally, the literature on knowledge commercialisation contains very little about those who typically work in the commercialisation units of universities, or in similar roles in other places of research. The research tends to be on either entrepreneurial academics or on managers of innovation start-up companies. Much more needs to be known about the commercialisation of knowledge in Australia, one strong reason being that key stakeholders including the federal government want much more to be done about the commercialisation of knowledge in Australia. Again, the present project addresses this argument directly.

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APPENDIX 4. TECHNOLOGY TRANSFER PROFESSIONAL SELF ASSESSMENT QUESTIONS

1. Contact details (if you would like the summary of the results please provide)
   - Name
   - Company
   - Email
   - Country
2. Tell us a little about your organisation and you.
   - Current Position Title
   - Department Name (optional)
   - How many people work in your department / office / unit?
   - How many years have you worked in technology transfer?
   - Do you have a specialty (e.g. business, bio, IT, engineering)?
   - What is your twitter handle?
   - How would you classify your level of experience as a Technology Transfer Professional?

Career Level Type Definitions

Early Career Technology Transfer Professional: Generally has less than 3 years Technology Transfer experience.Responsibility for one's self; being part of a team, not leading a team; working within guidelines and policies developed by others.

Mid Career Technology Transfer Professional: Responsibility for a team, such as a project team; leading a project; scope for discretion, judgment and decision-making regarding a project.

Senior Technology Transfer Professional: Responsible for leadership of the TTO unit and/ or interacting directly with the senior leadership of the organisation; having responsibility for the overall policy, budget, resourcing and staffing decisions of the unit.

Competency Mapping of Tech Transfer Professionals (TTP)

The respondent was requested for each of the fourteen capability clusters listed below 1 to 14:

- Provide a ranking:
- An Example of how they demonstrate competency in the area in their current job:

According to the self selection of experience, the relevant competencies required at the career level were detailed alongside the definition and theme as per framework.

Competency Ranking Scale:

Level 4: Expert, This is a clear strength for me

Level 3: I am a capable and effective performer in this area

Level 2: Intermediate, I would benefit from some development in this area

Level 1: Unsatisfactory, I would like significant development in this area

Not relevant to my role: Not relevant to my current role

Not Relevant: Not relevant to the technology transfer profession

1. Business Acumen and Analysis
2. Communication and Influence
3. Culture
4. Information Technology
5. Social Media
6. Intellectual Property (IP)
7. Knowledge Transfer
8. Legal
9. Marketing and Relationships
10. Organisational Administration and Development
11. Qualifications and Experience
12. Strategy and Results
13. Student Entrepreneurial Development
14. Teamwork

15. Rank the following capabilities according to importance for a Technology Transfer Professional
    - Resilience
    - Ability to adapt to change
    - Ability to identify opportunities and think strategically
    - Project Management Skills and Experience
    - Commercial Entrepreneurial experience
    - Commercial/ Industry experience
    - Experience conducting Research Projects
16. Please specify other capabilities that you feel are essential for success as a Technology Transfer Professional
17. In your current position, what constraints are there that impact your ability to contribute to converting of research into commercial outcomes?
18. What would you say your organisations philosophy of commercialisation is?
    - Commercialisation is seen as a way of generating income for the organisation
    - Commercialisation is seen as a way of generating relationships with industry and other stakeholders
    - Commercialisation is seen as a way to generate both income and relationships
    - Other (please specify)
19. What is your organisation's approach to commercialisation / knowledge exchange? Rank the importance, 10 is important and 1 is not.
    - generate revenue
    - generate relationships between researchers and industry
    - generate new inventions (collect more invention disclosures)
    - generate patents (file more patents)
    - keep costs low
    - generate agreements
    - maintain happy and satisfied internal stakeholders (academics, researchers, inventors)
    - maintain happy and satisfied external stakeholders (industry, companies, start-ups)
    - increase brand value of organisation
    - focus on high value technologies
20. How do you rate the following? Excellent/ Satisfactory/ Poor/ Unsatisfactory
- your satisfaction with opportunities to use your skills & capabilities in your role
- your sense of accomplishment in your role
- accessible resources to accomplish your role
- your overall level of engagement with your peers and the technology transfer community
    - Comments:

APPENDIX 5. STAKEHOLDER INTERVIEW QUESTIONS

Interviewee - General Information

1. Date of interview:
2. Interviewee's Name:
3. Interviewee's Job title?
4. Briefly, what are your qualifications and experience?
5. What type of organisation do you work for?
6. What Sector?
7. Which university or Public Research Agencies have you dealt with?
8. Have you engaged with University or Public Research Organisations for any of the following activities?
   - Licensee (external)
   - Research collaboration
   - Consulting
   - New invention disclosure
9. What services do you think Tech Transfer Offices (TTO) provide?
10. What services do you think Tech Transfer Offices (TTO) should provide?
11. When was your last interaction with a Tech Transfer Professional (TTP)? Date or None. If none – why?
12. And who or what organisation were they from?
13. Do you deal with multiple people in TTOs or just one?
14. At what level was the TTP that you engaged with? (according to the career level type definitions provided)

Career Level Type Definitions

Early Career Technology Transfer Professional: Generally has less than 3 years Technology Transfer experience.Responsibility for one's self; being part of a team, not leading a team; working within guidelines and policies developed by others.

Mid Career Technology Transfer Professional: Responsibility for a team, such as a project team; leading a project; scope for discretion, judgment and decision-making regarding a project.

Senior Technology Transfer Professional: Responsible for leadership of the TTO unit and/or interacting directly with the senior leadership of the organisation; having responsibility for the overall policy, budget, resourcing and staffing decisions of the unit.

General questions for comment:

15. Are there skills/ experience or behaviours that you believe are lacking within Tech Transfer Organisations? If so please explain and provide examples
16. How would these skills help in commercialisation of technology?
17. Which Organisations' Tech Transfer Professionals (TTP) do it well and why?
18. Which Organisations' Tech Transfer Professionals (TTP) are not great performers in this space? And why?

Competency Mapping of Tech Transfer Professionals (TTP)

Using the following scale we will ask you to **rank** the individual or organisation on their performance against a series of thirteen competency clusters (described below) for your most recent interaction and provide **comment**.

Competency Ranking Scale:

Level 4: Expert, A Clear Strength

Level 3: Advanced, Capable and effective performance

Level 2: Intermediate, Requires some development

Level 1: Unsatisfactory, Requires significant development

Not relevant: Not relevant to the position

Not Observed: Not observed by the interviewee, if not observed, ask if relevant.

Relevant Not observed, yet still believe to be relevant to the role

19. Which organisation or individual are you ranking?
20. When was this interaction?
21. Business Acumen and Analysis
    Definition: Shows commercial awareness
    Themes: Working knowledge of business; Commercial advice.
22. Communication and Influence
    Definition: Communicates, influences and persuades
    Themes: Communicating; influencing; persuading.

23. Culture

Definition: Shares customs, beliefs and values of the Unit

Themes: Culture of commercialisation.

24. Information Technology and Social Media

Definition: Uses and supports the application of computing and telecommunications technology to create, handle, share and exchange data, information, ideas, pictures and videos

Themes: Information and communication technology; Database; Secure network; Spreadsheet; Social media; Blogs; Wikis; Knowledge management; Social networking.

25. Intellectual Property (IP)

Definition: Manages the creation, administration and commercialisation of IP

Themes: Creation of IP; Administration of IP; Commercialisation of IP; Licensing.

26. Knowledge Transfer

Definition: Transfers knowledge from its creation to its commercialisation, adoption or dissemination. (The change of ownership, application or context of knowledge, from its generation through research, innovation and invention, to its commercialisation, adoption or dissemination)

Themes: Initiative; Improvement; Self-improvement; Evaluation; Culture of innovation; Risk; Knowledge transfer; Knowledge and information flow; Policy compliance; Data management; Research opportunities; Business opportunities; start-up business; Culture of innovation.

27. Legal

Definition: Manages legal and licensing considerations

Themes: Legislation; Risk management; Legal advice; Commercial advice; Licencing; Corporate governance.

28. Marketing and Relationships

Definition: Promotes the value of the work and the collaboration of people doing this work

Themes: Online and e-marketing; Events; Seminars; Presentations; Publications.

29. Organisational Administration and Development

Definition: Manages the performance and enhancement of the Unit and its work

Themes: Activities; Outputs; Outcomes; Impacts; Metrics; Risk; Budgets; Forecasts; Reports; Records; Training; Committee; Coordination; Data; Funding; Grants; Coaching; Mentoring.

30. Qualifications and Experience

Definition: Brings training, education and experience necessary to do the work

Themes: Interpersonal skills; Influencing; Conflict resolution; Professional qualification; Leadership ability; Manage budgets; Attention to detail; Communication skills; Work independently; Resilience.

31. Strategy and Results

Definition: Transforms strategy into action and results

Themes: Goals; Deadlines; Plans; Strategy; Vision; Deliver results; Budgets.

32. Student Entrepreneurial Development

Definition: Supports the development of entrepreneurial capability in students

Themes: Entrepreneurial culture; Start-up business; Creation; Student culture of innovation, knowledge exchange and entrepreneurship; Mentoring; Training.

33. Teamwork

Definition: Works in collaboration with others

Themes: Teams; Interpersonal skills; Conflict resolution; Honesty; Ethical behaviour; Inspires others; Leadership; Team commitment.

APPENDIX 6. SURVEY RESULTS: SKILLS GAP ANALYSIS FROM RANKING OF TTP STRENGTHS AND WEAKNESSES

This Appendix provides the details of the results compiled from both the TTP self-assessment survey and the stakeholder survey on perceived TTP capabilities. Summaries of the results are presented in the main part of this current report.

Besides being part of the information required to develop the final detailed capability framework, these surveys were used to identify the "skills gap". The skills gap is the disparity between the capabilities within each capability cluster that are perceived to be required and the corresponding capabilities that are perceived to exist at present in Australian TTP.

Both surveys were conducted at the level of the fourteen capability clusters identified for the initial set of clusters. Consequently, this Appendix presents fourteen tables below.

The manner in which the data has been presented in this Appendix has been chosen in order to focus on the issue of the skills gap.

Business Acumen and Analysis

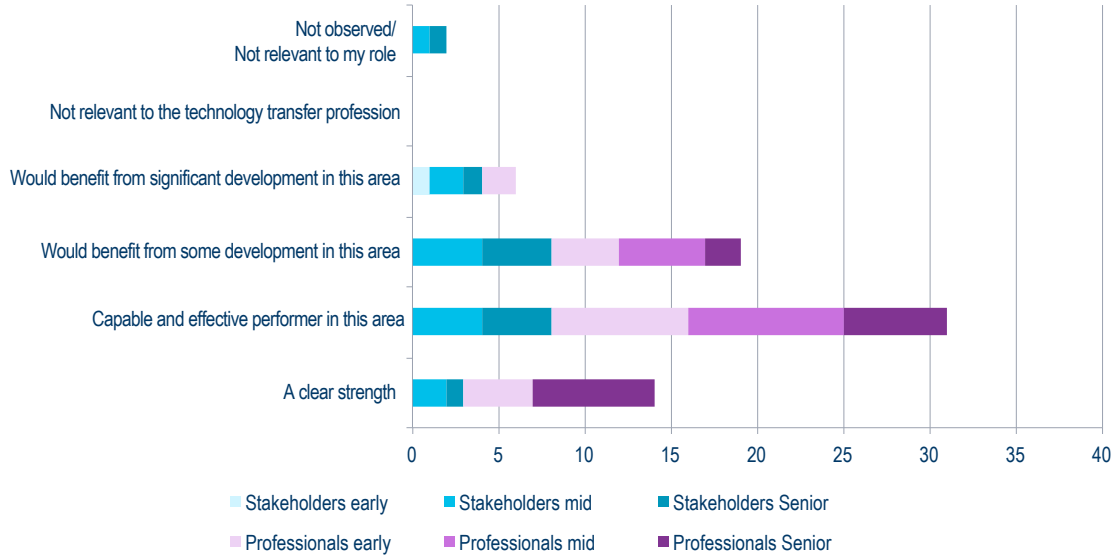

Figure 20. Comparing Stakeholders and TTP assessments on competencies in Business Acumen and Analysis

Stakeholder	TTP Self-Assessment	Gap Analysis Summary
▪ A skills gap was identified across all career levels within the Business Acumen cluster. ▪ 100% of Early Career TTPs were identified as needing significant development in this cluster. Please note only one individual was assessed in this seniority level and therefore it is an assessment of an individual TTP, not a group. ▪ 46% of Mid Career TTPs were ranked as requiring development within Business Acumen cluster whilst equally 46% of stakeholders identified them as capable or strong performers - so an equal split in the perception of their capability. ▪ 46% of Senior Career TTPs were also identified as requiring development within the Business Acumen cluster whilst equally 46% of stakeholders also identified them as capable so an equal split in the perception of capability.	▪ A moderate skills gap was identified for Early and Mid Career TTP within this cluster. ▪ 33% of Early Career TTP have identified that they are not fully capable within the Business Acumen Cluster and would benefit from further development. ▪ 36% of Mid Career TTP have identified that they are not fully capable within the Business Acumen Cluster and would benefit from further development. ▪ This highlights a need for development for both Early and Mid Career TTP in this cluster. It may also be worth considering an increased importance/focus on this cluster as an assessed criteria within the recruitment process of Early and Mid Career TTP	▪ Stakeholders identify more of a gap than TTOs. ▪ All levels moderate gap.

Communication and Influence

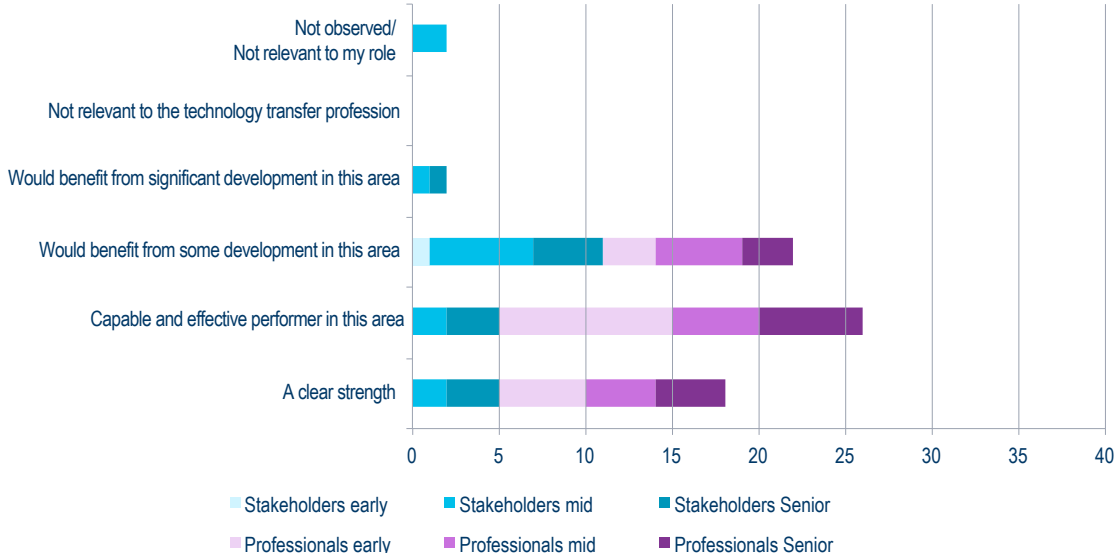

Figure 21. Comparing Stakeholders and TTP assessments on competencies in Communication and Influence

Stakeholder	TTP Self-Assessment	Gap Analysis Summary
▪ 100% of Early Career TTPs were identified as needing some development in this cluster. Please note only one individual was assessed in this seniority level and therefore it is an assessment of an individual TTP, not a group. ▪ 54% Mid Career TTPs were identified by stakeholders as not fully capable and requiring development within the Communication and Influence cluster. ▪ 54% of Senior Career TTPs were identified as capable or strong performers in this cluster by stakeholders, whilst 45% of stakeholders identified them as needing development and therefore not fully capable.	▪ 36% of Mid Career TTP have identified that they are not fully capable within the Communication and Influence Cluster and would benefit from further development. ▪ Whilst 77% of Senior TTP identify themselves as capable performers in this cluster, it is worth noting that 23% identify that they would benefit from development within the Communication and Influence cluster.	▪ Stakeholders identified a bigger gap than TTPs. ▪ Mid Career gap is significant ▪ Senior Career gap is moderate.

Culture

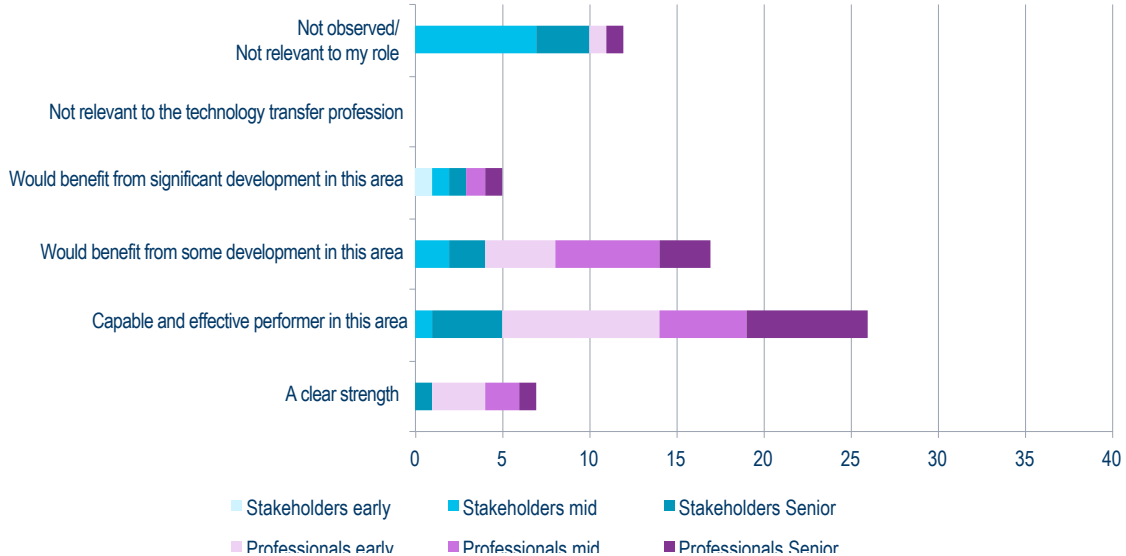

Figure 22. Comparing Stakeholders and TTP assessments on competencies in Culture

Stakeholder	TTP Self-Assessment	Gap Analysis Summary
▪ 100% of Early Career TTPs were identified as benefiting from significant development in this cluster. Please note only one individual was assessed in this seniority level and therefore it is an assessment of an individual TTP, not a group. ▪ 64% of stakeholders had not observed this cluster for Mid Career TTPs. Of the remaining stakeholders who had observed this cluster 27% identified the TTPs as benefiting from development in this cluster and only 9% as capable performers. ▪ 45% of Senior Career TTPs had been identified by stakeholders as being capable performers in this cluster, with 27% categorised as needing development and not fully capable and 27% not observed.	▪ The majority of respondents across all career levels identity as feeling capable in this cluster. It is worth noting that 24% of Early Career TTP identify as lacking confidence in their capability in this cluster and identified themselves as needing development. Whilst this is not unexpected given that they have less than 3 years' experience, it does flag an opportunity for some formal development.	▪ For Mid Career it is hard to assess whether there is a gap as 64% marked it as unobserved. ▪ For Senior there is a moderate gap.

Information Technology

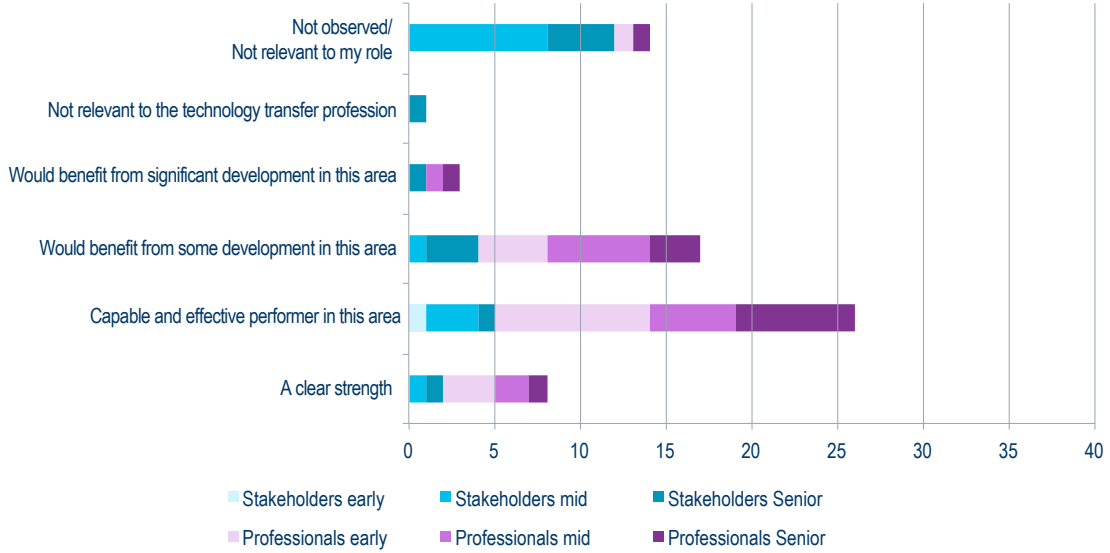

Figure 23. Comparing Stakeholders and TTP assessments on competencies in Information Technology

Stakeholder	TTP Self-Assessment	Gap Analysis Summary
▪ 100% of Early Career TTPs were identified as competent in this cluster. Please note only one individual was assessed in this seniority level and therefore it is an assessment of an individual, not a group. ▪ 62% of stakeholders had not observed this cluster for Mid Career TTPs. Of the remaining stakeholders who had observed this cluster 31% identified the TTPs as capable or strong performers. ▪ 36% of Senior Career TTPs had be categorised as not fully capable by stakeholders within this cluster with an additional 36% of stakeholders identifying themselves as having not observed this category.	▪ A skills gap in the Information technology cluster was identified through the survey results. ▪ 50% of Mid Career TTP identified themselves as not fully capable in this cluster and would benefit from development. 31% of Senior TTP felt they were not fully capable. ▪ These figures suggest that there is significant opportunity for development and improvement.	▪ For Mid Career it is hard to assess whether there is a gap as 62% marked it as unobserved. ▪ However 50% of Mid and 31% of Senior have identified themselves as requiring more development and therefore there is a gap.

Social Media

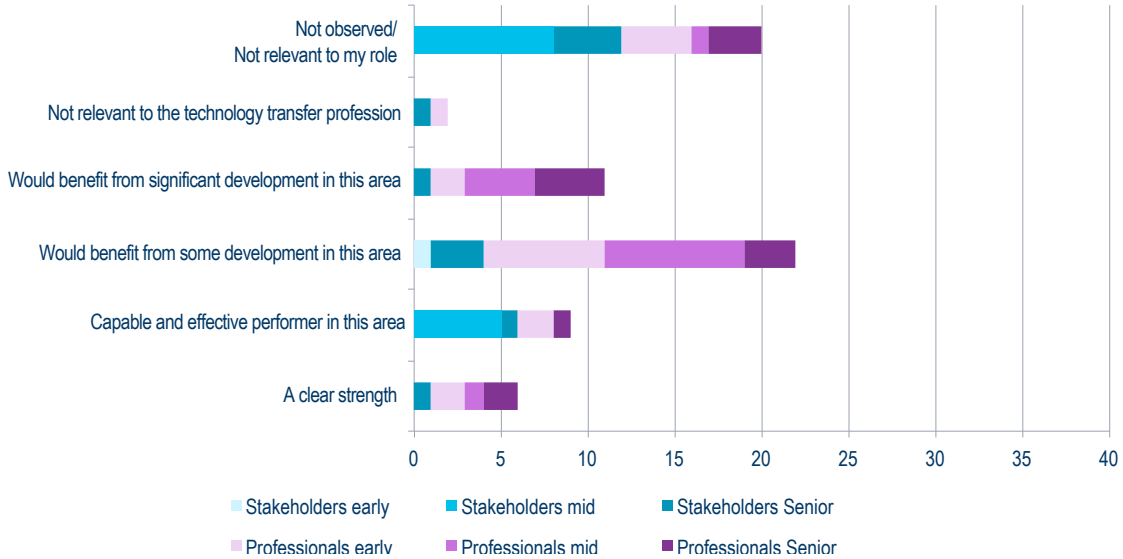

Figure 24. Comparing Stakeholders and TTP assessments on competencies in Social Media

Stakeholder	TTP Self-Assessment	Gap Analysis Summary
▪ 100% of Early Career TTPs were identified as benefiting from some development in this cluster. Please note only one individual was assessed in this career level and therefore it is an assessment of an individual TTP, not a group. ▪ 62% of stakeholders had not observed this cluster for Mid Career TTPs. Of the remaining stakeholders who had observed this cluster 38% identified the TTPs as capable performers. ▪ 36% of Senior Career TTPs were categorised by stakeholders as needing development and therefore not fully capable in this area.	▪ A significant skills gap in the use and application of Social Media was identified through the survey results. ▪ 50% of Early Career TTP identified themselves as not fully capable and would benefit from development in this area. It is also worth noting that 22% of respondents from this career level did not see Social Media as relevant to their role. ▪ 86% of Mid Career TTP identified themselves as not fully capable and would benefit from further development in this area. ▪ 54% of Senior TTP also identified themselves as not fully capable and would benefit from further development in this area. ▪ These figures suggest that there is significant opportunity for development and improvement in the understanding and application of Social Media within the Technology Transfer Profession.	▪ For Mid Career it is hard to assess whether there is a gap as 62% marked it as unobserved. ▪ However 50% of Early and 86% of Mid and 54% Senior have identified themselves as requiring more development and therefore there is a gap

Intellectual Property

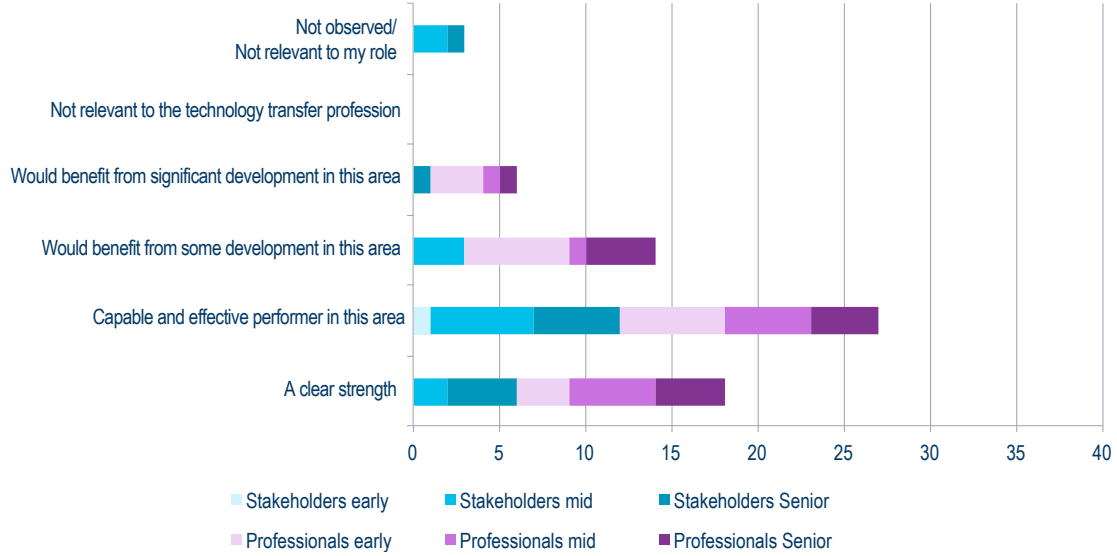

Figure 25. Comparing Stakeholders and TTP assessments on competencies in Intellectual Property

Stakeholder	TTP Self-Assessment	Gap Analysis Summary
▪ Competence within the Intellectual Property cluster was a clear strength for all career levels. ▪ 100% of Early Career TTPs were identified as competent in this cluster. Please note only one individual was assessed in this career level and therefore it is an assessment of an individual, not a group. ▪ 61% of stakeholders categorised Mid Career TTPs as capable and strong performers in this cluster. ▪ 81% of Senior Career TTPs were identified as capable and strong performers in the IP cluster with 36% of the 81% being identified as a clear strength for this group.	▪ Whilst 84% of Mid Career TTP identified themselves as capable in this cluster and 62% of the Senior Career group identified themselves as capable, there is still a skills gap within both the Early Career and Senior Career Groups. With 50% of Early Career and 39% of Senior Career TTP identifying themselves as needing further development in this area.	▪ This capability cluster overall is strong for TTP.

Knowledge Transfer

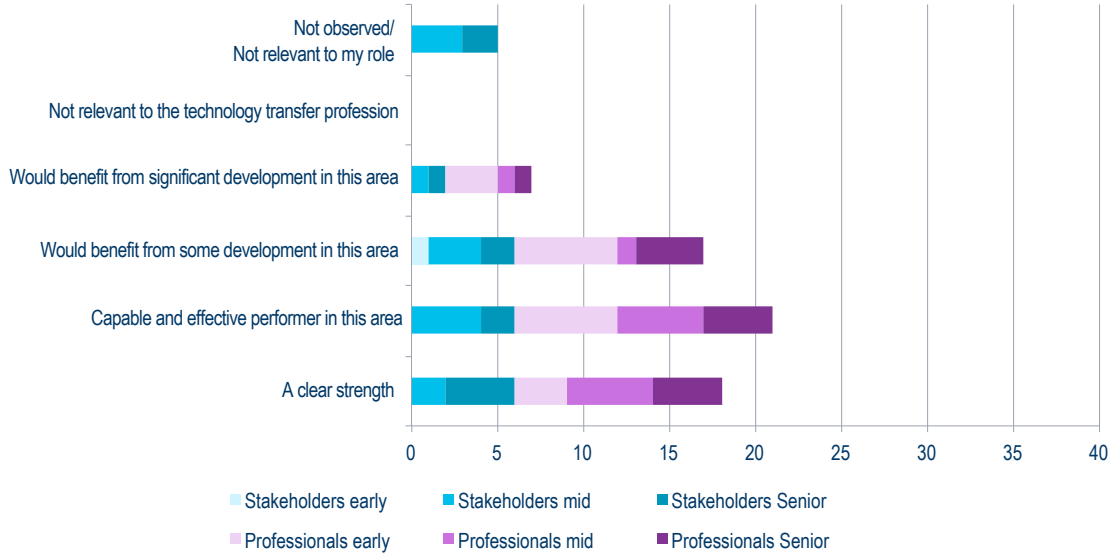

Figure 26. Comparing Stakeholders and TTP assessments on competencies in Knowledge Transfer

Stakeholder	TTP Self-Assessment	Gap Analysis Summary
▪ 100% of Early Career TTPs were identified as benefiting from some development in this cluster. Please note only one individual was assessed in this career level and therefore it is an assessment of an individual TTP, not a group. ▪ 46% of Mid Career TTPs were categorised as capable in this cluster with 31% being cited as needing development in this cluster. ▪ 54% of Senior Career TTPs have been categoried as capable in this cluster with 36% of the 54% being classified as demonstrating this cluster as a clear strength.	▪ 44% of Early Career TTP identified themselves as not fully capable and benefiting from further development in this cluster. ▪ 29% of Mid Career TTP identified themselves as not fully capable and needing further development in this cluster. ▪ 38% of Senior TTP also identified themselves as not fully capable and needing further development in this cluster. ▪ These figures suggest an opportunity for direct development and improvement across all career levels.	▪ Stakeholders see this area as a strength particularly for Senior TTP, but given the self-assessment there is opportunity for development of TTPs in this cluster.

Legal

Figure 27. Comparing Stakeholders and TTP assessments on competencies in Legal

Stakeholder	TTP Self-Assessment	Gap Analysis Summary
▪ 100% of Early Career TTPs were identified as competent in this cluster. Please note only one individual was assessed in this career level and therefore it is an assessment of an individual TTP, not a group. ▪ 41% of Mid Career TTPs were identified as requiring development in this cluster, with 33% being cited as capable performers and 25% unobserved in this cluster. ▪ The Senior Career cohort appear stronger within the legal category with 54% being categorised as capable or strong performers.	▪ A noteworthy skills gap was identified across all Career levels for the Legal Cluster. ▪ 44% of Early Career TTP identified themselves as not fully capable and needing further development in this cluster. ▪ 50% of Mid Career TTP identified themselves as not fully capable and needing further development in this cluster. ▪ 31% of Senior TTP also identified themselves as not fully capable and needing further development in this cluster. ▪ It is worth noting that not all respondents identified this cluster as being relevant to their current role. 11% of Early Career, 21% of Mid Career and 8% of Senior Career Respondents did not identify this cluster as being relevant to their current role.	▪ Strength varies with the career level and stakeholders have identified Senior Career as stronger in this area. ▪ In terms of self-assessment some have identified this cluster as not relevant to their role and this will be dependent on the structure of the team.

Marketing and Relationships

Figure 28. Comparing Stakeholders and TTP assessments on competencies in Marketing and Relationships

Stakeholder	TTP Self-Assessment	Gap Analysis Summary
▪ 100% of Early Career TTPs were identified as needing significant development in this cluster. Please note only one individual was assessed in this career level and therefore it is an assessment of an individual TTP, not a group. ▪ 39% of the Mid Career TTPs were categorised as capable within this cluster, but it is also worth noting that 38% of stakeholders had not observed Mid Career TTPs capability within this cluster. ▪ 45% of Senior Career TTPs were cited as capable in the Marketing and Relationships cluster.	▪ 72% of Mid Career TTP felt they were capable performers in this cluster. A significant skills gap has been identified within the Early Career and Senior Career levels. ▪ 55% of Early Career TTP identified themselves as not fully capable and needing further development in this cluster. ▪ 46% of Senior TTP also identified themselves as not fully capable and needing further development in this cluster. ▪ This highlights a need for significant development for both Early and Senior Career TTP in this cluster. It may also be worth considering an increased importance/focus on this area as an assessed criteria within the recruitment process of Early Career TTP.	▪ Whilst stakeholders categorized mid and senior career levels as capable in this cluster, Early and Senior levels within the TTP self-assessment suggested a moderate gap. Therefore this highlights the need for development.

Organisational Administration and Development

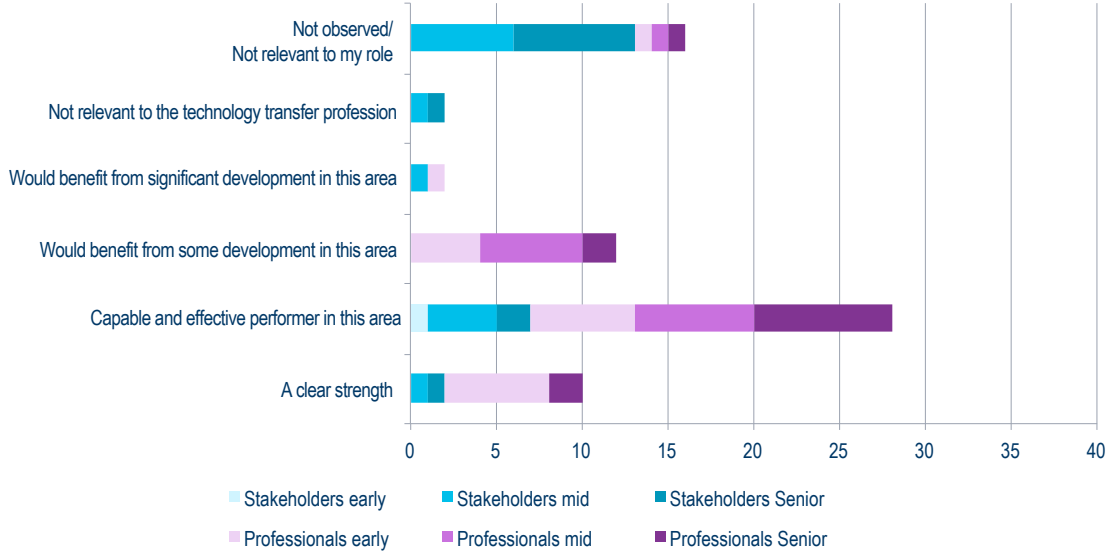

Figure 29. Comparing Stakeholders and TTP assessments on competencies in Organisational Administration and Development

Stakeholder	TTP Self-Assessment	Gap Analysis Summary
▪ 100% of Early Career TTPs were identified as competent in this cluster. Please note only one individual was assessed in this career level and therefore it is an assessment of an individual TTP, not a group. ▪ 46% of stakeholders had not observed this cluster for Mid Career TTPs. Of the remaining stakeholders who had observed this cluster 39% identified the TTPs as capable or strong performers ▪ 64% of stakeholders had not observed this cluster for Senior Career TTPs. Of the remaining stakeholders who had observed this cluster 27% identified the TTPs as capable or strong performers.	▪ 28% of Early Career TTP identified themselves as not fully capable and needing further development in this cluster. ▪ This may not be unexpected given that they have less than 3 years' experience; it does flag an opportunity for some formal development. ▪ It is noteworthy that 43% of Mid Career TTP have identified themselves as not fully capable in this cluster. Given this, development is needed for this specific group.	▪ Development is needed for Mid Career TTP in this cluster. Intervention/ development is also required at the Early Career level to allow full competency to be achieved prior to transition to the Mid Career level where it is assumed the pressure/ expectations increase resulting in a greater skills gap within this cluster. It may also be worth considering an increased importance/focus on this cluster as an assessed criteria within the recruitment process of Early Career TTP.

Qualifications and Experience

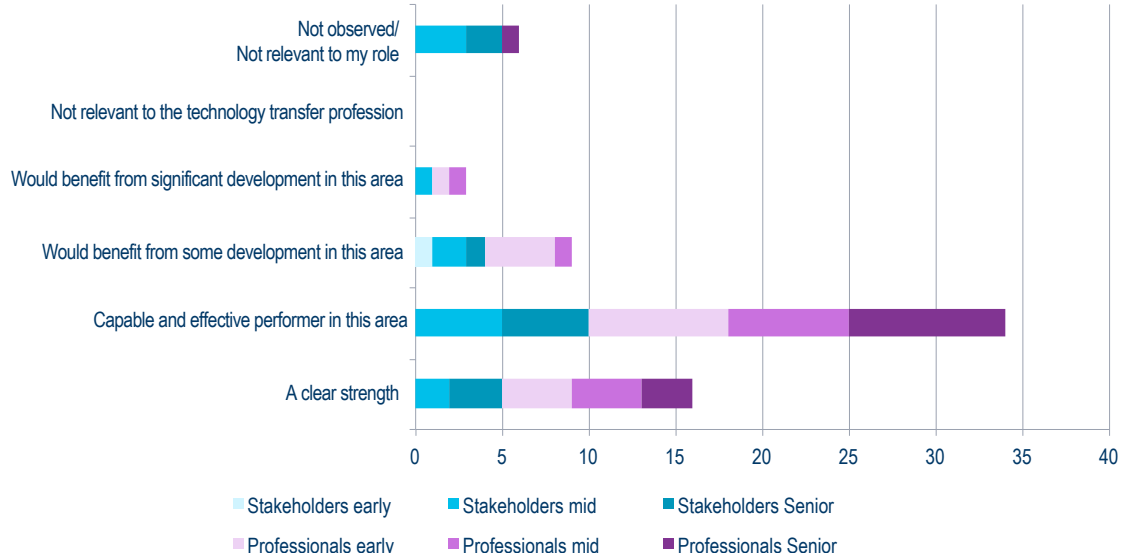

Figure 30. Comparing Stakeholders and TTP assessments on competencies in Qualifications and Experience

Stakeholder	TTP Self-Assessment	Gap Analysis Summary
▪ 100% of Early Career TTPs were identified as needing some development in this cluster. Please note only one individual was assessed in this career level and therefore it is an assessment of an individual TTP, not a group. ▪ 53% of Mid Career TTPs were classified as capable or strong within the cluster of qualifications and experience, with 23% being cited as requiring more development in this area. ▪ 72% of Senior Career TTPs were categorised by stakeholders as strong or capable performers in this cluster.	▪ 85% of Mid Career TTP identified themselves as capable or strong in this cluster. ▪ 92% of Senior Career TTP identified themselves as capable or strong in this cluster. ▪ 30% of Early Career TTP identified themselves as needing further development in this cluster. This may not be unexpected given that they are new to the industry with less than 3 years' experience.	▪ This is identified as a strength by stakeholders and by TTOs themselves. ▪ 23% of Mid Career TTP were cited as requiring development; the narrative of interviews suggested that broader experience of industry, business models and marketing would be of benefit to this career stage. ▪ Its worth noting that some of the capabilities within this cluster are evidence of being competent, eg. a degree.

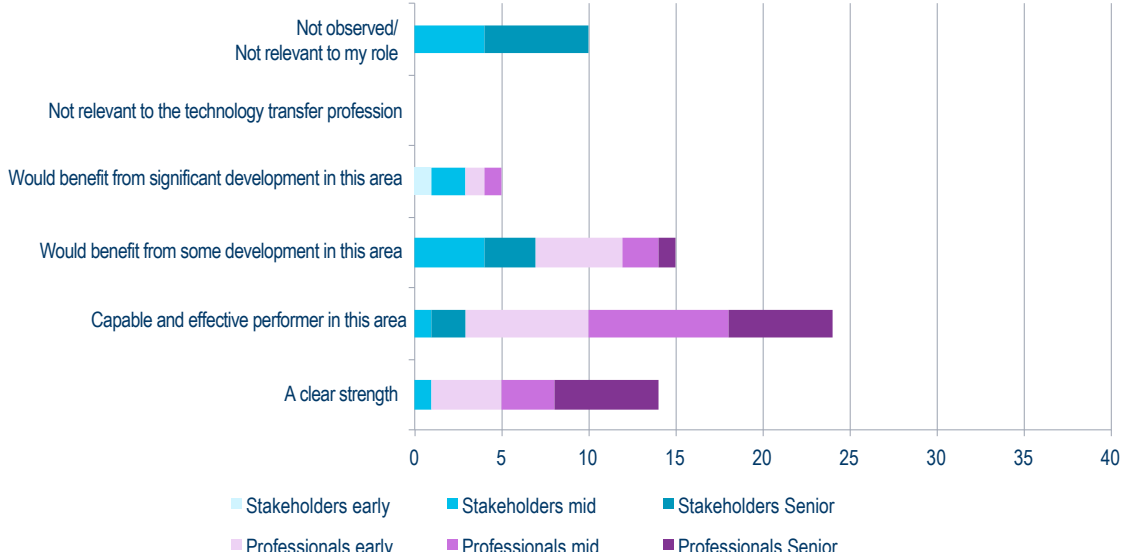

Figure 31. Comparing Stakeholders and TTP assessments on competencies in Strategy and Results

Stakeholder	TTP Self-Assessment	Gap Analysis Summary
▪ 100% of Early Career TTPs were identified as needing significant development in this cluster. Please note only one individual was assessed in this career level and therefore it is an assessment of an individual TTP, not a group. ▪ 50% of Mid Career TTPs were categorised as needing development in this cluster. ▪ 55% of stakeholders had not observed Senior TTPs within this cluster, with 27% being cited as requiring development in this cluster.	▪ A skills gap within this cluster has been identified for the Early Career TTP with 35% of them identifying as not fully capable and requiring further development. This represents an opportunity for development and improvement. ▪ 78% of Mid Career and 92% of Senior Career TTP identified themselves as capable or strong performers within this cluster.	▪ There is a disparity between what the stakeholders think and what TTO think. ▪ The fact that this is unobserved may or may not indicate that development is needed.

Student Entrepreneurial Development

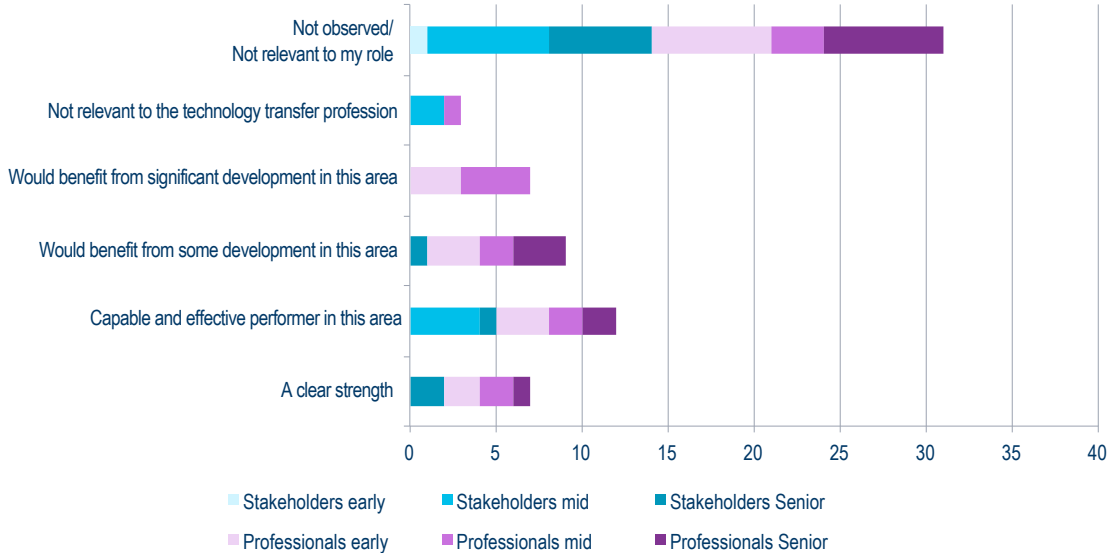

Figure 32. Comparing Stakeholders and TTP assessments on competencies in Student Entrepreneurial Development

Stakeholder	TTP Self-Assessment	Gap Analysis Summary
▪ In the majority of instances this cluster was unobserved by the stakeholders surveyed. ▪ Stakeholders categorised 100% of Early Career, 54% of Mid Career and 60% of Senior Career TTPs as unobserved in this cluster. ▪ Of those who had observed this cluster, they ranked 31% of Mid Career TTPs as capable and 30% of Senior TTPs as capable or strong within this cluster.	▪ 34% of Early Career TTP identified themselves as not fully capable and needing further development in this cluster. ▪ 43% of Mid Career TTP identified themselves as not fully capable and needing further development in this cluster. ▪ 23% of Senior Career TTP identified themselves as not fully capable and needing further development in this cluster. ▪ 39% of Early Career, 21% of Mid Career and 54% of Senior Career TTP did not believe that this cluster is relevant to their current role.	▪ There is possibility for development in this cluster. ▪ In terms of self-assessment some TTP have identified this cluster as not relevant to their role and this will be dependent on the structure of the team and organizational policy. ▪ The compentencies in this cluster were indentified to address part of a broader stakeholder set rather than focus on students

Teamwork

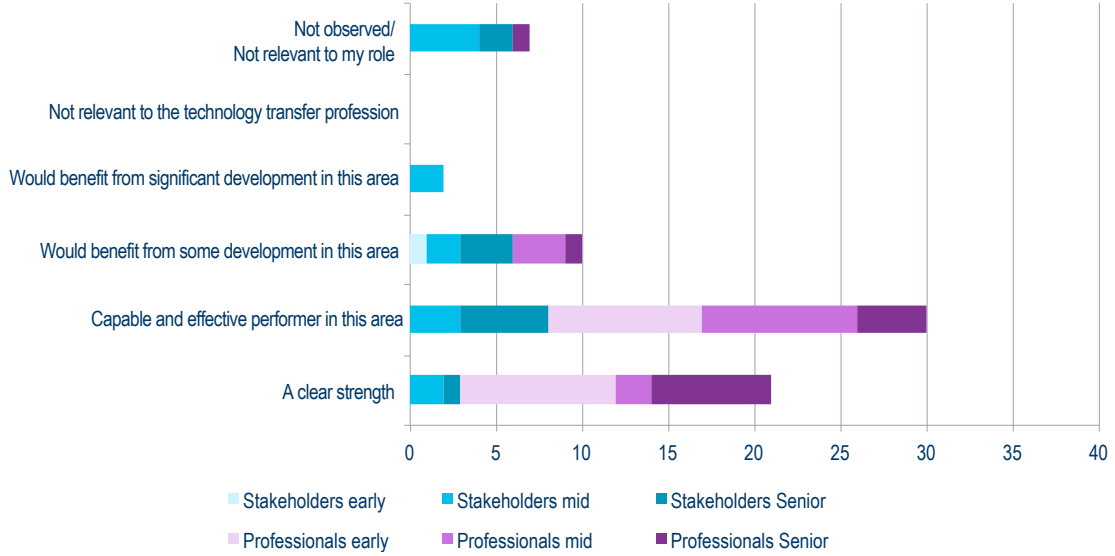

Figure 33. Comparing Stakeholders and TTP assessments on competencies in Teamwork

Stakeholder	TTP Self-Assessment	Gap Analysis Summary
▪ 100% of Early Career TTPs were identified as needing some development in this cluster. Please note only one individual was assessed in this career level and therefore it is an assessment of an individual TTP, not a group. ▪ 38% of Mid Career TTPs were classified as capable or strong in this cluster, with 30% being cited as needing development and 31% not being observed within this cluster. ▪ 45% of Senior Career TTPs were classified by stakeholders as capable or strong in this cluster, with 27% needing some development in this cluster.	▪ 100% of Early Career and 85% of Senior Career TTP identified themselves as capable or strong performers in the cluster of Teamwork. It is worth noting that 21% of Mid Career TTP identified themselves as needing further development in this cluster	▪ Teamwork assessment for Mid Career consistent between stakeholder and TTP with development needed here.

KNOWLEDGE
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