

SCIENCE AND INDUSTRY
ENDOWMENT FUND (SIEF) –
EXPERIMENTAL DEVELOPMENT
PROGRAM (EDP)

2022 Program Evaluation (DRAFT V0.2)

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EXECUTIVE SUMMARY

The Science and Industry Endowment Fund (SIEF) Experimental Development Program (EDP) is designed to address a significant gap in current funding options available for publicly funded research agencies (PRFAs) in the Industry portfolio for progressing technology development to a stage suitable for attracting commercial investment and market uptake.

The EDP specifically targets support for projects aiming to bridge the technology readiness level (TRL) ‘valley of death’ (TRL levels 3-7) on the path to commercialisation, particularly where funding is required to move a technology to pilot scale to assist in gaining commercial traction. If technical and commercialisation risks can be addressed at this stage, then it is more likely that the investment required for full commercialisation of the technology can be secured.

The objectives of the EDP program are to support research that:

1. is at the experimental development end of the research continuum;
2. translates research for commercial impact;
3. moves discoveries along the pathway to commercialisation;
4. accelerates commercialisation and entrepreneurial activities; and
5. ‘de-risks’ for future commercial investors.

This evaluation focuses on assessing the performance of the EDP against these objectives. The results of this evaluation will support SIEF’s commitment to the continuous improvement of the program, ultimately enhancing progression of technology innovations to a stage suitable for attracting commercial investment and market uptake.

The findings presented in this report are based on data drawn from documentation provided by SIEF (project applications, and progress/final reports; meeting minutes; financial information, etc.) for the 12 EDP projects funded and completed to date; and from 11 semi-structured interviews with SIEF EDP project leads and reviewers, and SIEF/CSIRO associates.

Key findings

Level of support (Objective 1)

- The assessment of this objective relates primarily to the role of the EDP in supporting research that is at the experimental development end of the research continuum, including through encouraging project partnerships and contributions.
- Interviewees identified that the EDP fills an important funding gap in the Australian innovation system in relation to experimental development research. They particularly felt that the program’s use of an independent, industry-focused panel to assess project proposals from the perspective of technology readiness level and commercial potential for the focal technology – and the general efficacy of program processes (including the reporting and review processes, and the support offered by the SIEF Secretariat) – provide excellent support for experimental development research projects looking to bridge the TRL-related ‘valley of death’ on the path to commercialisation for technological innovations.
- However, interviewees also identified ways in which they believe this level of support could be enhanced, including supporting greater engagement of external parties during the project application phase; providing feedback on project outcomes to application reviewers; and other, broader process improvements (e.g., the adoption of more flexible approaches to the use of project funds and the selection of the independent review panel).



- While there is evidence that the EDP supports experimental development research through its encouragement of appropriate project partnerships and associated financial contributions, the existing data is insufficient to establish the efficacy and sufficiency of these partnerships and contributions in supporting optimal project (and, therefore, ultimately program) outcomes.

Commercialisation journey (Objectives 2, 3, 4)

- The KPIs relevant for Objectives 2, 3, and 4 demonstrate various ways in which participating in the EDP program has advanced the commercialisation journey of funded project technologies, including in terms of TRL advancement, and securing ongoing funding (e.g., through licences, direct transfer to markets, etc.). However, as no success thresholds were identified for each KPI, it is not possible to establish whether or not the KPI results actually represent objectively successful outcomes for the program.
- However, evidence of the counterfactual (i.e., the ‘without program’ scenario) based on interview data suggests that the EDP does play an important role in supporting experimental development research, which often struggles to gain funding owing to the risk associated with its TRL, affecting its ability to scale to the point where effective commercialisation is possible.
- Both the final project reports and interview data also suggest that the EDP provides broader, longer-term benefits for the commercialisation journeys of program participants, particularly through the various ways in which it supports participants to develop an improved appreciation of innovation and entrepreneurship, thereby providing an important source of value for the Australian innovation system beyond the specific outcomes of the funded projects.

De-risking for future commercial investors (Objective 5)

- Program KPIs also indicate that participating in the EDP does de-risk project technologies to support future commercial investment, including through TRL advancement and the encouraging of participation of industry partners in funded projects.
- However, again, as success thresholds associated with each KPI have not been identified, it is not possible to establish whether or not the results for each KPI related to this objective actually represent objectively successful outcomes for the program.

While the data analysed in this evaluation relating to the EDP’s existing KPI structure provides some indication that the program is achieving its objectives, it is not possible to definitively establish that this is the case, particularly in the absence of objectively determined success thresholds for each KPI. A more detailed consideration of the high-level impact pathway for the program (as included in this evaluation), especially in terms of the identified intended outcomes, and a KPI framework that is more overtly linked to the program’s critical path to impact (combined with an appropriately documented and implemented Monitoring and Evaluation plan), may assist the program in the future to definitively identify the extent to which it is achieving its stated objectives.



BACKGROUND

Description of the program¹

The Science and Industry Endowment Fund (SIEF) Experimental Development Program (EDP) is designed to address a significant gap in current funding options available for publicly funded research agencies (PRFAs) in the Industry portfolio for progressing technology development to a stage suitable for attracting commercial investment and market uptake. The EDP plays an important role in the overall SIEF Portfolio, complementing other SIEF programs and activities.

The EDP specifically targets support for projects aiming to bridge the technology readiness level (TRL) 'valley of death' (TRL levels 3-7) on the path to commercialisation, particularly where funding is required to move a technology to pilot scale to assist in gaining commercial traction. If technical and commercialisation risks can be addressed at this stage, then it is more likely that the investment required for full commercialisation of the technology can be secured.

Program objectives

To support research that:

1. is at the experimental development end of the research continuum;
2. translates research for commercial impact;
3. moves discoveries along the pathway to commercialisation;
4. accelerates commercialisation and entrepreneurial activities; and
5. 'de-risks' for future commercial investors.

Eligibility criteria

1. The Lead Applicant must be an Eligible Organisation in the **Industry** portfolio (Eligible Organisations are CSIRO, ANSTO, AIMS, and Geoscience Australia).
2. Research activities must primarily be conducted by the Lead Applicant.
3. Pre-screening for commercial viability must have been conducted by the Lead Applicant.
4. Research activities must align with the SIEF Primary Purpose.
5. Funding will only be available for activities that fall under the definition of 'Research'; and specifically, 'Experimental Development'.
6. Applications must be endorsed by all Collaborating Organisations and by an authorised delegate.
7. The Lead Applicant/institution and researchers must comply with the Australian Code for the Responsible Conduct of Research (2018).
8. Successful Applicants must enter into a SIEF Funding Agreement by the specified date.

High-level Impact Pathway

As part of this evaluation, Tractuum was tasked with developing a high-level impact pathway for the EDP (see Appendix 1). This impact pathway is grounded in the CSIRO Impact Framework, which is based on a program logic model. Pathways based on this framework are intended to be used as a strategic management tool for supporting the achievement of specific impact goals. The pathway captures the intended process of creating impact which

¹ The content for 'Background' section is derived primarily from <https://sief.org.au/csiro-gift/experimental-development-program-2/> as well as data gathered during the interviews conducted for this evaluation.





begins with deploying inputs, to conduct (in this instance) program-related activities, to produce outputs, which themselves are translated through short to medium term outcomes into longer term impacts.

An impact pathway analysis is the mechanism through which intended benefits are firstly identified, and the causal links between specific activities and these intended benefits are established. This includes defining changes, linking processes, identifying indicators to monitor progress towards the intended impacts, and flagging unintended consequences. This pathway forms the basis for effective impact assessment processes.

Independence and governance of the SIEF EDP

Project Assessment Process

The process for awarding EDP funding involves an open call to Eligible Organisations (see above). The assessment of proposals (which must include a business plan for the project technology) is conducted by the SIEF EDP Panel who may also seek advice from external experts as necessary (on a confidential basis). The SIEF EDP Panel includes at least one member of the SIEF Advisory Council (or nominee), together with independent experts with commercialisation and/or technical domain specific expertise. This panel is charged with ensuring that the project keeps a firm focus on the market/commercial potential of the technology, as well as enhancing the project team's understanding of the technology's market environment (e.g., potential competitors, regulatory requirements, etc). The panel also makes an independent assessment of the project technology's current TRL. Recommendations from the EDP Panel are made to the SIEF Trustee; and all investments are subject to a final decision by the Trustee.

It is expected the Lead Applicant will have conducted a review process to ensure only high-quality proposals that meet all the eligibility criteria are submitted. Through this review process, the Lead Applicant must ensure:

- that the technology is at least at a TRL4;
- commercialisation planning is well advanced;
- a clear path to end users (including potential partner companies) can be presented (although additional funding contributions from a commercial partner is not a pre-requisite for EDP support); and
- technical matters associated with the proposal have been adequately considered.

Post project approval

Once a project has been assessed by the Panel – and approved by the Trustee based on the Panel's recommendation – formal funding arrangements are commenced. EDP funding agreements contain a formal milestone stage-gating process. CSIRO's Director – Commercialisation has to sign off on both milestone and final reports as a SIEF delegate. In addition to technology advancement milestones, funded EDP projects are expected to demonstrate their engagement with industry to support the ultimate commercialisation of the project technology.

Focus of this program evaluation

This evaluation focuses on assessing the performance of the EDP against the program objectives provided above to the extent possible given the data available. The results of this evaluation will support SIEF's commitment to the continuous improvement of the program, ultimately enhancing progression of technology innovations to a stage suitable for attracting commercial investment and market uptake.



Evaluation methodology

Tractuum has followed the evaluation methodology originally determined by the SIEF Secretariat and CSIRO's Performance and Evaluation (P&E) Team.² This involved an assessment of the program's key performance indicators (as supplied to Tractuum) based on the analysis of relevant data drawn from documentation provided by SIEF (project applications, and progress/final reports; meeting minutes; financial information, etc.) for the 12 EDP projects funded and completed to date; and from semi-structured interviews with SIEF EDP project leads and reviewers, and SIEF/CSIRO associates. In all, eleven (three project participant, three reviewer, four SIEF associate, and one CSIRO associate) interviews were conducted with participants nominated by the SIEF Secretariat. Interviewees were asked to draw on their direct experience of the EDP to address the questions posed (see Appendix 2 for the interview schedules developed by the P&E Team and validated with the SIEF Secretariat).

It is important to note that Tractuum was specifically instructed *not* to provide recommendations as part of the reporting of this evaluation.

This document has been shared with Dr Anne-Maree Dowd, Executive Manager – Performance and Evaluation, and with the SIEF Secretariat, for review and feedback prior to finalisation.

Limitations

Tractuum has made every effort to ensure the accuracy of the findings presented in this report. However, given certain constraints of the methodology (e.g., especially in relation to the availability of relevant data), some caution should be exercised when interpreting and responding to this report.

² NB: Tractuum was contracted to conduct the data collection and analysis and develop the report for this evaluation after resourcing constraints meant that the P&E Team could no longer conduct these evaluation processes as originally intended.





FINDINGS

This section details the findings of the program evaluation, focusing particularly on an assessment of the extent to which the EDP has met its objectives. It is structured in the manner agreed to between the SIEF Secretariat and P&E Team; and focuses on three key areas: Level of support (linked to Objective 1); Commercialisation journey (linked to Objectives 2, 3, & 4); and De-risking for future commercial investors (linked to Objective 5). As instructed, the results of the data analysis relating to program KPIs associated with the relevant objectives are presented in tables, with a discussion of these results included where possible/appropriate.

Level of support (Objective 1)

One of the primary objectives of the EDP is to support research that is at the experimental development³ end of the research continuum (Objective 1). Interviewees identified several ways in which the program contributes to this support, as well as other ways in which the EDP could look to support research at this stage of development. Table 1 provides details of both of these aspects, including supporting evidence from the interview data.

Table 1: Current - and potential additional - support provided by the SIEF EDP for experimental development research

Current support	Interview Evidence
<i>Filling an important gap in the Australian innovation system</i>	“Trying to support early-stage technologies up to a point could attract [other – i.e., not SIEF EDP] funding. EDP sits somewhere between ARC grant and seed round funding. Many times, we lose valuable R&D between these two, as there is no support available. SIEF EDP addresses this gap.”
<i>Involvement of an independent, industry-focused panel to assess project proposals from the perspective of technology readiness level and commercial potential for the focal technology</i>	<p>“Having an independent industry panel in SIEF EDP provides great value.”</p> <p>“Overall governance and the process of review against criteria through an independent industry panel is great as well and doesn't need to change.”</p> <p>“It is very important. Most of the projects that I have reviewed highlight great science but a lack of commercial perspective. Industry assessors put an industry lens over these projects and better them for commercialisation. Many projects state the size of the market. But it is important that the existence or potentiality of having a multi-billion dollar market doesn't ensure success. Industry experience and review can help making that clear.”</p> <p>“The researchers gained insights from industry reviewers about focus areas to have the technology actually move through the process. The panel gave insights about commercial barriers and commercial perspectives on technology, which are very different from scientific and technical hurdles.”</p>
<i>Efficacy of program processes</i>	<p>“Reporting and review requirements. Noncompliance would lead to stopping grants. This, and milestone reporting/mid-stage reviews, helped keep things on track and a sense of discipline.”</p> <p>“What differentiates SIEF from other projects is that there is considerable amount of follow-up from the SIEF advisory panel and SIEF management. EDP program closely tracks progress of projects against their milestones and</p>

³ Defined as “acquiring, combining, shaping, and using existing scientific, technological, business, and other relevant knowledge and skills with the aim of developing new or improved products, processes, or services.” (<https://www.ukri.org/councils/innovate-uk/guidance-for-applicants/general-guidance/categories-of-research-and-development/#:~:text=Experimental%20development%20means%20acquiring%2C,improved%20products%2C%20processes%20or%20services.>)





helping them with any roadblocks. I have not had this experience with other granting bodies. This is a time-consuming activity and being well managed by SIEF.”

“The focus in the SIEF EDP program is on milestone delivery; time frames are rigid which helps keep things on track. Pros- This provided structure, boundary, and accountability. Also helped with planning CapEX and OPEX”

Efficacy of funding arrangements “SIEF's differentiators compared to other similar options in the market include that there is no ROI, no equity interest in technology – it is a straight grant/free money.”

Program support provided by the SIEF Secretariat⁴ “The staff inside CSIRO is very helpful, responsive, and professional... The overall process is good and the people I have worked with are great as well.”

Potential Additional Support	Interview Evidence
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<i>Program processes to support greater engagement of external parties during the application phase</i>	“The program can't be improved as much, but the process of providing inputs in the application can be improved. The engagement of the externals early on in the genesis of a project could be helpful in ensuring that the project is truly committed to a commercial outcome. The more we train the applicants to be thinking about the end game from the start or having people in the team ⁵ who could help drive that would be very helpful.”
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<i>Potential additional process improvements</i>	“The focus in the SIEF EDP program is on milestone delivery; time frames are rigid which helps keep things on track... Cons- Gave an impression that there was limited flexibility to change or redirect if after some time into the program it was determined that the path initially suggested was not most optimal for commercialisation or if a more attractive option emerges. Another panel review halfway through the program might have been helpful to assess how everything was tracking and if the milestones and targets were still appropriate, and is this still the right focus? This could potentially also improve the success rate of programs coming out of SIEF.”
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“R&D resource was missing in our project as we were unaware that we could use these resources⁶ to support our project. It would be helpful if the initial communication package⁷ could clarify this to avoid such confusion/misinterpretations. If there are mechanisms to allow these resources, it might potentially be possible for the SIEF Research office to offer/suggest these resources that are aligned with a particular project from their engagement in different programs.”

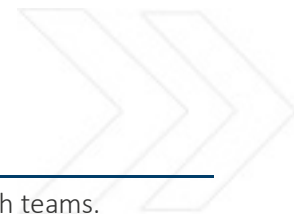
⁴ NB: Through implementing the EDP, the SIEF Secretariat has developed extensive, valuable knowledge of how to manage a program such as this. This is a critical capability; and, if this knowledge is shared effectively and appropriately, offers CSIRO an important opportunity for institutional learning, knowledge management, and growing its capability base.

⁵ For example, commercialisation experts. Interviewees suggested that to be effective, EDP projects also require business development work to happen in parallel with the experimental development work. This component is very resource intensive; and many R&D teams tend to underestimate the time and effort required. Building funding allowances for dedicated business development support into program processes may be beneficial for the ultimate success of EDP projects.

⁶ For example, a PhD student or post-doctoral fellow.

⁷ That is, the communication package provided to project teams at the time of the project proposal development.





“SIEF [EDP] is a great program and often a lifeline for research teams. However, the effectiveness of turning SIEF funding into commercialisation outcomes is hard as the funding can only be used for technical development. This makes it hard to drive commercialisation outcomes to serve the intended purpose of the grant... There is a need to allow the money to be spent outside of CSIRO and go wherever it's needed in order to advance the case for commercialisation... For commercialisation success we don't only need the science, but also require engineers for which CSIRO needs to partner with external organisations that can help with productisation and scale up. The skills required from TRL 1-3/4 are very different from TRL 4-6; and the assumption that CSIRO has the full capability to accomplish the work required on different stages of the TRL scale is just not right. From my experience CSIRO lacks in mid TRL scale-up skills and commercialisation requires more than just a focus on science. There is dearth of engineering capability that we could tap into for successful commercialisation.”

“SIEF application mentor support – that is, a new applicant getting support from a team that has already been successful in a SIEF application – might be valuable for new applicants as the application is not a simple exercise. We did get help from someone who was previously involved and knew what was required, else it would have been hard to navigate.”

“SIEF EDP requires a selection of an independent review panel. This exercise is sometimes hard when the space is small, there is vested interest and you can also not go internationally, or academic. The SIEF office discounts reviewers quickly if they have prior knowledge of the project or have attended meetings on the project. So, in theory having an industry panel for some projects makes a lot of sense in but in practice it is very difficult... There is a need to relax this idea of an independent panel that's non-academic, that's based in Australia, that's knowledgeable about the industry, and willing to sit on a panel as there are very few people available or willing to do that.”

“The last one is the nature of milestones. The way the program is set up right now, the researcher has to know up front what their killer experiments are going to be and then regardless of what happens in the killer experiments, there is a need to comply to the original plan. In cases of variation, the agreement has to go to the Trustee for approval. A lot of time is spent in getting approval for variations/rescoping of science work that is inherently uncertain. There is a critical need for some flexibility in the grant milestones as the scientific hypothesis is being tested. This presents an opportunity for a more agile milestone process with more stages and less governance.”

Feedback on project outcomes

Reviewer interviewees identified that they would like to receive feedback on what happened to the projects they reviewed which were subsequently funded.

Partnership and contributions

Another way in which the EDP supports experimental development research is through the program's encouragement of appropriate project partnerships and associated financial contributions. Table 2 provides details relating to EDP project partnerships, and the nature and extent of financial contributions made to projects in addition to the SIEF funding provided.



Table 2: Consolidated details of SIEF EDP project partnerships and financial contributions

Partnership/Financial Contribution Element	Results
Projects with company (non-research) partners (as defined by financial contribution)	6
Projects with non-CSIRO research organisation partners (as defined by financial contribution)	3
Proportion of projects involving more than one organisation	7 out of 12
Partner (non-CSIRO) financial contributions ⁸	\$2,833,505 As a % of total project expenditure = 10.35%

Discussion

- While the available data is useful in enhancing the program’s understanding of the current efficacy of the support it provides for experimental development research, and areas in which it could look to provide additional support, the data relating to EDP project partnerships and contributions is less effective. Knowing partnerships numbers, and the extent of partner financial support of projects, is valuable; however, this data (which represents the extent of the data made available for this evaluation in relation to these aspects) is insufficient to establish the *efficacy* and *sufficiency* of these partnerships and contributions. Further, more specifically targeted data would need to be collected to enable this analysis.
- The data in Table 1 relating to potential process improvements for the EDP (based on the interviews conducted for this evaluation) is provided for the information of the program only. It is not intended as a set of recommendations for action.

Commercialisation journey (Objectives 2, 3, 4)

The SIEF EDP program has three specific objectives relating to its support for the process of commercialisation (the commercialisation ‘journey’) for funded projects:

- Objective 2: translates research for commercial impact;
- Objective 3: moves discoveries along the pathway to commercialisation; and
- Objective 4: accelerates commercialisation and entrepreneurial activities.

The program has established a series of KPIs relating to these objectives. Table 3 provides the details of, and the associated results for, each KPI, as well as explanatory notes as required. Details of the data sources relied on for each KPI are also provided.

⁸ These results have been calculated based on the project finance data provided by SIEF.





Table 3: Findings for SIEF EDP KPIs Relevant to Objectives 2, 3, 4

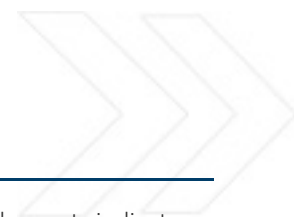
KPI	Description of Purpose	Data Sources	Result	Notes
Percentage projects that demonstrate commercial impact post SIEF	Shows progress along path to impact	Final project reports, impact case studies, evaluation interviews	25%	<ul style="list-style-type: none"> (a) The three projects identified as achieving commercial 'impact' are Hovermap⁹, Going for Gold¹⁰, and Megasonics.¹¹ (b) Impact case study reporting identifies that TranspiratiONal is actively pursuing a spin out opportunity, which has not been realised at this point in time, and therefore, it is not included in this result. (c) The H2 Generation final project report notes that commercialisation efforts are ongoing, though not yet achieved, and therefore it is not included in this result.
Number of patents	Shows progress along path to impact	Final project reports	2	<ul style="list-style-type: none"> (a) CO2 Generation and Graph Air note in their final reports patents which resulted from SIEF EDP funded activities. (b) NB: Graph Air also notes in its final report that 4 invention disclosures were lodged relating to its SIEF EDP funded activities.
Number of technologies that have been transferred to the market two years after completing their participation in the EDP (CPKPI)	Shows progress along path to impact	Evaluation interviews	2	<ul style="list-style-type: none"> (a) NB: The three project participants interviewed for this evaluation did not indicate that their projects have transferred to the market. The technologies identified here relate to Hovermap and Going for Gold (refer to Footnote 4 and 5). (b) Carbon Fibre and Graph Air have not reached the two-year post-project time period stipulated in the KPI, and therefore, are not included in this result.

⁹ Through its utilisation in the Emesent spin out – see <https://www.emesent.com/hovermap/>

¹⁰ Through its 'transfer' to Clean Mining Limited – see <https://im-mining.com/tag/going-for-gold/>

¹¹ Through royalties received through Sonosys, as identified in the final project report.





Proportion of projects that meet objectives	Shows progress along path to impact	Final project reports	7/12 fully met, 5/12 partially met	(a) NB: The final reports indicate that objectives (as evidenced through milestones) were substantially, but not fully, met for 5 of the 12 projects assessed for this evaluation.
Percentage of technologies that have enhanced their technology readiness level after their participation in the EDP (CPKPI)	Shows progress along path to impact	Final project reports	41.67%	(a) Evidence of TRL increase post EDP participation was greatly enhanced through the available impact case study reports. However, the percentage figure reported here includes some assumptions regarding TRL advancement (e.g., for Hovermap and Going for Gold). (b) No evidence of further TRL advancement post project completion could be found for 7 of the 12 projects reviewed.
Percentage of research teams that receive ongoing commercialisation support from venture capital or industry sources one year and three years after completing EDP (CPKPI)	Shows progress along path to impact	Evaluation Interviews	25%	(a) This result relied in part on data collected from one interview (i.e., only one out of three participant interviewees identified that their technology had received ongoing support as stipulated in the KPI). The other projects represented in this result (i.e., Hovermap and Going for Gold) are assumed to have received support based on other evidence available (again, see Footnotes 4 and 5).
Analysis of progress if no SIEF funding	Looking to establish counterfactual	Evaluation interviews	See 'Discussion' section below	(a) Data to support the analysis relating to this KPI was drawn from impact case studies and the final project reports, in addition to the evaluation interviews.
Number of licences	Shows willingness of the market to purchase the product	Final project reports, evaluation interviews	3	(a) NB: This result refers to the number of <i>projects</i> which have issued licences, rather than the <i>actual number of licences</i> , which could not be established based on the available evidence. Again, the result is based on assumptions relating to Hovermap and Going for Gold.





Improved appreciation of innovation and entrepreneurship among program participants and industry reviewers (CPKPI)	Shift in entrepreneurial and innovation mindset (similar to ON innovation qual and quant data collection)	Final project reports, evaluation interviews	See 'Discussion' section below	(a) Where available, impact case study data was also relied on to support the analysis relating to this KPI.
Percentage of projects that increase TRL¹²	3rd party to verify TRL SIEF data levels	83.33%	(a) Final project reports were relied on as the primary source of data for this KPI. (b) The projects which did not identify in their final project report an increase in TRL (i.e., Prawn RNAi and Vaximiser) did note that participating in the EDP resulted in a (self-assessed) increase in commercial readiness level (CRL).	

Discussion

General

- The results detailed in Table 3 provide the program with a degree of understanding of its success against its targeted KPIs. However, as Tractuum was not provided with details relating to the success thresholds associated with each KPI, it is not possible to establish whether or not the results for each KPI *actually* represent objectively successful outcomes for the program.
- However, interviewees provided some important considerations for the program in terms of its ability to ultimately determine if it is succeeding. One aspect to consider is clearly establishing (and documenting) the role the program intends to play within the broader innovation system, and targeting the means of establishing success accordingly:

“SIEF EDP is part of ecosystem – it is not venture or seed funding. It is just developmental funding. If the projects have the next round of funding available (venture/seed capital/other sources) it helps the SIEF EDP program achieve its goal. However, if the rest of the ecosystem is not working, SIEF EDP can't do much in achieving its goal or has much viability. It is the system we need to look at to determine the significance of SIEF in the overall commercialisation success.”

Further, interviewees suggested that continued refinement of program process requirements could also more effectively facilitate project teams’ pathways to commercialisation:

“The recurring issue to a varying degree is that the projects are unable to make a convincing case about being truly pointed to a commercial outcome. This almost always comes through in the analysis. There is a lack of understanding of the realisable market, what the product would look like, and the competitors such that

¹² NB: Interviewees noted some of the inherent issues with the self-assessment of TRL as part of project reporting, especially in terms of the over-estimation of TRL level on the part of researchers. However, no evidence of an independent assessment of the TRL level of project technologies at the end of each project was provided; and it was not within the scope or resourcing of this evaluation to attempt such an assessment – therefore, the data presented in the table still represents the self-assessment of the respective project teams.





input of market and industry has been acquired to see how to define a product. **This can be improved by engaging commercialisation experts early on.**

“There is a case for bringing in this kind of expertise/industry perspective [as represented in the SIEF EDP Panel] earlier than later so that the R&D teams are more aligned to deliver commercialisation outcomes. That way EDP program participants would come up with a much stronger proposal. I believe there is an opportunity to bring in that commercial perspective much earlier. How could we do it? **To the list of SIEF eligibility criteria can there be an opportunity to add a requirement for Commercial mentors for the application to work with the team?** Currently the applications are coming from research laboratory without a thorough view of independent commercial lens. The research strategy should be driven by the commercialisation strategy.”

Interviewees also suggested that this support may need to be provided more effectively by CSIRO, particularly in terms of the appropriate resourcing of the Commercialisation team to support SIEF EDP project teams:

“I think there is a genuine opportunity to invest a little bit more in the SIEF office itself to help with that process [project proposal development] and to invest in the Commercialisation team to drive these things faster... The SIEF team for EDP requires market analysis, competitor analysis, investment analysis, and cash flow modelling, technical program management, a lot of admin, etc. Those are all things that a relatively earlier career commercialisation person could do and if you had those people there doing a SIEF application is actually a really great training ground.... They get to go on the journey and actually see the project through and have to live with the mistakes they made and to clean up their own misconceptions and that is an immense journey in terms of just professional development. That just doesn’t make SIEF process more efficient, but this also improves commercialisation capacity within CSIRO and Australia.”

- The efficacy of some of the current KPIs in the context of the purpose of the EDP could be reflected on. For example, the TRL required for project approval, and the focus on bridging the commercialisation ‘valley of death’ may mean that ‘number of patents’ may not be as effective a KPI for the EDP as it may be for other programs. The interview data supports this:

“IP is highly desired for getting this funding.”

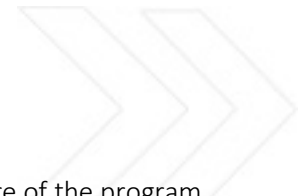
“The program supports technologies that are advanced enough to test applications in the real world/commercial applications/tech transfer type area. It serves as a platform for the killer experiment – that is, to test the viability before significant resources are put into developing and perfecting the technology. This is critical in the innovation sector and SIEF provides a great platform to do this.

“The EDP program had a basic philosophy of supporting science that had an industry outcome. The attractiveness of the EDP program was that the selected projects were commercially relevant but had hit a roadblock and needed extra support to commercialise.”

- While most KPIs would seem to be reasonable for a program such as this¹³, the process of establishing KPI performance may need some examination. For example, while TRL at the EDP proposal stage is self-assessed by the project team, it is reviewed by the SIEF EDP Panel who provide an opinion on the accuracy of its representation. Current data relating to the advancement of TRL as a result of participation in an EDP project is entirely self-assessed. An independent assessment of this change would assist in

¹³ Regardless, it may still be worth revisiting the KPI structure in light of the draft impact pathway presented in this evaluation report to determine if the current KPIs accurately enable an assessment of the program’s critical path to impact.





effectively determining the role of the project in advancing TRL. Further, given the nature of the program, requiring a more detailed and definitive exploration of changes in CRL as a result of participating in the EDP (including the provision of relevant evidence in final project reports) would further assist the program in evidencing its role in the focal technology's commercialisation journey.

Counterfactual

- The 'counterfactual' represents the 'without program' scenario – that is, what would or would not happen in the absence of the SIEF EDP.
- Interview evidence relating to Objective 1¹⁴ supports the claim that the EDP fills a gap in the current R&D landscape. Further to this evidence, interviewees noted that without the quantum of funding provided by the program, CSIRO researchers (in particular) would find it difficult to access resources to enable research to “cross the [commercialisation] valley of death”.

“The absence of SIEF funding would have led to delays in technology advancement. The funding also gave the R&D team the flexibility to identify and work with the right collaborators. Given our TRL, it would have been hard to get an industry partner in the absence of SIEF funding. Another potential option might have been [another funding source] project, but the SIEF grant was at the right level and at the right time.”

- As the EDP is a small program with a small number of projects funded, each project gets “significant attention”. Interviewees claim that this is not possible with other funding options, which means that EDP teams are more effectively supported than others “in their journey... [and] along the way for the success and to keep the momentum going.”
- The final project reports also provide useful insight regarding the 'without EDP' scenario. For example, the Prawn RNAi report suggests that given the size and general R&D budgets of the prawn industry, it is unlikely that the research supported by the EDP for this project would have occurred. For TranspiratiONal, the value of the SIEF EDP funding was that it facilitated the scaling of the R&D efforts, enabling collaboration with commercial manufacturers and targeted end users (i.e., farmers) to fast-track learning, including learning regarding the "product assurances" that would be required for the technology to enter its targeted market (e.g., establishing how the technology could “provide the greatest benefit at the least cost”)¹⁵:

“SIEF funding has been the most singularly effective and valuable thing that has happened to the TranspiratiONal team since its involvement in the inaugural CSIRO Acceleration Program to fast track commercialisation of the Sprayable Biodegradable Polymer Membrane (SBPM) Technology.”

Additionally, the final project reports (including for Megasonics and Going for Gold) identified that the availability of SIEF EDP funding enables project teams to manage the risk associated with experimental development research, with the Going for Gold team suggesting that:

“The SIEF funding assisted to support the risk in fast-tracking the technology development to a process demonstration at scale in the field. This has allowed development through three TRL levels concurrently and has positioned the technology for adoption now in a commercially viable form.”

Improved appreciation of innovation and entrepreneurship among program participants and industry reviewers

- The final project reports provided evidence of several ways in which participating in the EDP program improved participants' appreciation of both innovation and entrepreneurship. These included:

¹⁴ See Table 1 – ‘Filling an important gap in the Australian innovation system’.

¹⁵ Similar learning and scale benefits enabled through EDP funding were noted by the Hovermap, Vaximiser, Carbon Fibre, and Graph Air project teams.





- Recognising the need for researchers to support business development activities related to their technology (including business analysis; market research; business model development; the development of a ‘pitch’ for potential capital investors; etc.);
 - Encouraging teams to search for “industry collaboration opportunities and seek bigger horizons”, both during their EDP projects and after completion to support their innovation efforts;
 - Identifying the value for advancing the commercial potential of their technology through participating in (i) additional programs, such as CSIRO’s ON Accelerator program; and (ii) relevant executive education courses;
 - Facilitating collaboration with university-based entrepreneurship and innovation courses to support the development of business plans to advance the commercialisation of the project’s focal technology; and
 - Supporting the direct engagement of researchers with venture capital companies in key markets (e.g., Silicon Valley).
- Data from the interviews conducted with the project participants supported further the role of the project in improving participants’ appreciation of innovation and entrepreneurship. For example:
 - “The R&D team had a desire to take the technology to the real world. The SIEF project helped unfold what scaling up entails – the challenges and opportunities in taking something from lab to the real world. SIEF provided clear focus on TRL development with outcome, client, and scale-up mentality... We also engaged with MSV in the process – getting insights from experts and funding bodies was very helpful understanding what was needed to get funding/ further interest in technology.”
 - The industry reviewer interviewee respondents did not note any improvement in their appreciation of innovation and entrepreneurship related to their connection to the EDP.

De-risking for future commercial investors (Objective 5)

Objective 5 relates specifically to the role of the EDP program in supporting project teams to de-risk their technologies to increase their chances of securing future ongoing commercial investment.

The program has established a series of KPIs relating to Objective 5. Table 4 provides the details of, and the associated results for, each KPI, as well as explanatory notes as required. Details of the data sources relied on for each KPI are also provided.

Table 4: Findings for SIEF EDP KPIs Relevant to Objective 5

KPI	Description	Data Sources	Result	Notes
Number of projects that received commercial investment post SIEF funding (CPKPI)	Shows end user engagement and clear path to impact	Evaluation interviews	3	(a) This result relied in part on data collected from one interview (i.e., only one out of three participant interviewees identified that their technology had received commercial investment as stipulated in the KPI). The other projects represented in this result



(i.e., Hovermap and Going for Gold) are assumed to have received support based on other evidence available (again, see Footnotes 4 and 5).

Does the project have companies involved (directly or indirectly)?	Shows end user engagement and clear path to impact	SIEF	6	(a) Data to support this KPI was drawn primarily from the project funding data provided by SIEF.
Percentage of projects that increase TRL (CPKPI)	3rd party to verify TRL levels	SIEF	83.33%	<p>(a) Final project reports were relied on as the primary source of data for this KPI.</p> <p>(b) The projects which did not identify in their final project report an increase in TRL (i.e., Prawn RNAi and Vaximiser) did note that participating in the EDP resulted in a (self-assessed) increase in commercial readiness level (CRL).</p>

Decision making processes (Team driven vs SIEF driven decisions)

- This evaluation was tasked with considering the decision-making processes relating to closing investments (i.e., no longer pursuing a commercial pathway for the technology) vs continuing to advance the relevant technology towards effective commercialisation, especially in terms of the focus of these decisions (i.e., were they driven by project teams or SIEF?).
- Apart from evidence of instances where project applications were denied by SIEF, there is little evidence of SIEF playing a role in decisions either to close projects (apart from the perspective of the EDP itself) or continue the commercialisation journey. In general, it would appear that most projects have continued to be pursued post the EDP funding period. Where it is noted in final project reports that projects have actually not been (or are likely not to be) pursued, decisions tend to be attributed to the project teams themselves; and are associated primarily with commercial-related factors (e.g., issues with securing ongoing funding support from industry partners).

Discussion

- Similarly for the results for the KPIs for Objectives 2, 3, and 4, the results detailed in Table 4 provide the program with a degree of understanding of its success against the targeted KPIs for Objective 5. However, again, as Tractuum was not provided with details relating to the success thresholds associated with each KPI, it is not possible to establish whether or not the results for each KPI *actually* represent objectively successful outcomes for the program. Other limitations relating to the results of these KPIs are highlighted in the ‘Notes’ column of Table 4.
- However, as noted in the ‘Counterfactual’ discussion above, interviewees did support the role that the EDP program plays in de-risking focal project technologies to support future commercial investment.



Further support is also provided through responses provided to other questions posed in the interviews, for example:

“SIEF [EDP] is playing the role of de-risking technology that through scale up, prototyping and systems development, [project teams] gets to know what it is useful for – that is the market gap that the program is designed for.”



CONCLUSION

The purpose of this program evaluation was to establish as effectively as possible given the available data the extent to which the SIEF EDP is meeting its stated objectives. The evaluation has been conducted on the assumption that the investment in the EDP represents a significant and ongoing commitment by SIEF to fill a funding gap for Industry portfolio PRFAs relating to R&D activities designed to enable innovative technologies to bridge the commercialisation ‘valley of death’; and on that basis, that SIEF wishes to use the results of this evaluation to support the ongoing program and performance management of the EDP into the future.

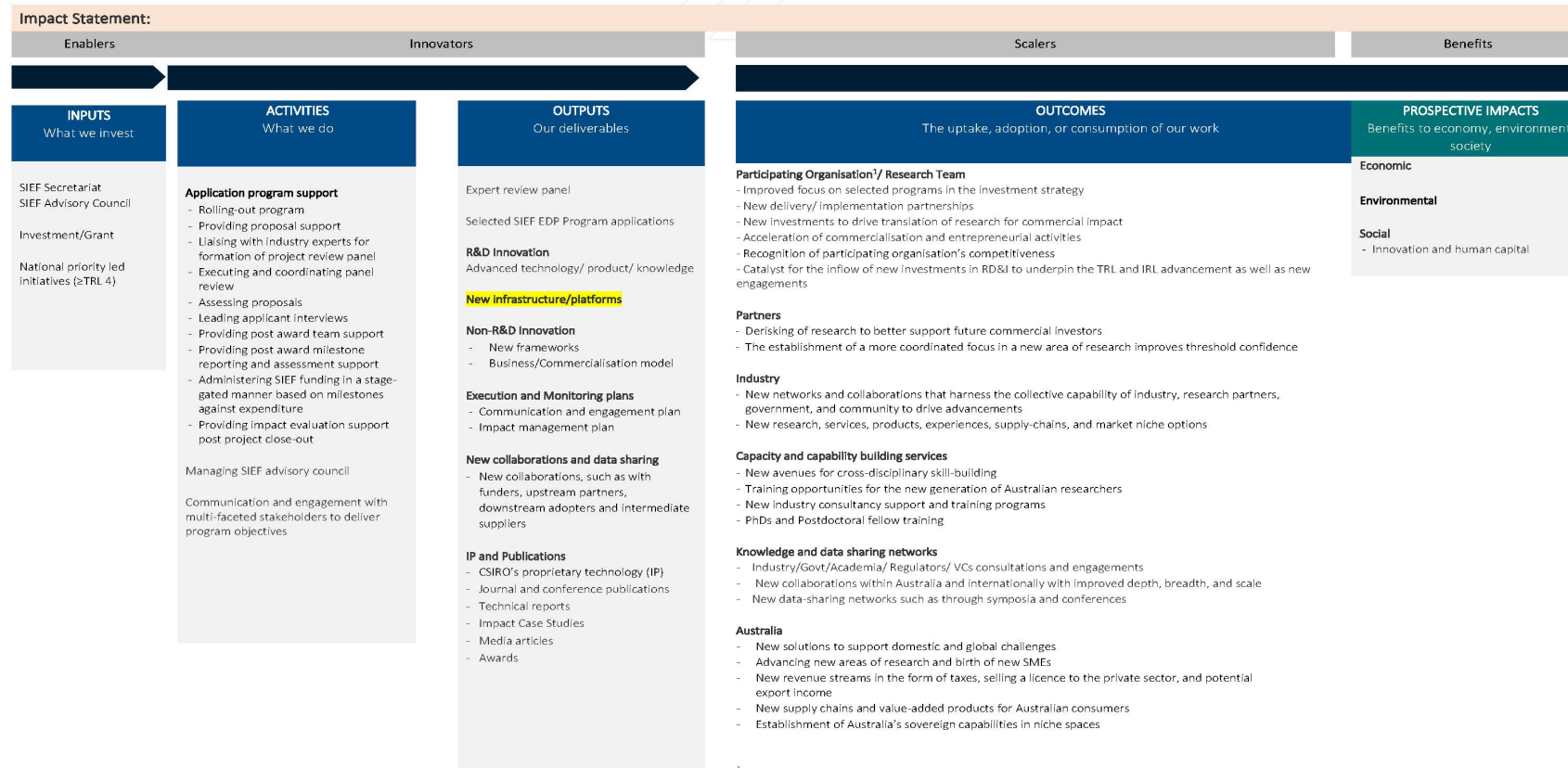
While the data that was able to be analysed in this evaluation relating to the EDP’s existing KPI structure provided some indication that the program is achieving its objectives, it is not possible to *definitively* establish that this is the case, particularly in the absence of objectively determined success thresholds for each KPI. Tractuum also makes no comment on the appropriateness of the KPIs in terms of their relationship to the ability of the program to actually evidence that it is achieving its objectives. A more detailed consideration of the high-level impact pathway for the program (as included in this evaluation), especially in terms of the identified intended outcomes, and a KPI framework that is more overtly linked to the program’s critical path to impact (combined with an appropriately documented and implemented Monitoring and Evaluation plan), may assist the program in the future to definitively identify the extent to which it is achieving its stated objectives.

APPENDICES

TR  CTUUM



SIEF EDP PROGRAM - IMPACT PATHWAY



¹CSIRO, ANSTO, AIMS, Geoscience Australia



SIEF EDP Evaluation *Project Participants* Interview Schedule

Name:

Project name:

SIEF EDP Funding Date/s (at least which year):

Opening Questions:

- Please **describe your technology**
- What **market need** were you addressing?
- Have you had success in **securing**:
 - Ongoing funding (i.e., total capital raised, total grant funding etc) or investors (i.e., within what timeframe of finishing the EDP program?)
 - Patents, licences, royalties etc (i.e., IP security and revenue sources - gross revenue by financial year)
 - Operating or business model
 - Employees (how many?)

Attribution SIEF EDP Program:

- What contribution did the SIEF EDP program make to the **technology readiness** of your research/project over your allocated funding period?
- How did the panel review feedback help you regarding your technology and/or research commercialisation planning?
- How did the SIEF EDP program affect your **attitude towards innovation and entrepreneurship**?
- How did the SIEF EDP governance and project management aid you in achieving your objectives? (Prompts: Cultural shift, benefit, education review)
- Without SIEF EDP Program funding, **how would your research/project have progressed?**

Closing

- Would you consider applying for SIEF EDP for a different technology? (Would you go through the process again? Please give an explanation for your response)
- Is there **anything you'd like to add** about your involvement or experience with the SIEF EDP Program?





1. Please rate your **CURRENT** technology readiness score below: (Circle your response)

1 2 3 4 5 6 7 8 9

Please indicate your level of agreement with the following items (1 = Strongly Disagree, 5 = Strongly Agree):

As a result of funding from the SIEF EDP program, I have:

Increased engagement with industry partners to assist with the further development/uptake/commercialisation of my research	1	2	3	4	5	N/A
Additional information:						
Increased engagement with research partners to assist with the further development/uptake/commercialisation of my research	1	2	3	4	5	N/A
Additional information:						
A clearer vision of our future commercialisation pathway	1	2	3	4	5	N/A
Additional information:						
A better understanding of who to engage with to realise our commercialisation goals	1	2	3	4	5	N/A
Additional information:						

Since receiving funding from the SIEF EDP Program, I have:

Gained external funding (or additional funding) to assist with the uptake/commercialisation of my research	1	2	3	4	5	N/A
Additional information:						
Successfully commercialised my research	1	2	3	4	5	N/A
Additional information:						
Evidence of adoption of my research	1	2	3	4	5	N/A
Additional information:						
Have an operating spin-out	1	2	3	4	5	N/A
Additional information:						
Have an operating joint venture business	1	2	3	4	5	N/A
Additional information:						
Successfully licenced my technology	Yes		No			
Additional information:						

How would you rate the SIEF EDP Program? (1 = Very poor, 5 = Outstanding)	1	2	3	4	5	N/A
Additional information:						



SIEF EDP Evaluation *Reviewers* Interview Schedule

Name:

Stakeholder Role: (e.g., Program Advisor, industry representative, etc.):

Opening Questions:

- Please **describe your connection to the SIEF EDP Program**
- What **market need** do you see the SIEF EDP Program is addressing?

Attribution SIEF EDP Program:

- Did reviewing a SIEF EDP application shift your attitude towards research and the research community?
- What benefits do you see for having an industry-based review panel?
- From your perspective, without the SIEF EDP Program funding **do you believe the participants would have progressed along the commercialisation pathway?**
 - **Yes** – why? Then what role did the SIEF Program play in their pathway?
 - **No** – why? What was it about the SIEF Program that supported their progress that could not be secured outside the Program?

Closing

- Could you please comment on your experiences as a Reviewer? Would you be a reviewer again?
- Is there **anything you'd like to add** about your involvement or experience with the SIEF EDP Program? (Prompts: Culture, maturity of understanding of grant recipients on tailoring milestones (quantitative, industry focussed, measurable), business plan writing)





SIEF EDP Evaluation *SIEF staff* Interview Schedule

Name:

Stakeholder Role: (e.g., Program Advisor, industry representative, etc.)

Opening Questions:

- Please **describe your connection to the SIEF EDP Program**
- What **market need** do you see the SIEF EDP Program is addressing?
- How successful for you think the Program has been in **securing**:
 - Ongoing funding (i.e., total capital raised, total grant funding etc)
 - Investors (i.e., within what timeframe of finishing the EDP program?)
 - Patents, licences, royalties etc (i.e., IP security and revenue sources - gross revenue by financial year)
 - Establishing operating or business model

Attribution SIEF EDP Program:

- What contribution do you think the SIEF EDP program has made to the **technology readiness** of the technologies you are aware of and during the allocated funding period?
- How effective do you think the SIEF EDP program was in **delivering commercial outcomes**?
- Did you see the SIEF EDP program shift the participants' **attitudes towards innovation and entrepreneurship**?
- From your perspective, without the SIEF EDP Program funding **do you believe the participants would have progressed along the commercialisation pathway**?
 - **Yes** – why? Then what role did the SIEF Program play in their pathway?
 - **No** – why? What was it about the SIEF Program that supported their progress that could not be secured outside the Program?

Closing

- Is there **anything you'd like to add** about your involvement or experience with the SIEF EDP Program?
- Culture, maturity of understanding of grant recipients on tailoring milestones (quantitative, industry focussed, measurable). Business plan writing.





PARTICIPANT INFORMATION SHEET (PROGRAM PARTICIPANTS)

Evaluation of the SIEF Experimental Development Program

Project overview

You are invited to take part in an evaluation of the SIEF Experimental Development Program (EDP) which seeks to measure the success of the SIEF EDP against its publicly stated objectives, and to enhance SIEF's understanding of any areas for improvement. The evaluation is being carried out on behalf of SIEF by Harmeet Kaur and Thomas Keenan from Tractuum Pty Ltd. Findings from the study will help SIEF in future decisions and activities relating to scientific research and development.

What does participation involve?

Participation in this study will involve taking part in an interview that will take approximately 30-45 minutes. All interviews will be conducted by Tractuum and will take place at a time and venue that is convenient to you. The interview will cover your insight into how the SIEF EDP Program:

- 1) translates research for commercial impact;
- 2) has directly affected the success of your technology/research;
- 3) moves discoveries along the pathway to commercialisation;
- 4) 'de-risks' for future commercial investors.

With your permission, the interview will be audio recorded for transcription and reference purposes to help ensure the accuracy of the data.

Risks and benefits

While your participation in this project may not benefit you directly, it will increase SIEF's overall understanding of the utility of the SIEF EDP Program, and its ability to encourage the translation of Australia's world-class scientific research into impact.

Aside from giving up your time, there are no foreseeable risks associated with participating in this study.

Withdrawal from the research project

Participation in this evaluation is completely voluntary and you do not have to take part. Your decision whether to participate will not affect your current or future relationship with the researchers or anyone else at SIEF. It also has no impact on your employment. If any topic is raised during the interview that you prefer not to discuss, you only need to tell the interviewer and the topic will not be pursued. Similarly, you are free to stop the interview at any time. In this case, any recordings will be erased and the information you have provided will not be included in the study results. If you wish to withdraw after the interview has finished, simply notify the researchers listed below and your interview data will be destroyed. You may withdraw from this study at any time up until publication of the final outputs.



Confidentiality

All information provided by you will be treated confidentially. Your name or any other personal information will not be included in any publications resulting from the study. All data collected in this study will be coded and subsequently analysed and reported in such a way that responses will not be able to be linked to any individuals. Although interviews may be recorded and analysed by a researcher, the recordings will only be available to our research team. Any data collected as part of this study will be securely stored as per Tractuum's Recordkeeping Procedures.

How will my information be used?

The interviews will be conducted via the WebEx or MS Teams conferencing platforms. Each interview will be recorded for data collection purposes, and the responses may be transcribed by a third-party provider to assist with data analysis processes. This information will be stored securely. The information obtained through the interviews will be used in a systematic evaluation of the SIEF EDP Program. The analysis and final report will de-identify the sources of information to promote a willingness to openly and honestly share details indicative of the interview participant's experiences.

Harmeet Kaur

Impact Analyst, Tractuum

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harmeet@tractuum.com.au

Thank you for taking the time to help with this research project. Please keep this sheet for your information.

TRACTUUM

PARTICIPANT INFORMATION SHEET (REVIEWERS)

Evaluation of the SIEF Experimental Development Program



Project overview

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- 5) translates research for commercial impact;
- 6) has directly affected the success of the project participant's technology/research;
- 7) moves discoveries along the pathway to commercialisation;
- 8) 'de-risks' for future commercial investors.

With your permission, the interview will be audio recorded for transcription and reference purposes to help ensure the accuracy of the data.

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