ROYAL ACADEMY OF ENGINEERING

Newton Agham

LIF Philippines Impact Assessment

On behalf of:

The Royal Academy of Engineering and the Newton Agham Programme

April 2019

Submitted by Oxentia Ltd:

Mr Edward Butcher

Ms Britta Wyatt

Dr Steve Cleverley

Disclaimer

About Oxentia

Oxentia is the new name for Isis Enterprise, a successful innovation management and technology commercialisation consultancy that started life as an operating division within the world leading technology transfer company of the University of Oxford, Oxford University Innovation.

Since 2004, Oxentia has delivered services to a worldwide customer base of public and private sector clients in over 60 countries and is a key part of Oxford's innovation ecosystem. Oxentia works in partnership with our global clients to build capacity, develop capability and enable innovation for the benefit of economies and societies. We excel at delivering services to suit the needs of diverse world economies.

Oxentia has worked in partnership with the Royal Academy of Engineering to provide training and mentoring for the Leaders in Innovation Fellowships (LIF) Programme since 2015.

Acknowledgements

The authors would like to thank the following individuals for their contributions to this report:

Karen Ann Hipol (British Embassy Manila)

Renz Homer Cerillo (British Embassy Manila)

Rowena Guevara (Department of Science and Technology (DOST)

Melvin Carlos (DOST-PCAARRD, Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development)

Goldy Yancha (Idea Space Foundation)

Gia Santos (HeartSmart)

Kristine Mae Magtubo (Co-Founder and CEO, Veris Tech)

Merlinda Palencia (Adamson University)

Dickie Gonzalez (Animo Labs Technology Business Incubator)

Nilo Bugtai (De La Salle University)

Drexel Camacho (De La Salle University)

Ma. Carmen Lagman (De La Salle University)

Patricia San Jose (University of the Philippines, Manila)

Maricor Soriano (University of the Philippines, Diliman)

Luis Sison (University of the Philippines, Diliman)

Giovanni Tapang (University of the Philippines, Diliman)

Arsol Reyes (Ateneo de Manila)

Francis Aldrine Uy (Mapua University)

Gaston Ortigas Jr. (Asian Institute of Management)

Matthew Escobido (Asian Institute of Management)

Ronna Reigner C. Señora (Asian Institute of Management)

Shane McHugh (Royal Academy of Engineering)

Mahmoda Ali (Royal Academy of Engineering)

The DOST Office of the Undersecretary for Research and Development, and the DOST Research Councils

ISBN: 978-909327-45-0

ROYAL ACADEMY OF ENGINEERING

Newton Agham

Contents

Tables and figures

1. Foreword

When the Royal Academy of Engineering began to deliver the Leaders in Innovation Fellowship (LIF) programme in 2014 under the UK government's Newton Fund, the objective was simple. We saw an opportunity to draw upon the wealth of expertise within the UK to give aspiring research entrepreneurs in emerging economies the skills they needed to bring their innovations out of the lab and into the market.

From the earliest days of the programme, we saw the kind of impact we had expected – a rapid release of energy and creativity from incredible individuals who finally had the business skills to complement their ideas and their drive. In the Philippines alone there were several innovations from the opening few cohorts that stood out because of their ingenuity and massive social impact. For example, Maricor Soriano's innovation that maps coral density and creates employment in maritime communities or Kristine Magtubo's mobile clinic in a case, which has been adopted across the Philippines. This report features some of their stories.

But we also saw other impacts that we had not expected.

We heard about LIF alumni who helped change regulations at national level or within universities to improve innovation capacity. We heard about partner countries setting up national innovation funds in direct response to the sudden influx of technology entrepreneurs with excellent business plans. We heard about alumni who decided that entrepreneurship was not for them, but who became champions and advocates of entrepreneurial thinking within their lecture halls and common rooms. We heard about mutual support groups forming on Facebook and WhatsApp. We heard of LIF alumni from different cohorts and even different continents collaborating on new business ideas that were genuinely unique and disruptive.

It became clear that a programme that was originally envisaged as a tool for empowering individuals in partner countries was also having an aggregate impact on technology-led innovation systems, sometimes in ways we could not predict.

This report was commissioned as an attempt to capture the full range of impacts that LIF and its alumni have had on the national innovation ecosystem over the past four years. While the detailed statistics presented are specific to the Philippines, many of the broader messages are relevant to innovation stakeholders across all 16 countries where LIF is in operation.

This report showcases some of the major successes of the programme: the contribution LIF has made to changing mindset and culture within universities in the Philippines, and the role of LIF alumni as influencers and enablers as well as their progress towards building startups and scale-ups. It also signposts some future challenges as the businesses seeded by this programme mature. In particular, it highlights the challenge of attracting private finance to technology innovation, improving the risk appetite of local investors, and bridging the cultural divide between industry and academia.

As chair of the LIF steering group, I am delighted to showcase the direct and indirect impacts of the programme and to point towards the next steps that the UK and the Philippines can take together in strengthening the local innovation ecosystem. I would like to thank DOST, AIM, the Newton Fund in-country team, LIF alumni and other stakeholders in the Philippines who freely gave their time and expertise in preparing this report, and to Oxentia for carrying out this research.

More broadly, I am indebted to all the research and innovation agencies within Newton Fund countries that have adopted the programme with enthusiasm and integrated it into their national innovation support systems; our range of excellent delivery partners, including Oxentia and the Source Institute. Of course, I am indebted to the LIF alumni community, which now has over 900 world-class engineering innovators from 16 countries, whose technology businesses will help build a more prosperous and sustainable future.

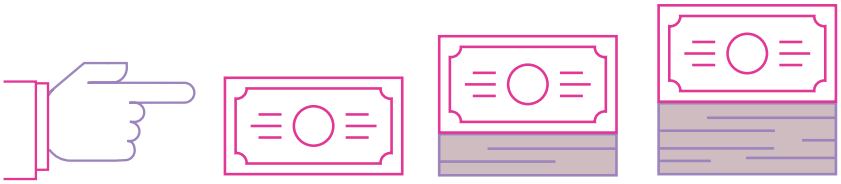
Professor Norman Apsley OBE FREng

2. Executive summary

The Leaders in Innovation Fellowships (LIF) programme is designed to build the entrepreneurship capacity of researchers to help them commercialise innovations that address development challenges. LIF runs across multiple countries and is about to complete its fifth year of operation. The programme is viewed as having been particularly successful within the Philippines. The following report explores the Philippine entrepreneurship and innovation (E&I) ecosystem and the impact that LIF has had on it. The report provides insights on the following specific areas:

- The impact of the programme in developing LIF project technologies and more generally its impact on the Philippines.
- The current stage of development of the E&I ecosystem in the Philippines.
- Critical success factors behind the achievements of LIF in the Philippines.
- How LIF might develop in the future.

LIF fellows in the Philippines
have raised almost
US$11 million
for their projects.



The Philippine E&I ecosystem

Although the E&I ecosystem in the Philippines is still nascent and emerging, there have been many government-led initiatives and policies in recent years that have stimulated interest in E&I. The number of incubators and entrepreneurship training courses is expanding. Further, university technology transfer offices (TTO) have been growing in number, are creating incentives and are raising awareness to build a pipeline of innovations. However, many barriers to E&I in the Philippines remain: cultural acceptance of entrepreneurship within academia is low; early stage and translational funding can be difficult to access; and there is mistrust and a lack of collaboration between universities and industry.

Impacts and outcomes

LIF is having a significant positive impact on the E&I ecosystem by changing perceptions and mindsets around commercialisation and creating LIF fellows who go on to become very important influencers and enablers – teaching others and creating an E&I friendly environment by bringing in new policies, setting up TTOs and technology management offices (TMOs).

LIF fellows have been successful in raising large amounts of funding from their projects. Progress in the later stages of commercialisation, such as fee-paying licences and revenue-generating spin-outs, appears to be slower in developing. This is not unexpected, as commercialisation can take many years. A positive indication is that many LIF fellows report they are already in negotiations and/or are close to commercial readiness with their innovations.

The future of LIF

Looking to the future, it does not appear that there will be a shortage of appropriate projects and LIF fellows for subsequent LIF cohorts. However, it may be beneficial to continue to encourage future recruitment in additional geographic regions outside of Luzon. Although the Department of Science and Technology (DOST) is the major research funder in the Philippines, there may be room in future for partners to fund researchers who go on to join the LIF programme. Based on the current areas of research activity, it is likely that a high proportion of future projects will come from agriculture, medicine and environmental fields. Ideally programme content and, potentially, structure should be adjusted to reflect this subject weighting.

A lack of industry to take forward licences (as per the Ecosystem review) means that spin-outs and/or market-ready products are often required pathways for commercialisation. However, these are both time-intensive options and often require LIF fellows to choose between commercial and academic career progression. This lack of time was seen as a limiting factor for many participants who wish to commercialise. One possible way of alleviating this constraint may be to pair LIF fellows with junior academics or students, who have more time to devote to commercialisation.

This issue also raises interesting questions around the desired outcomes of LIF, and profiles of the participants.

Introducing streaming with optional subject modules for different types of fellows, for example TTO specialists or university/government executives, could be a very valuable addition to the programme maximising benefit to the participants and therefore to the E&I ecosystem as a whole. The level of streaming and specialisation within a cohort will be dependent on what impacts are desired from the programme in terms of: commercialising technologies versus creating technical enablers versus creating influencers.

Separately from any specialist streamed content, LIF fellows requested modified or additional content in a range of areas. There was a particular demand for practical exercises to help them develop the theoretical knowledge from lectures.

There was significant interest in the development of a LIF alumni community, which could play an important role in maintaining the progress and momentum of projects, even after the end of the programme. Forming links between LIF and other organisations such as incubators and industry associations was also seen as potentially valuable. LIF fellows are already doing significant work in passing on the skills and learnings from LIF. In addition to teaching on E&I courses, LIF fellows are already acting as unofficial ambassadors for the programme, giving talks and seminars. There was enthusiasm for more official programmes to pass on their learnings, but many will be constrained by a lack of available time. One of the easiest and most efficient ways of LIF fellows passing on their knowledge and expertise would be for them to hold a debrief session with the TTO or TMO of their home institution.

Learnings for other LIF countries

Four major critical success factors (CSFs) under LIF's impact in the Philippines are:

1. supportive funding body and home institutions
2. successfully changing mindsets of LIF fellows so that commercialisation is seen as positive and socially useful
3. existing E&I friendly policies and regulations
4. the continuing support received by LIF fellows from the programme.

The second and third CSFs are being further developed by LIF fellows who both pass on positive messages on commercialisation and develop E&I enabling policies in their home institutions. Encouraging current and future LIF fellows to be more active in this area will help to create a virtuous circle.

Fellows (LIF1-4):

728

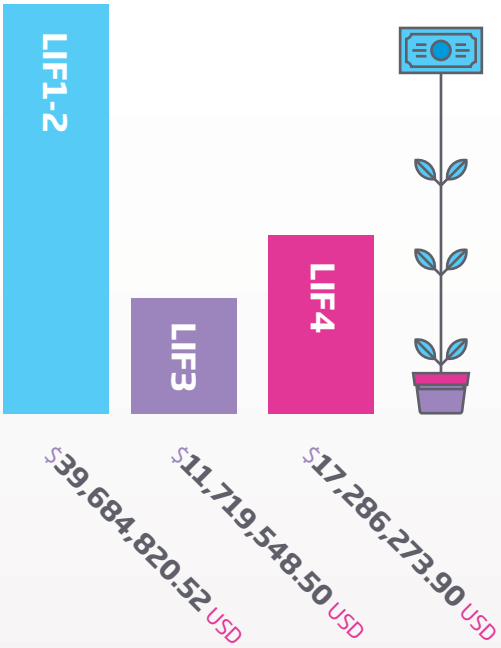
LIF countries:

16

LIF in-country partners:

35

Innovation funding raised since start of LIF:



93.5%

93.5% of LIF1-4 fellows say LIF has been important in helping them commercialise their innovation.

Products launched:

32 new LIF1-2 products launched

10 LIF3 new products launched

Licensing deals signed:

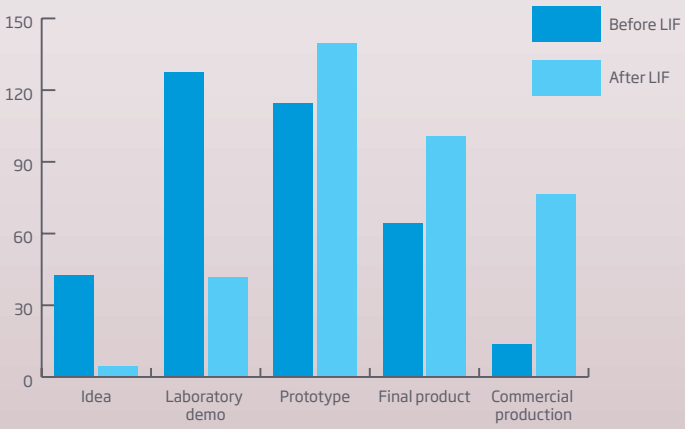
19 LIF1-2

10 LIF3

Jobs created by LIF1 and LIF2:

650

By the end of LIF3, fewer projects were in the idea and lab demo stages of development, and more were prototypes, final products or in commercial production.



*The figures presented here represent four years of LIF Programme achievements across all countries.

3. Introduction

3.1 About the Newton Fund

The LIF programme is supported by the UK's Newton Fund, part of the UK's official Overseas Development Assistance. The Newton Fund began in 2014 with £375 million to be used over a five-year period by selected delivery partners. In 2015, the fund was extended and expanded. It was again extended from 2019 to 2021 and expanded by doubling the £75 million investment to £150 million by 2021, leading to a £735 million UK investment to 2021, with partner countries providing matched resources within the fund.[1]

The LIF programme in the Philippines is part of the Newton Agham (Science) Programme, a collaboration between the UK and the Philippines in science, research and innovation. Through its embassy, the UK government works with UK delivery partners and Philippine science and innovation institutions, such as DOST, the Department of Agriculture (DA), and the Commission on Higher Education (CHED), to implement programmes that strengthen science and innovation capacity.

3.2 About the Leaders in Innovation Fellowships programme

The LIF programme is supported by the UK's Royal Academy of Engineering (the Academy) in response to the Newton Fund launch in 2014.

The LIF programme builds the entrepreneurship capacity of researchers to help them commercialise innovations that address one or more of the UN's Sustainable Development Goals (SDGs). The programme is entering its fifth year and runs across 16 countries, including the Philippines.

The primary objective of the programme is to support researchers to commercialise innovations aimed at addressing social and economic challenges in their country; a secondary objective is to promote improved understanding of and attitudes towards entrepreneurship within the research sector. It is aimed at researchers who are at the point of developing a business proposition for their innovation. By promoting innovation and entrepreneurship for economic growth, the programme directly addresses SDGs 8 and 9, but the businesses the programme supports are expected to have impacts across all 17 SDGs.

The LIF programme

has been running since 2014, helping researchers across

16 different countries to commercialise innovations

that address the UN's Sustainable Development Goals.

3.2.1 Structure

During a two-week residential programme in the UK, cohorts of up to 15 participants (LIF fellows) from across 16 Newton Fund countries, benefit from a focused period of interactive training in entrepreneurship, events, industry visits, and access to expert coaches and mentors. These activities help them develop their business plans, executive summaries and investor/market 'pitching' of their technologies. LIF participants also have opportunities for international networking as part of the Academy's bespoke six-month follow-on support programme, including in-country workshops and mentoring, which ends the year-long programme. There are annual opportunities for the programme's alumni to join regional events hosted by the Academy and the in-country partner.

3.2.2 In-country partner

Each country that works with the Academy on the Newton Fund programme provides match funding for the LIF programme.

Within the Philippines, where LIF is about to complete its fifth year of operation, matched funding is provided by DOST, which is the premier science and technology body in the Philippines. DOST provides leadership, central direction and coordination for all scientific and technological initiatives, policies, and programmes to sustain national development.

Upon return to the Philippines, the cohort of LIF fellows continues to benefit from ongoing training and support in taking their commercialisation plan forward.

This is provided by the Asian Institute of Management's (AIM) follow-on programme (funded by DOST) and continued individual mentoring from the residential programme, which extends for up to a year should the LIF fellow require it.

To date, 75 LIF fellows have taken part in the Philippines LIF programme over five cohorts. Figure 1 summarises the principal activities undertaken in the LIF Philippines programme.

Figure 1: Activities that make up the LIF programme[2]

AIM Launch Programme Academy UK	UK Academy residential programme	AIM Landing Programme	Academy follow-on programme	Demo Day
• Organiser: AIM • Manila • Three-day preparatory commercialisation course • Goal: To prepare fellows for the Academy's Residential Programme	• Organiser: Royal Academy of Engineering • London • Ten-day residential training and mentoring programme • Goals: Develop skills and understanding of commercialisation. Create business plans and pitch decks	• Organiser: AIM • Manila • Six-month training and mentoring programme (fellows attend the course for three days a month) • Goals: Further develop skills and understanding of the commercialisation process	• Organiser: Royal Academy of Engineering • Six-to eight-month remote coaching support. Two day in-country event with training, coaching, experience sharing and networking • Goals: To help further develop and commercialise the fellow's innovation	• Organiser: AIM • Manila • Innovation showcase • Goals: To receive investment or constructive feedback

3.3 About this review

Oxentia has been commissioned to perform an impact evaluation to fully understand what the Newton Fund is achieving through the LIF programme, adding colour and detail to existing quantitative evaluations, providing stories and evidence of the impact, and identifying and describing enabling factors that have accelerated this change. The impact evaluation was conducted between July 2018 and January 2019. It involved the following elements:

- Desk-based review, to provide background context about the E&I ecosystem and engineering research activities in the Philippines.
- Review and compilation of existing evaluations of the programme and impact data previously gathered by the Academy, DOST and Oxentia.
- Survey of LIF fellows from the Philippines, to gather additional data on the outcomes from their commercialisation activities (n=39).
- In-person interviews with 13 LIF fellows and 11 other stakeholders from the Philippines, plus seven follow-up telephone interviews, to seek input on impact and outcomes to date.
- Production of a short supplemental video to capture stories of the impact of LIF.
- Preparation of eight case studies on LIF fellows that are presented throughout this report.

This report summarises the findings from these analyses, sharing the outcomes that have been achieved to date, identifying key factors that may have influenced – or impeded – the success of the LIF fellows, and presenting suggestions for future enhancements to the LIF programme in the Philippines.

Developing an exciting new E&I course and changing university policies to enable research

CASE STUDY

Francis Aldrine A Uy, Ph.D.

(LIF 4 2018)

Dean, School of Civil, Environmental and Geological Engineering, Mapúa University

Monitoring the structural health of buildings, particularly those in areas subject to earthquakes, can be difficult and costly. Francis' innovation, Universal Structural Health Evaluation and Recording System (USHER), is a building structural health monitoring system composed of a sensor and web portal.

USHER can be installed in all building types and enables building managers to monitor structural integrity, remotely and cost effectively. USHER has been extremely successful receiving almost $1 million in grants from DOST to trial and further commercialise the technology. The technology has also won a national and an international digital innovation award.

Francis' experiences on LIF and success with USHER have inspired him to make changes at Mapúa University to encourage others to take part in entrepreneurship and innovation. The knowledge Francis gained from LIF has also played an important role in the commercialisation of USHER.

Creation of a new E&I course:

Francis has developed a new E&I course at Mapúa University for graduates and undergraduates, which was inspired by and uses LIF content.

A new policy to encourage research for commercialisation:

Francis has also helped in the creation of new policies at his home university, to enable a better research environment. Mapúa University is a teaching-focused university, where previously academics had no time officially assigned for research. However, on LIF Francis saw the importance and opportunities represented by research commercialisation. As a result of this, Francis pushed for the development and introduction of new policies that enable faculty members to convert to full-time or part-time researchers.

The commercial development of USHER:

The skills and knowledge Francis learnt on LIF have helped him move forwards with the commercialisation of USHER. Francis found the content on business models and the development of value propositions particularly useful

Understanding the value of university research:

"LIF showed me the value of commercialising university research, that's what encouraged me to set up this policy allowing staff to shift some of their time from teaching to research."

"Senior directors of the company that owns Mapúa [a private university that is a member of the Yuchengco Group of Companies] are monitoring the progress of both my innovation, USHER, and commercialisation more broadly at Mapúa. If either generate revenue these directors will support more changes to help technopreneurship."

4. The E&I ecosystem: enablers and barriers to impact

4.1 Introduction

The LIF programme aims to build the entrepreneurship capacity of researchers, to help them commercialise innovations that address development challenges. To understand and measure the impact of LIF, it is important to consider the nature of the E&I ecosystem in which the LIF Philippines cohort operates.

Recent literature has identified certain drivers that can facilitate innovation within a geographic region[3,4]. These include: access to industry and markets, government policy and legalisation, funding and finance, education and training, university research, innovation support programmes, and entrepreneurial culture. Successful E&I ecosystems create a cohesive social and economic system that can support the creation and growth of new ventures[5]. A study by Feld in 2012 emphasised the importance of the interactions between players in the ecosystem, access to relevant resources, and an enabling role of government in the background[6].

Interviews with LIF fellows and other stakeholders indicated that although the E&I ecosystem in the Philippines is still nascent and emerging, there have been many supportive initiatives and policy from government in recent years, that have stimulated interest in E&I and have been an enabler for LIF. Given the early maturity of the local E&I ecosystem, cultural acceptance of entrepreneurship, within academia, is low, and a key outcome from LIF so far has been 'changing mindsets'. Many interviewees were enthusiastic in citing the value of LIF.

The stakeholder interviews also indicate that there have been a number of positive trends in terms of new support for E&I. There have been a growing number of incubators and

"LIF changes the mindsets and aspirations of LIF fellows, helping to tackle some of the barriers around perception. It makes academics realise that commercialising their research is not 'selfish' but actually patriotic as it means that others can benefit from their research"

Deputy Director, Manila-based incubator

entrepreneurship training/support (many targeted at students). University TTOs have been creating incentives and raising awareness to build a pipeline of innovations; going forward many plan to invest further resources in turning disclosures into deals.

The following section combines feedback from a literature review and interviews with LIF fellows and stakeholders. It presents a review of the E&I ecosystem in the Philippines, identifying the gaps and enablers that will influence the success of the LIF programme.

There has been a rise in

entrepreneurial spirit

in the Philippines, a recent survey showed that

54% of startups were launched between 2016 and 2017.

4.2 Research and education

Universities play an important role in stimulating and enabling innovation. They are often at the heart of the innovation ecosystem, serving as the pipeline for new research-led innovations, while also educating the innovative workforce of the future.

The overarching view from the literature is that the Philippines is producing valuable intellectual property (IP) from its research; however, the overall level of research activity – and exploitation – remains relatively low. Some of the limiting factors include:

- lack of a strong research culture and lack of incentives for research careers [7, 8]
- lack of PhD/postdoctoral research positions and training, and an oversupply of science, technology, engineering and mathematics (STEM) graduates who are under employed and then emigrate [9]
- research funding is lower than the UNESCO recommended 1% of the gross domestic product (GDP) [10], despite recent increases in research budgets (Appendix 8.3, Table 9)
- low volume of research publications compared to other ASEAN countries, although what is produced is well regarded (as per the FWCI index) [11, 12](Appendix 8.3.3 Figure 41 and Figure 42).

Government agencies such as DOST and CHED recognise the importance of filling the R&D gap if the country is to sustain its growth and move from a services-based economy to a knowledge-driven economy[14].

Recent efforts to enhance the research funding base have included[13]:

- CHED imposing research and publishing requirements on universities
- DOST seed funding sources for young researchers
- monetary incentives for quality publications
- grants for international conference presentations.

The strength of the *student* base in the Philippines also represents a potential opportunity for innovation. The quality of STEM-related education in the Philippines is considered acceptable by global standards[14], and young researchers are increasingly seen as contributing to a stronger innovation ecosystem. The Philippines ranks highly in *The Global Innovation Index 2018* in terms of Science and Engineering graduates (ranked number 17), and research talent in business enterprise (ranked number 7)[15]. These young researchers and student entrepreneurs could be a source for new LIF projects.

"Although the situation varies between universities, generally researchers are not hired or incentivised to commercialise or exploit their research, teaching is a much bigger focus"

Deputy Director, Manila-based incubator

4.3 Government support, incentives and regulation

Regulatory frameworks, incentives and government support are key enablers for innovation. For nascent E&I ecosystems such as the Philippines, government support can have a strong influence in building innovation capacity.

The key piece of legislation related to research commercialisation is the Philippine Technology Transfer Act of 2009[16]. While this has been highly positive in enabling intellectual property (IP) exploitation, there was a sense among many interviewees that two aspects of the law are impeding commercialisation:

- **Constraints on licensing deal terms:** according to interviewees, the law states that licensing deals must be non-exclusive (unless they go through an exception process), and it presents guideline figures for the financial deal terms. Although useful as protective measures, some interviewees feel these guidelines require updating to reflect the realities of the current day.
- **Timelines for fairness of opinion reports:** required for government-funded research licensing, this report evaluates the fairness of the proposed licensing transaction. Preparing and submitting the report is estimated to take 10 person-days[17], and the total process could take three to six months. Some stakeholders felt this was a major barrier, not only in terms of effort, but in terms of deterring potential licensees.

Overall, however, interviewees viewed the government support for innovation as a highly positive element of the ecosystem, which has been increasing in recent years. Chapter 4.2 highlighted recent government initiatives to drive research activity. Interviewees also noted how DOST has been investing and making changes to stimulate innovation, for example, by investing in TTOs, mandating technology transfer for STEM research, and trying to join up the ecosystem. There have also been a wide range of government initiatives and programmes in recent years to support startups and technology commercialisation, and to facilitate industry-university interaction (see Chapter 4.4).

4.4 University and industry engagement

The role of industry in the E&I ecosystem is multi-fold. Local companies and industry have a role to play in:

1. collaborating on (and sometimes funding) R&D;
2. providing a channel to bring innovations to market, by taking on early-stage technologies through licence deals and developing them to be market-ready products; and
3. providing the enabling supply chains for the manufacturing, distribution and sales of university products (both for in-house production or for spin-out companies).

The literature review and the stakeholder interviews have identified three critical gaps with regards to industry engagement in the Philippines:

- **Negative perceptions of collaboration:** The USAID STRIDE report (2014)[18] characterises the Philippine ecosystem as having a widespread general mistrust and dismissiveness between universities and industry, with a competitive rather than collaborative nature. Neither side appears to view direct collaborations as valuable. The university perception is that it yields neither publications, nor prestige, nor patents. While the industry view is that research collaborations are more complicated when compared to other options (such as consulting arrangements). The report also identified legal barriers that prevent industry from co-funding alongside government, and an apparent gap in awareness – or at least mismatched expectations – on both sides of how to do deals and share in rewards.
- **High industry expectations:** Because of the early stage of the E&I ecosystem, local companies and industry lack awareness of commercialisation models, and appear unwilling to license or acquire university IP until it is at a higher technology readiness level (TRL). However, some stakeholders interviewed for this report indicated that through educating their industry partners, they have been able to change this mindset.

- **Weak manufacturing sector:**
  Some more complex technologies can be difficult to commercialise in the Philippines as it lacks the required infrastructure. Interviewees highlighted challenges in accessing prototyping companies (for medical devices), testing and design services, very low volume manufacturers, or manufacturers in general (the local industry having a focus on assembly instead). Given that industry expects high TRL products currently, LIF fellows report that this has resulted in delays, missed licensing opportunities, or outsourcing distribution and manufacturing to other countries.

Figure 2: USAID STRIDE Programme

Despite these challenges, it is worth noting that the STRIDE report identified pockets of excellent collaboration on concrete opportunities among high-level business, government and universities. Furthermore, since the original report was published, the STRIDE programme has funded several successful initiatives to increase collaboration, which should have a positive effect on the ecosystem in the longer term (see: USAID STRIDE Programme).

"It's been difficult to commercialise the medical device, finding facilities or companies capable of manufacturing prototypes which we could use to approach potential clients, has been a real barrier"

LIF fellow

USAID STRIDE Programme

Stimulating university-industry collaboration and commercialisation

The USAID Science, Technology, Research and Innovation for Development (STRIDE) programme was launched in 2013 under Partnership for Growth (PFG), a five-year, US$32 million initiative to support collaborative research between industry and academia, as well as between Philippine and US universities[19]. It provides capacity-building training for Philippine researchers to be more effective and successful collaborators. STRIDE has also supported government policy improvements to make research more effective, while proving mechanisms to improve strengthened industry-academia-government dialogue. During its five-year period working in the Philippines, STRIDE has achieved the following results:

- 28 grants (total value over US$2.5 million) awarded to Philippine universities for research in collaboration with Philippine industry and/or US university
- 26 scholarships awarded to Philippine scholars to study in the US
- 10 Philippine universities mentored to set up knowledge and technology transfer offices
- 12 innovation workshops with government, industry and academia complete
- *International Journal of Philippine Science and Technology* established
- Philippine Government-University-Industry Research Roundtable established.

Following on from STRIDE's initial five-year commitment, DOST partnered with STRIDE, the De La Salle University and RTI International to launch a startup training programme in April 2018 to help commercialise research projects. The Filipinnovation Entrepreneurship Corps (FEC) programme is based on the US National Science Foundation's successful I-Corps programme, which places researchers in teams led by entrepreneurs to rapidly define the commercial and societal value of their research[20]. DOST also runs TECHNICOM (2014 to present), a programme that aids commercially viable and locally developed research and development projects[21, 22].

4.5 Funding and support

Access to capital is critical for taking innovations out to the market, particularly for spin-outs and startups, but also for translational and applied research.

LIF fellows surveyed for this report have raised over $11m USD in follow-on funding, with government grants being the largest source (see Appendix 8.2.1). Despite the existence of this funding, and support provided by TECHNICOM and DOST, over one-third of the stakeholders interviewed for this report still saw a lack of early stage and translational funding as a barrier to commercialisation. 'Translational' funds can bridge the gap between public and private sector investment, by providing follow-on investment that moves innovations closer to market so they can be adopted by industry. The interviews indicate that the challenge is similar to that faced by universities seeking to engage with industry: investors in the Philippines are risk averse and many are not willing (or incentivised) to invest in early-stage technologies.

On the other side of the equation, venture capital (VC) firms feel that there is not a sufficient pipeline of Philippine innovations. One example was of a Philippine VC that builds up to 70% of its portfolio outside of the country because "the startup ecosystem is still early stage".

This comment reflects findings from the literature review: that the lack of experienced technological entrepreneurs greatly falls below the demand from local VCs for profitable technology startups and spin-out companies[23].

Despite a lack of VC investment, nearly every interviewee commented on the growth in incubators for startups from both within and outside of universities. An article by Channel NewsAsia in 2017, for example, listed four different incubator and angel investment sources for startups in the Philippines[24]. Many of these are targeted at student startups, but still represents a strong and favourable shift in the E&I landscape. The risk is that with the lack of follow-on funding, it is likely that many of these investments will then flounder.

The table below summarises some of the comments about the investment landscape in the Philippines.

Table 1: Gaps in the funding landscape [25]

Category	Selected comments from stakeholder interviews
Translational funding	• Desire for more government *translational* funding schemes, to complement the existing funding sources, and bridge the gap between public and private sector investment. • More investment is needed in pre-commercialisation services to make tech investment ready.
Risk averse investment community	• Banks in the Philippines are seen as risk-averse and do not want to invest in the early-stage ventures. • Business people/investors are used to quicker returns and are looking for lower risk. • "Philippine investors tend to be more traditional, bricks and mortar focused, they don't understand startup investment and the need for patience!" • There is a lack of patient capital in the Philippines.
Gaps in the investment landscape	• There are business angels in Manila who provide early-stage funding to startups, but there is a tendency for them not to provide follow-on funding so companies tend to fail. • There is a strong cluster of incubators, but finance is missing.

4.6 Entrepreneurship culture

The Philippines has a relatively nascent entrepreneurial culture, ranking 84th in the Global Entrepreneurship Index[26]. According to the STRIDE report, startup and spin-out companies have had difficulty getting off the ground in the Philippines because of a general aversion to risk among professionals[27].
This reflects similar findings from the stakeholder interviews, which strongly identified changing culture and mindset as a key outcome for LIF fellows participating in the LIF programme.

The government has taken note of these issues and has deliberately stimulated nationwide interest in technology and academic entrepreneurship through education, support organisation and corporate initiatives, yet the experience and expertise to grow and nurture the startup ecosystem remains absent[28].
A recent survey of startup CEOs showed that 54% of founders reported launching their startups between 2016 and 2017, demonstrating the recent rise in entrepreneurial spirit, despite

"Historically students at universities in the Philippines target professional, secure jobs with top brand companies. We're trying to change the culture so that entrepreneurship is seen as a viable attractive option"

Director, Luzon-based incubator

Filipino children traditionally being raised to become professionals[29].

Interviewees also commented on these recent growth entrepreneurship initiatives, and the valuable impact they are having. Many felt that the timing of the LIF programme and its launch four years ago has complemented the recent changes in the ecosystem and has contributed to changes in culture and mindset. Chapter 5.4.1 provides a further discussion on the impact of LIF in changing culture and mindsets.

Table 2: Stakeholder comments on the growing awareness of E&I in the Philippines [30]

Category	Selected comments from stakeholder interviews
New initiatives that raise awareness	• "I think there is momentum growing. Seems easier to bring your technologies to the market now. There are now more incubators, more coworking spaces, some of which are funded by the private sector." • There has been growth in the number of incubators and a growing awareness of the opportunities offered by E&I from students to institutions and government departments. • DOST's Technology Application and Promotion Institute (TAPI)[31] is targeted at bringing awareness of commercialisation to into other parts of the country.
More room to improve	• There is still a negative view of commercialisation and a lack of awareness that "you can still be patriotic and pursue your academic ambition and be technopreneurial." • "The culture has started changing, but there is still a large role for LIF in this." • "In our university, there is now an awareness of IP, and there is [an incubator] which helps researchers to make products [....] DOST now asks [about the product, and the IP] in their applications, so we researchers are made aware of making ideas into a real product. So definitely mindset will change [in the future], although still less than 10% [of academics] are aware of IP!"

Becoming the director of a technology transfer office

CASE STUDY

Prof Proceso L Fernandez, Jr, (Jon), Ph.D.

(LIF 2 2016)

Director, Technology Management Office, Ateneo de Manila University

Professor, Department of Information Systems and Computer Science, Ateneo de Manila University

Jon, a computer scientist, joined the LIF programme in 2016 and was looking to commercialise his traffic management software.

Jon's software could not be commercialised, but thanks to new skills developed on the LIF programme, Jon has been able to take on a new role as director of the Technology Management Office (TMO) at Ateneo de Manila University.

Developing the skills needed to be a TMO director:

LIF gave Jon the skills he needed to effectively perform the duties of a TMO director. Two of the most important learnings were understanding that a viable technology must solve a need or customer pain point and that a successful spin-out team requires different types of people with complementary skills. Jon's office is currently working to commercialise more than a dozen research outputs by different faculty members of the university. From these, two spin-out companies are currently undergoing registration with the Securities and Exchange Commission.

Further developing the university's IP policy:

Jon is also actively helping out in the formulation of Ateneo's IP policy, which primarily expands the IP policy of the Ateneo's School of Science and Engineering to cover sections relating to copyright so that the policy can be applied broadly across the university. This should open up more opportunities for the university to commercialise its research and creative works.

Understanding pain points and creating teams:

"At LIF I learned that it is crucial to understand the need or pain point that a technology is trying solve. I also saw that a spin-out is likely to have a much better chance of success if the team members have different complementary skills."

Gaining skills and confidence:

"I'm a computer scientist, had I not gone on the LIF programme I would probably feel overwhelmed by this job."

Developing IP policies to increase the opportunities for commercialisation:

"We are essentially adapting the School of Science and Engineering's IP policy and adding sections to cover issues related to copyright so that it's more applicable across the institution, not just within science and engineering. This should open up more opportunities for the university to commercialise its research and creative works."

Developing skills for a new career in technology transfer

CASE STUDY

Patricia San Jose

(LIF 4 2018)

Technology Transfer Officer, University of the Philippines Manila

Patricia's innovation is a Philippine-specific, early-stage vaccination for Leptospirosis, a bacterial infection that can cause Weil's disease and meningitis. Initially, the vaccine was to be developed for humans.

However, after LIF Patricia realised that the agricultural sector might be a better market to target as there are fewer barriers to entry, the vaccine is now being developed for domestic animals by a research team from the College of Public Health at University of the Philippines Manila, led by the technology's inventor, Dr. Nina G. Gloriani.

Patricia started a new role as a technology transfer officer shortly before joining the LIF programme. She had a technical background, but little commercial experience or training and the skills she learned on the LIF programme have helped her in her new role.

Developing commercialisation skills for technology transfer:

Patricia started a new role as a technology transfer officer shortly before joining the LIF programme in 2018. She had a technical background, thanks to her studies in marine biology, but little commercial experience or training. The LIF programme has helped to give her the commercial and business skills she needed to work as a technology transfer officer. Patricia is now managing 30 technologies and taking the lead in licence negotiations. She is also passing the skills she learnt at LIF to other colleagues.

Overcoming barriers to the commercialisation of Patricia's innovation:

After the LIF programme, Patricia discovered several barriers to the further development and commercialisation of the vaccine. However, using the knowledge and skills learnt on LIF, Patricia saw how she could pivot to a new market with fewer barriers, enabling the development of the vaccine to continue.

Developing commercialisation skills:

"In terms of business development and commercialisation, before LIF I wasn't really sure what I was doing. LIF has given me these skills and shown me how a technology can actually be commercialised."

"The negotiation practise sessions we had in the UK were great, they've really helped me a lot in my role at the TTO. I have to talk to the inventors, and negotiate with potential clients, understanding the mindset of business people is very important in this process ... I also learnt about pivoting to different products, which has been really helpful."

Successfully working at a TTO:

"I'm now managing 30 technologies for my office and taking the lead in a licence negotiation. LIF has really helped give me the skills and confidence I need to do my job. I'm also passing on skills to others: I gave a talk about LIF and commercialisation to a group of colleagues recently."

5. Impact of the LIF programme in the Philippines

5.1 Introduction

Prior to this review, DOST and Oxentia completed studies to gather data about the programme's impact. The LIF fellows, from all 16 geographies, are surveyed at specific points during the LIF programme. Surveys include an entry and an exit survey as part of the residential programme and the follow-on programme, and an alumni survey after the end of the LIF programme.

The purpose of all three surveys is to assess personal and project development before versus after LIF, asking questions such as project status and level of funding raised. Examples of the data outputs and brief commentary can be found in Appendix 8.1. In addition, in 2018, DOST prepared an analysis of the inputs and outputs of the programmes, including a comparison of skills gained through the LIF programme.

Except for the alumni survey, existing analyses have not investigated the outcomes of the programme in terms of commercial metrics and broader impacts on the ecosystem and individuals. The survey and interview data gathered by Oxentia during this review has focused on providing a complete picture of LIF's impact on the innovation ecosystem in the Philippines. Specifically, this review looks to understand more about the impact and outcomes related to personal achievements in both the short and long term, impacts on individual ventures, and the impact that the LIF programme has had on the broader innovation ecosystem. Significantly this review has found that one of the greatest impacts of LIF in the Philippines has been on institutional E&I capacity. LIF fellows, and other stakeholders who have been inspired by LIF, have gone on to set up TTOs, introduce new entrepreneurship courses, and develop E&I enabling policies and procedures at their home institutions.

The logic model[32] in Figure 3 provides a snapshot of the impact from the LIF Philippines programme, bringing together the previous analyses with data gathered in this review. The inputs, activities, outputs, and outcomes are further explained in the following chapters. Numbers have been provided where data exists, and suggested metrics have been provided where data is not available.

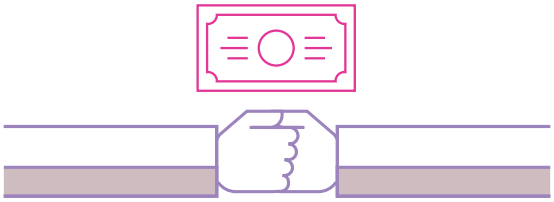
Figure 3: Philippines LIF Programme Logic model (LIF1-4) [33]

INPUTS	OUTPUTS		OUTCOMES - IMPACT		
People and partners	Activities	Participation	Personal/other achievements	Ventures/projects	Broader ecosystem
AIM Launch Programme: • 5 professors • 6 cases **Academy UK residential programme:** • 40 trainers • 12 coaches • 185 training hours • 100 coaching **AIM Landing Programme:** • 8 professors • 24 cases **Academy follow-on programme:** • 9 coaches	**AIM Launch Programme:** • 24 class sessions provided to each LIF cohort of 15 **Academy residential programme:** • 57 training sessions delivered • 20 coaching sessions delivered **AIM Landing Programme:** • 48 classes (per cohort of 15) • 108 hours of class sessions (per cohort of 15) • 24 coaching sessions (54 hours of coaching) (per cohort of 15) **Academy follow-on:** • 87% of fellows receiving support • 375 remote coaching hours provided • Three two-day in-country events held **AIM Demo Day:** • >600 prospective customers, investors, and partners attend Demo Days	**Types of participants:** • 43 researchers trained • 17 technology transfer officers trained • 26 institutions capacitated • 7 regions covered **Venture outputs:** • 45 go-to-market strategies developed • 45 product management plans developed • 45 concrete business models developed • 45 DOST-funded fellows trained • 55 technologies promoted	**Short-term:** • 3 published media articles • 4 DOST-AIM MOA partnerships • 60 commitment contracts from agencies of participating fellows • Increase in knowledge and confidence of LIF fellows in key **Long term:** • LIF fellows pass on their knowledge through conference presentations, mentoring and teaching • Skills and experiences from LIF play a crucial role in shaping and developing the careers of LIF fellows • LIF fellows collaborate together exchanging information, developing new ideas and submitting joint funding proposals	**Short term:** • Over the course of the LIF programme projects develop, moving from ideas and lab demos to more advanced stages such as prototypes and final products **Mid to long term:** • (Success measures - economic impact/ outcomes) • $11 million in funding raised by LIF projects • 4 projects have concluded licence deals • 2 active spin-outs are currently generating revenue, one of which has received over $100,000 in revenue in the past 12 months • Spin-outs are creating jobs	• LIF alumni set up new TTOs • LIF fellows develop new E&I courses and create new E&I friendly policies at their home university • LIF is changing existing negative perceptions of E&I in academia **International collaborations:** • 1 LIF fellow is collaborating with the University of Oxford through the Academy's Frontiers of Engineering for Development Programme • 1 fellow in discussions with UK universities relating to potential collaborations • 1 fellow is exploring the possibility of Thai LIF fellows acting as distributors for her LIF product

Two LIF fellows have formed active spin-out companies, one of which has generated

over US$100,000

in the last 12 months.



5.2 Inputs and outputs

The inputs to the LIF programme include funding, personnel, facilities, and from sources such as the Academy, Newton Fund, DOST, AIM and so on. Key figures from the Academy include:

- 40 trainers from the Academy's UK residential programme have provided 185 hours of training
- nine coaches from the Academy's follow-on programme have provided 375 hours of remote coaching
- three in-country training and networking events have been held.

The input data in the logic model for the Academy's residential programme includes all four cohorts, with estimated data for LIF1. The input data in the logic model for the Academy's follow-on programme only includes cohorts 2, 3 and 4, because the follow-on programme did not officially commence until LIF2. All data regarding the LIF4 Academy's follow-on is approximate as the programme is still ongoing.

Activities measured in the logic model include the number and types of courses, sessions, and training that were run as a part of the LIF programme including the AIM Boot Camp, Academy's residential programme, AIM Landing Programme, Academy's follow-on programme, and AIM Demo Day. Further details regarding these programmes can be found in Figure 1. It is worth noting that the AIM components of the programme are unique to the Philippines, with many participants highlighting this additional support package as a critical success factor.

The participation section of the logic model highlights any results that occurred because of the activities (for example, a certain number of people were trained, technologies were promoted, how many countries/regions were represented who the LIF programme reaches).

Data from the Academy shows the 60 LIF fellows participated in the LIF residential programme, and 61% of these participated in the follow-on support programme (Figure 4). It should be noted that LIF1 did not have a formal follow-on programme, while participation levels for LIF3 and LIF4 follow-on programmes were exceptionally high. DOST also provided a breakdown of where LIF fellows came from, including institutions and the outputs from their participation such as the number of technologies promoted, go-to-market strategies, product management plans, and business models. (Figure 5).

Figure 4: Participation in Academy residential and follow-on programmes (LIF1-4) [34]

LIF1-4 LIF fellows that participated in the London residential programme

	LIF1	LIF2	LIF3	LIF4	**TOTAL**
Philippines	15	15	15	15	**60**

LIF1-4 LIF fellows that participated in follow-on programme after the London residential programme

	LIF1	LIF2	LIF3	LIF4	**TOTAL**	**% OF**
Yes	2	7	13	15	**37**	62%
No	13	8	2	0	**23**	38%
TOTAL	**15**	**15**	**15**	**15**	**60**	

Figure 5: DOST-reported data from LIF programmes 1-4 [35]

LIF accomplishments per batch

PERFORMANCE INDICATORS	ACTUAL ACCOMPLISHMENTS				GRAND TOTAL
	LIF 1 (2015)	LIF 2 (2016)	LIF 3 (2017)	LIF 4 (2018)	
No. of technologies promoted	11	15	14	15	**55**
No. of researchers trained	10	12	11	10	**43**
No. of tech transfer officers trained	5	3	4	5	**17**
No. of institutions capacitated					
DOST	5	3	0	1	**9**
HEI -SUC	3	4	6	8	**21**
Private	3	2	2	3	**10**
St. Luke's/PhilMech	1	1	0	0	**2**
TOTAL	12	10	8	12	**26**
Regions covered (according to institution)	2	3	5	5	**7**
Monitoring Council	PCIEERD	PCIEERD	PCAARRD	PCAARRD	

LIF programme accomplishments

DOST 6Ps	LIF 3 & 4 accomplishments (as of Jan 2018)	Cumulative LIF accomplishments (as of Jan 2018)
Products	• 15 go-to-market strategies developed • 15 product management plans developed • 15 concrete business models developed	• 45 go-to-market strategies developed • 45 product management plans developed • 45 concrete business models developed
People and services	• 15 DOST-funded fellows trained/15 ongoing • >200 prospective customers, investors and partners at Demo Day	• 45 DOST-funded fellow strained/15 ongoing • >600 prospective customers, investors and partners at Demo Day
Publications	• One published media article	• Three published media articles
Partnerships	• Two DOST-AIM MOA • 30 Commitment Contracts from Agencies of participating fellows	• Four DOST-AIM MOA • 60 Commitment Contracts from agencies of participating fellows

While all LIF fellows receive similar support during the residential and AIM components of the programme, individuals have the opportunity to request specific areas for support during the Academy follow-on programme. Surveys coordinated by Oxentia and the Academy after the follow-on programme (LIF2 and LIF3) reported that the top areas of support received from their coaches includes: new product/service ideas, marketing strategy, and partner search (Figure 6). A broader survey asking about the value of the support received from the whole of the LIF programme (LIF1 to LIF3) highlighted the importance of pitching and presentation skills, and funding support as well (Figure 7).

Figure 6: Support received from coach during the Academy's follow-on programme [36]

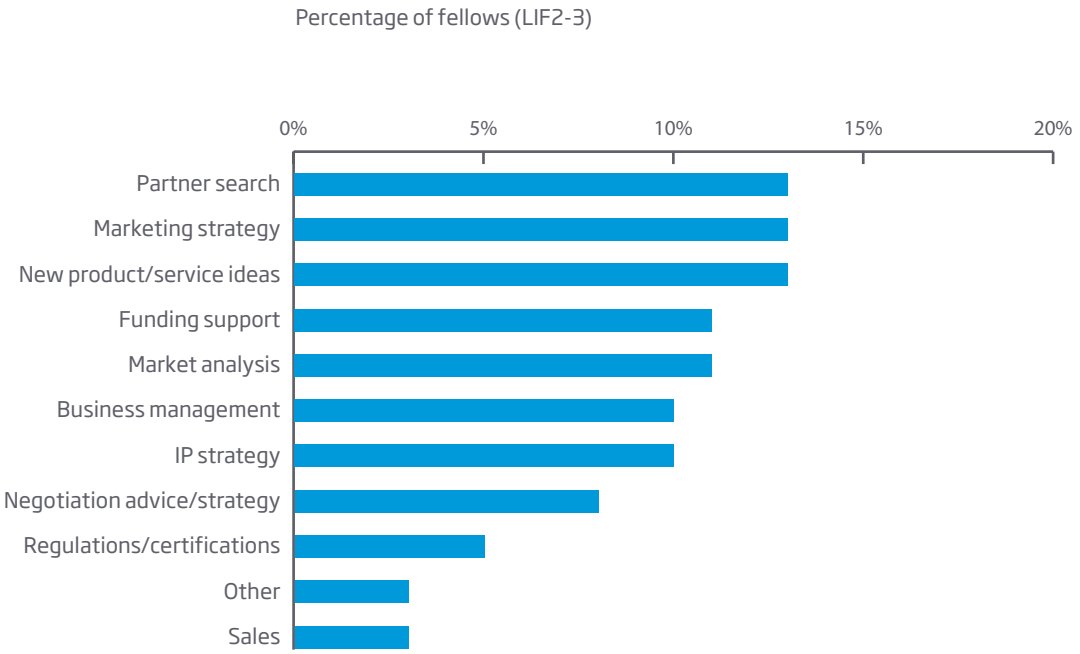
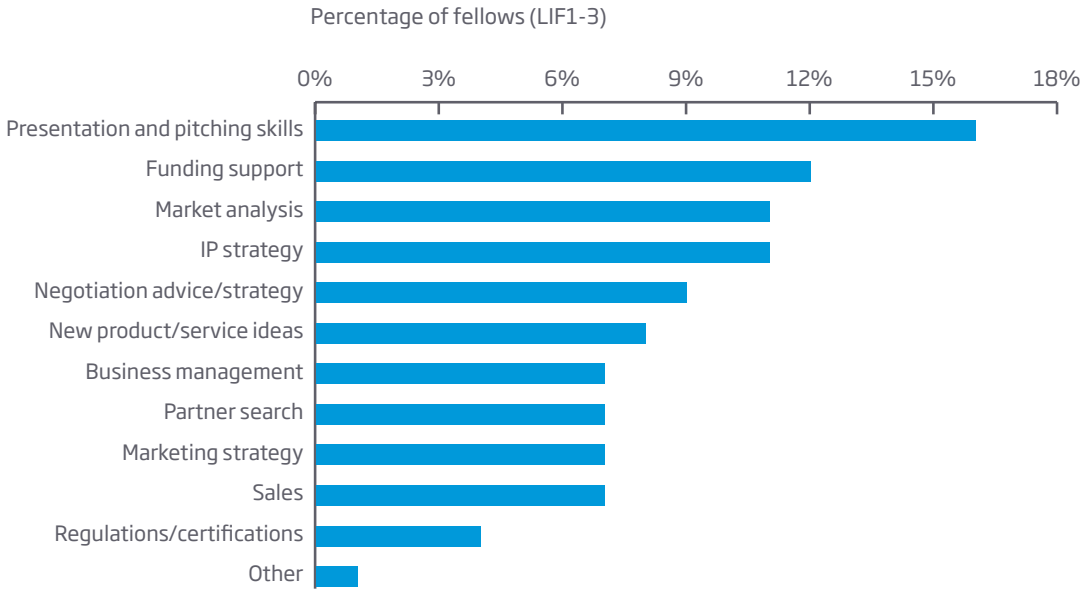


Figure 7: How has your LIF experience helped your entrepreneurial activities? (LIF1-3 only) [37]



5.3 Outcomes - project impacts

While inputs and outputs are important, impact on the LIF fellows' projects is a critical measure of success. Each fellow applied to the programme with a specific research project that they hoped to commercialise. Common metrics for university commercialisation include: funding raised, licence deals, spin-outs formed, jobs created, revenues or licence income received. However, many of these outcomes can take years to realise, and therefore short-term measures are also needed to show how the LIF residential programme directly influenced the projects, for example product development improvement, commercial progress.

Such short-term measures have previously been captured via the Oxentia/Academy entry, exit and alumni surveys (see Chapter 5.1 and Appendix 8.1). To gain more granular data relating to the longer-term impact on projects, Oxentia ran a more comprehensive survey of LIF fellows from Filipino cohorts (LIF1 to LIF4) in August 2018.

Of the 39 survey respondents, 20 report being ready for commercialisation: 10% (four) have concluded a licence deal, although only two of those have started receiving income from it. Nearly half of respondents (18) are considering a spin-out as a route to market. Three have already formed a company (though one of these is currently dormant), and 10 are in negotiations with potential clients and/or their university. Since the start of LIF, LIF fellows have secured an additional US$11 million in funding.

A summary of the findings is presented in Table 3. Additional charts and figures are also provided in Appendix 8.2.

In addition to the direct commercialisation outcomes associated with these 39 LIF fellows, indirect benefits include: LIF fellows using the skills they have learnt to successfully license other technologies, passing their LIF skills on to colleagues and students, and one fellow has gone on to set up an innovation centre, which has to date received almost US$1 million in funding.

LIF fellows have performed impressively in terms of gaining funding for their projects. Progress in the later stages of commercialisation, such as fee-paying licences and revenue-generating spin-outs, appears to be slower.

However, many of the projects are still being actively commercialised, with growth expected soon. Within the next 24 months respondents anticipated the number of fee-paying licences growing and 11 LIF fellows anticipate receiving income within the next two years, currently two have received income. Similarly, although only four spin-outs are currently generating revenue and only two are registered, the majority are in the process of registering and have a final product, suggesting that an increase will occur in the short term.

There are numerous possible explanations behind the slow growth in both licences and spin-outs. Some interviewees suggested that many LIF fellows, who are often tenured academics, simply do not have the time, and in some cases desire, to commercialise their projects. Some stakeholders compared the commercialisation outputs from LIF with that of a different programme, AIM's Master of Science in Innovation and Business (MSIB) course, in which participants are students, and suggested that the other programme achieved faster outcomes in part because of the younger participants having more time and fewer responsibilities than LIF fellows. It has been suggested that LIF fellows could be partnered with younger academics or students to help push projects forward (see Chapter 6, The future of LIF).

However, it is useful to note that their 'products' are less likely to be research based (and therefore less complex) and hence could be easier to commercialise.

Other important factors may include a lack of resources and infrastructure within LIF fellows' home institutions in the form of undermanned TTO offices, legal departments and a lack of sufficiently developed procedures and pathways for commercialisation. Interviewees also noted that there are very few precedents for licensing to spin-out companies. One university is exploring a conditional licensing model, that would enable it to support earlier spin-outs that may not be incorporated nor have investment yet. Interviewees also noted that alternative commercialisation models are common, including direct sales from the university (so, neither a spin-out nor licence) or manufacturing or distribution agreements.

Table 3: Highlights from the Oxentia LIF Philippines Impact Survey (August 2018)

- **Number of responses:** all 60 LIF fellows from the Philippines were invited to take the survey; 39 responded.
- **Commercialisation status:** most projects are still actively undergoing commercialisation with only six currently on hold because of changes in project priorities and funding challenges. In some cases, the project objectives changed to focus on a new/different market or application. This means 33 projects are still going ahead, although two of which are being developed by other team members.
- **Stage of development:** 20 LIF fellows reported that their projects are at the prototype stage, 11 have developed a final product and nine projects are at commercial production. None of the projects were still at the idea/concept stage. Despite many being ready for commercial production, most projects have not yet completed a licence or spin-out (see next bullets).
- **Funding amount:** collectively, respondents have raised almost US$11 million[38] across all cohorts. The majority of this funding came from government grants. The second biggest source was foundations, charities and trusts followed by university grants and angel investors.
- **Funding source:** in terms of frequency, the most common funding sources were government grants, from which 77% of respondents had received funding. 13% received a university grant and 8% received in-kind support. Angel investors and seed funding were each accessed by 5% of respondents, all of whom came from the first (2015) cohort.
- **Licence deals:** so far, four projects have concluded licence deals[39]. One of the licence deals is with a Filipino micro-enterprise in the drugs and medical sector. Two projects have reported receiving income from their licence deals in the past 12 months, in both cases the total amount was lower than US$10,000.

  However, 11 projects are in licence negotiations and/or expect to receive licence income within 12 to 24 months. Around half of these expect their licence income to be below US$50,000. Another LIF fellow from a TTO has gone on to sign three non-exclusive licence deals for an agricultural technology that was separate from their LIF project, noting that LIF helped them to complete these deals.
- **Spin-out formation:** forming a spin-out/startup was the most frequently chosen route to market for LIF projects. Of the 18 respondents who are pursuing this route, three have formed companies, two of which are from the LIF1 cohort and one from LIF4. (One of the companies is currently dormant).

  The remaining projects that planned to form a spin-out appear to be in the process of incorporating and registering their companies. Of these projects in the process of incorporating or registering, five have what they describe as a final product while another claims to have gone into commercial production.
- **Spin-out revenues:** the two active spin-outs have all generated income in the last 12 months, one has generated over US$100,000 (LIF1) and the other between US$10,000 and US$50,000 (LIF4). Two other spin-outs from LIF1 and 2, neither of which appears to be registered (one is still negotiating with the university), have generated less than US$10,000 in the past 12 months.

  For those that have not generated an income, 10 are currently in negotiations with potential customers, four are testing their products with potential customers and four have users who are (currently) not paying.
- **Spin-out jobs:** spin-outs have created around 37 new jobs. However, in most cases (10 projects) less than 50% of employees in these spin-outs are full time. The LIF fellows' most common role in the spin-out is as a founder/president/CEO or consultant.
- **Additional routes to market:** in some instances, LIF fellows take on a consultancy role to commercialise their technology as they do not feel comfortable owning equity or directly taking part in a for-profit company. Another LIF fellow is currently selling the spin-out's product via their home university; the product is being sold at below cost to test and understand the market, but by 2019 prices will be increased.

Oxentia has observed these alternative models in other countries in the region where industry may not be prepared to take on new innovations (see Chapter 4, Ecosystem review). It could be that these outcomes have not been captured in the survey results, and these should be explored further in the future.

There is also a lag time in producing outcomes from intellectual property, which may not be accounted for here. The experience of UK universities suggests an average of four years from disclosure to licence agreement, and an additional four years from agreement to royalty income. Furthermore, a 2016 study involving almost 370 university-driven technology projects observed that less than one-quarter will succeed in market access within 5 to 10 years[40]. Given that commercialisation and entrepreneurship are still emerging areas in the Philippines, one could expect these timelines to be even longer.

Additional time will be needed to fully judge the impact on specific projects and ventures of the LIF programme. Looking further ahead, it was noted that both LIF fellows and their projects tended to be Philippines or Southeast Asia focused; a factor that is likely to impact the geographic and commercial scale of the outcomes of the programme.

5.4 Outcomes - personal impacts and achievements

In addition to advancing the commercialisation of LIF fellows' technologies, the programme has had many other outcomes that are crucial to developing the E&I ecosystem in the Philippines.

Other personal outcomes of interest include information around whether LIF fellows have had contact with other LIF fellows, the importance of their LIF training on personal or project development, how/if/when LIF fellows pass along their knowledge learned on the LIF programme (for example, through a conference presentation, mentoring, teaching, and/or a new venture idea). These types of outcomes represent the 'bottom-up' approach that is important for changes to be made across the ecosystem to result in a permissive knowledge exchange and commercialisation (KEC) environment.

5.4.1 Changing perceptions and mindsets around commercialisation

One of the strongest findings to emerge from this review was the impact that the programme has on changing mindsets and culture among the participants, and by effect, among the Philippines' broader E&I ecosystem.

In the Philippines, many researchers choose a career in academia because of a desire to do good and benefit society. There is a strong belief that carrying out research is a patriotic and altruistic activity. By contrast there is an ingrained belief among academics, and within many institutions, that commercialisation is selfish, which is accompanied by mistrust of the private sector. However, the review indicates that LIF has changed this perception among LIF fellows, helping them to understand that commercialisation can help their work to have impact and benefit the wider population.

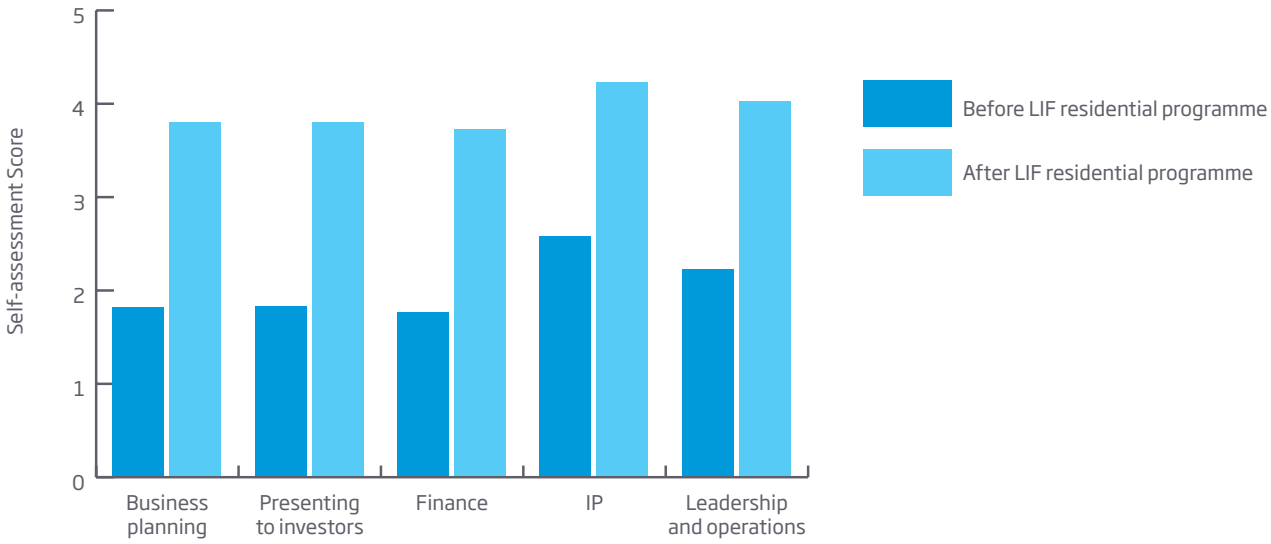
5.4.2 Developing entrepreneurial skills

While many of the fundamental entrepreneurial skills were not new to LIF fellows, the entry and exit surveys for the residential programme in London show it has played an important role in increasing proficiency (Figure 8). The programme builds the capabilities and confidence of LIF fellows enabling them to see that they are capable of creating their own products and businesses.

"The staff at our technology transfer office are great. Unfortunately, they're also really busy so it can take a long time to get advice or receive important documentation"

LIF fellow

Figure 8: LIF fellows' self-assessed skill base before and after the LIF residential programme (LIF3-4 [41])



Interviewees reported that LIF helps them to develop the hard and soft skills needed to commercialise their ideas and bring them to market (Table 4). Pitching was one of the most commonly cited skills in the interviews, followed by business plan preparation. Three interviewees specifically commented on the negotiation course that was offered during the AIM landing programme as being highly beneficial.

LIF fellows also reported that the programme has changed the way in which they think about their research and its potential end users. Traditionally academics are taught to think about the science they are performing; LIF trains fellows to take a further step and look at the problem their invention will be solving for customers through their end product.

"The practise pitch sessions were really helpful, we learnt what should go into a pitch and how it should be delivered. I feel much more confident presenting my project now"

LIF fellow

"Because we are researchers, we usually focus on the technology rather than the market. It's sort of an eye opener that the starting point for the innovation should be the needs of the market"

LIF fellow

Table 4: Hard and soft skills developed by LIF fellows [42]

Hard skills	No. of times cited
Pitching	6
Business plan preparation	3
Negotiating	3
Value proposition	2
Business models	2
Market validation	2
Selecting and triaging technologies	1
Management	1
Company operations	1
TRL assessment	1
Financial models	1
Filing patents	1

Soft skills and concepts	No. of times cited
The customer journey	2
Pivoting	1
Understanding cultural differences in business	1
Empathy	1
Understanding client pain points	1
Routes to market	1
The importance of regulations	1
The importance of teams and different roles	1

5.4.3 Developing links and collaboration between academics

The LIF programme plays a very important role in stimulating contact, collaboration, debate and the exchange of information between LIF fellows.

While LIF fellows meet to develop new ideas, submit joint funding applications and exchange information, a high proportion also use it as an opportunity to chat and provide moral support, as being an entrepreneur can be a lonely experience (Figure 9). Many LIF fellows provided suggestions for how to continue to build these networks beyond the current LIF programme (see Chapter 6.3 for proposed changes to LIF).

The LIF programme has also resulted in collaborations with students from the AIM's MSIB course tackling issues such as disease identification in banana plantations, an important industry in the Philippines as the world's third largest banana producer[43].

5.5 Outcomes - broader impacts of LIF

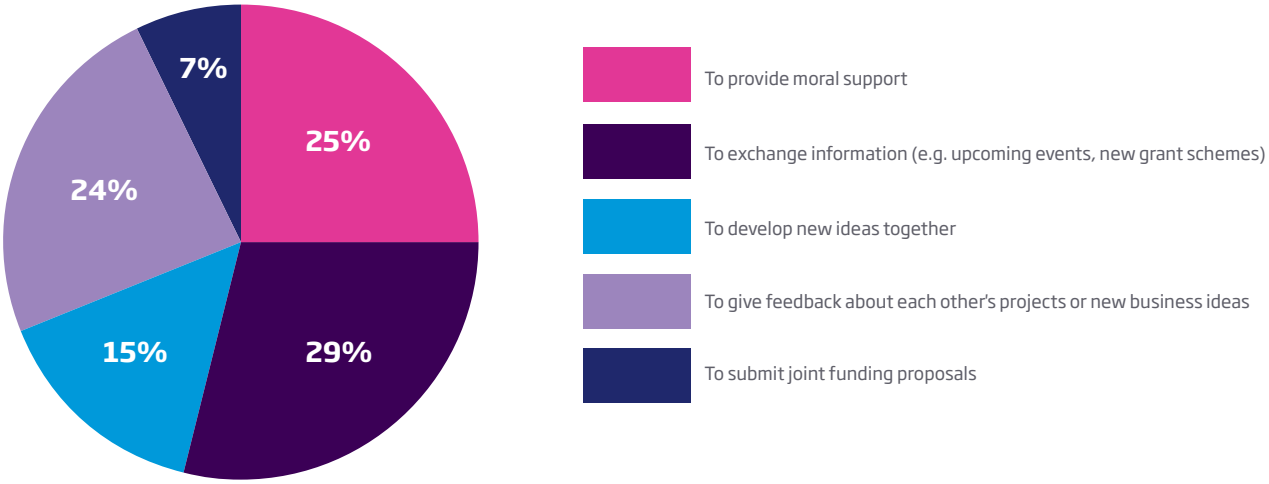
LIF is also producing outputs critical to the further development of the broader E&I ecosystem in the Philippines. This is predominantly through 'influencer and enabler' LIF fellows who pass on their skills and experiences to others and build E&I capacity within their home universities and institutions.

5.5.1 Career progression and influence

Arguably one of the most important outcomes of LIF is the creation of powerful Influencers and enablers capable of developing the E&I ecosystem.

Many LIF fellows, often those who already hold senior positions, move to posts enabling them to become powerful influencers passing on knowledge and helping to develop E&I capacity in others and at their institutions. Others move to technical positions within TTO or TMO where they help enable others to commercialise research. While these senior influencers and enablers may have limited time to develop their own technologies, they are critical in further developing the entire E&I ecosystem within the Philippines. They are therefore a crucial output of the LIF programme (see Chapter 6.2 for further discussion of the role of influencers and the future pipeline for LIF projects).

Figure 9: Have you been in contact with LIF fellows since London? What has this contact been for? (LIF1-3)[44]



5.5.2 LIF fellows pass on their skills

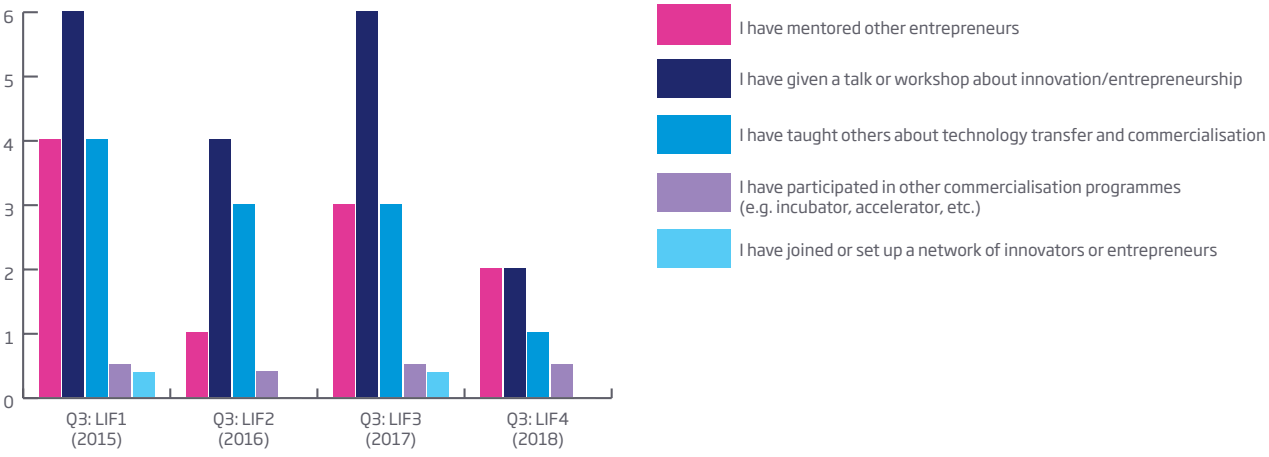
LIF fellows return to their home institutions and pass on their skills and experiences through mentoring other entrepreneurs (25%), holding talks and workshops on innovation and entrepreneurship (45%), and some (28%) have gone on to teach technology transfer and commercialisation.

These numbers are shown by cohort in Figure 10. Given the early stage of the E&I ecosystem, such activities are viewed as a crucial part of developing an entrepreneurial research culture in the Philippines.

"I realised it's important for us to start early (developing an entrepreneurial mindset) ... if we start early and train our students to look into what is the most important need, the customer experience, the pain points – we will have better research outputs"

LIF4 fellow

Figure 10: How LIF fellows are passing on skills and experiences earned during the LIF programme [45]



5.5.3 Building capacity at their home institutions

LIF fellows, and other stakeholders who have been inspired by LIF, have helped to develop important institutional capacity through the adoption and development of new E&I workshops and courses, new divisions and departments such as TTOs and TMOs, and new policies related to E&I (Table 5). For example, three LIF fellows have started new TTO or TMO offices. Another has become the director of a TMO, a role that he believes he would not have been able to successfully take on had it not been for his LIF training and experiences. Another fellow is planning to open an incubator at their institution, while an alumni angel investor network is currently being developed by another LIF fellow.

"Getting access to finance in the early days can be difficult so I'm setting up an alumni angel investor network for the university"

LIF fellow

LIF is also having a very positive impact on E&I courses within institutions. Inspired by his LIF experience, one fellow has created an entirely new innovation course at his university, entitled the 'Total Leadership in Innovation' course. The course is open to both graduates and undergraduates, with much of its content having been informed by LIF. Another fellow supported the adoption of a new E&I course at her university and currently teaches some of its modules. One fellow has also added material learnt on LIF to an existing E&I course at their institution. Stakeholders such as academics, who have taught or been involved in some way in LIF, also stated that LIF had helped in the development of three new courses, including AIM's MSIB course.

Furthermore, one stakeholder mentioned that their experience of LIF had informed the creation of a new innovation school at their institution.

"Now I tell my students to commercialise! I also teach on our new entrepreneurship course, which uses some of the material we were taught on LIF!"

LIF4 fellow

LIF fellows have returned to their home institutions where they have introduced new E&I friendly policies. One fellow wanted to work on the spin-out company exploiting her innovation while continuing to be employed by her university; previously she would have had to resign from the university to be involved in the spin-out. However, she has managed to negotiate a new policy enabling her to work on the spin-out, in which the university has equity, while continuing to draw a university salary. This paves the way for other academics at her university to do the same. Having seen the potential benefits of commercialising research, a LIF fellow from a teaching focused university has developed a new research policy whereby academics at his institution can transfer time previously reserved for teaching to carrying out research.

"I negotiated with the university to create a policy which means academics can work full time on a spin-out, while still being employed by the university, providing the university holds equity in the spin-out"

LIF fellow

Table 5: Examples of institutional impact [46]

Category	Impact examples	Fellow or stakeholder	Count
TTO and support services	Started a TMO/TTO	LIF fellows	3
	Moved into a new role as a TMO director	LIF fellow	1
	Planning to open an incubator	LIF fellow	1
	Developing alumni angel investor networks	LIF fellow	1
Courses	Added new content from LIF to an E&I course	LIF fellow	1
	Developed a new E&I course inspired by LIF	LIF fellow	1
	Learnings and experiences from LIF have helped inspire and develop new E&I courses at an institution	LIF stakeholders	3
	Learnings and experiences from LIF have helped inspire and develop a new school of innovation within an institution	LIF stakeholders	1
	Supported the introduction of new E&I courses	LIF fellow	1
Policies	Developed a policy enabling faculty members to transfer time previously reserved for teaching to research	LIF fellow	1
	Developing licensing and spin-out policies based on fellow's technology	LIF fellow	1
	Negotiated a policy enabling academics to work on a spin-out while drawing a university salary	LIF fellow	1

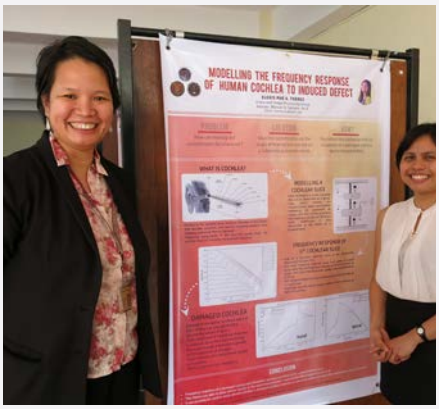
Mapping coral reefs and creating jobs for Filipino graduates

CASE STUDY

Prof Maricor Soriano, Ph.D.

(LIF 1 2015)

Professor, National Institute of Physics, University of the Philippines Diliman



Mapping and monitoring the extent of coral reefs around the 36,000 kilometre coastline of the Philippines using conventional techniques can be slow, labour intensive, inaccurate and expensive. Local governments in the Philippines are mandated to carry out biannual surveys of their coast but are often prevented from doing so by the associated cost and technical difficulty.

Maricor's innovation, the Automated Rapid Reef Assessment System (ARRAS), provides a fast, inexpensive and accurate way for local governments to map and monitor reefs in their area.

Setting up a spin-out company:

Maricor's participation in LIF and other incubators has led to Antipara Exploration, an underwater mapping and analysis company. Although ARRAS has not been licensed yet from UP Diliman it is still being utilised: local governments have been contracting work through UP Diliman for reef monitoring services using ARRAS.

Creating jobs for graduates:

LIF showed Maricor that forming a spin-out to exploit ARRAS could be a very good way of getting stakeholders to use ARRAS and of providing employment for Filipino science graduates, who might otherwise go overseas. Antipara is owned by its staff and hired several of Maricor's former students. (Maricor is a consultant to the firm but does not hold equity). The IP behind ARRAS will be licensed to Antipara for exploitation.

Changing mindsets:

"LIF convinced me that a spin-out could be a way of getting local governments to use ARRAS, while at the same time generating money which could be used to provide good jobs for the best local graduates."

Developing business skills:

"I learnt about how I could make my technology into a business. Using the Business Model Canvas, we developed areas like revenue streams and partners."

The importance of customer feedback:

"We carried out a DOST-funded market validation project for ARRAS. It told us two very important things: the first was that trial users of ARRAS (local governments) didn't want pictures or video footage of reefs, they just wanted summary reports giving them the information, so we've redeveloped ARRAS to do this. The second thing was that local governments, our potential customers, needed to be educated about monitoring reefs and budgeting to do so."

6. The future of LIF

6.1 Introduction

The LIF programme is planned to be funded by the Newton Fund through to 2021, although the programme has the potential to have continued impact far beyond this point. Stakeholders and LIF fellows interviewed for this report were asked to provide recommendations for:

- where future participants to the LIF programme may come from, and what the pipeline for the future may look like
- how LIF in the Philippines could evolve
- how coaching could evolve/improve
- what pilot approaches to a next generation LIF or a LIF alumni cohort could be adopted in the Philippines
- how the LIF alumni group in the Philippines could be better engaged by universities, DOST and the UK embassy and government
- how benefits could be realised for the UK tech scene and science diplomacy strategy from what has already been put in place.

Their feedback is presented in the following sections.

6.2 Who will be the future LIF fellows?

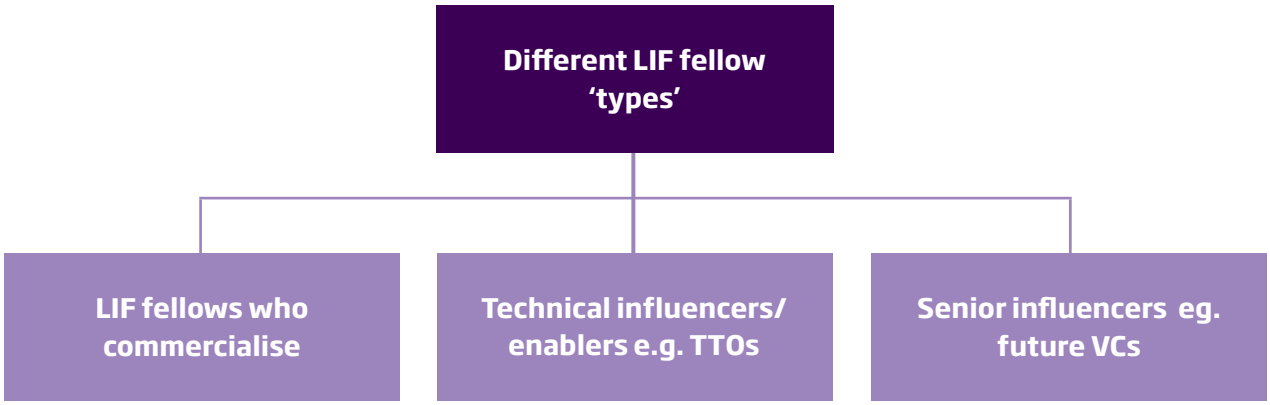
A key concern for LIF in the Philippines has been whether the best or most appropriate projects had already been taken up by previous cohorts, leaving an insufficiently large supply of future projects.

However, interviewees indicated that there is significant untapped potential in terms of future entrepreneurs and technologies within the Philippine ecosystem.

It may be necessary for future cohorts to decide what kind of impact is desired from LIF; is the focus to commercialise technologies, or to create influencers capable of developing the E&I ecosystem more broadly, or to create technical influencers/enablers who will go on to work in TTOs or TMOs (see Figure 11)? The desired impact could have implications for who is selected, how they are selected and potentially what they are taught in the programme.

LIF fellows with existing senior positions may be more likely to become important influencers but are less likely to have the time to commercialise their innovation. By contrast younger, more junior LIF fellows may have the time to devote and invest in taking an innovation through to commercialisation.

Figure 11: Potential future types of LIF fellow



6.2.1 Ensuring a commercialisation focus

A key issue raised by multiple interviewees was that tenured academics entering the LIF programme are not always able to spend time commercialising their research, or simply did not have the desire to do so as they wished to focus on their academic career. To try to mitigate this, one suggestion was that that applicants could be assessed or screened on:

- willingness, aptitude and likely ability to commercialise (for example, as part of the application process, it has been suggested that applicants could be required to gather initial market feedback, to help identify applicants with the correct aptitude and desire)
- the presence of likely entrepreneurs (junior academics) within the academic's group who might be more likely to choose a career in entrepreneurship.

Another suggestion was that the LIF programme could actively look to partner tenured academic LIF fellows with more junior academics who are more likely to have the time to work on commercialisation. Some stakeholders suggested that LIF could partner with AIM's MSIB programme, which typically has younger participants and is also heavily focused on commercialisation. A similar model in the UK is the ICURe programme, which LIF may wish to explore further[47].

Finally, many of the stakeholders felt that students are likely to be a large source of innovation projects in the future, and some suggested that LIF could/should start selecting a higher proportion of early-stage academics or students. These LIF fellows will have fewer existing responsibilities, and culturally may also be more open to a career in E&I as there is now increasing emphasis on this within curricula. However, it is worth noting that generally it is senior academics who are the recipients of DOST grants. As there is currently a requirement that LIF fellows are DOST funded, there is therefore a tendency for LIF fellows to be senior academics. There have been instances where a senior academic has nominated a junior colleague to take part in the programme in their place. In these situations, it is helpful if the senior academic is prepared to give the junior LIF fellow the autonomy to make decisions regarding the development and commercialisation of a project.

6.2.2 Creating influencers and enablers

Stakeholders also recognised that LIF innovations are more successfully commercialised when there is a joined-up approach among the LIF fellows/researchers, the TTOs and the senior management at a university.

The LIF programme is already producing influential individuals within research institutions, some of whom go on to develop their technology successfully. There is a possibility that the

process could be taken a stage further by creating a shorter executive version of LIF for senior management within institutions. Another suggestion was to create a pathway for TTO managers, academics who may be looking to change career, or those who have recently moved into a new position within a TTO. While some of the course content would remain unchanged, specialist or more detailed sections on areas such as IP would need to be introduced.

6.2.3 Expanding the recruitment process

According to interviewees, one of the current selection criteria is for LIF projects to be DOST funded. There is also a tendency for projects to be sourced from the Luzon region and Metro Manila. This is due both to the presence of high-quality academic institutions in these areas and the fact that they are more easily accessible than some other regions of the Philippines. Although, interviewees recognise the limitations of the current selection criteria, they identified a number of sources for LIF projects in the future:

- Additional DOST-funded projects: three of the four LIF cohorts have been selected exclusively from DOST-funded projects; and stakeholders from funding bodies believe there is still a pipeline of several hundred projects that could benefit from LIF.
- Other interviewees stated that appropriate projects could potentially be sourced from non-DOST-funded research (should selection criteria be broadened), and more generally from private universities.
- A stakeholder with experience of research in other areas of the Philippines suggested that other regions could yield attractive projects. To help encourage applicants from these areas, application deadlines could be extended and the awareness that interviews or pitches could be held over Skype could be fostered and better communicated.

"A lot of the case studies were focused around tech, but my innovation is in agriculture, so it would have been nice to have some examples or presentations which were a bit more related to my sector"

LIF fellow

- There may also be opportunities for LIF to leverage the broader Philippines E&I ecosystem and recruit from, or in conjunction with, innovation hubs (such as UPSCALE at UP Diliman).
- There are potential opportunities represented by younger prospective LIF fellows and student entrepreneurs, if the criteria could be widened to include them.

6.3 Suggested changes to the LIF programme

6.3.1 Content

There is a great amount of enthusiasm for the LIF programme and its content among LIF fellows and other stakeholders (see Appendix, Table 10 for specific aspects of the programme that were mentioned).

When asked what changes they would like to see made to the programme, LIF fellows and other stakeholders put forward a broad range of topics that they would like to see added or altered. The most frequently mentioned are shown in Table 6.

The two most popular suggested changes were around hearing more, and more varied, entrepreneur stories. (In particular, LIF fellows were interested in a wider range of case studies

Over **20%** of those questioned requested that **more practical exercises in areas such as valuation and negotiation be added to the programme.**

or stories of commercialisation from other sectors beyond digital/tech.) The other most frequently requested addition was more practise and practical exercises to help increase skills and confidence in areas such as valuation, negotiation and pricing. Many of the other suggestions were very practical and included areas such as assistance with technical and legal issues, particularly from fellows whose university TMOs are under-resourced and so do not have sufficient time to provide assistance in these areas. Other fellows were interested in learning more about standards and certifications and gaining access to manufacturers and distributors.

"The programme has been so helpful to me; the negotiation practise sessions we had in the UK were great, they've really helped me a lot in my role at the TTO. I have to talk to both the inventors, and negotiate with potential clients, understanding the mindset of business people is very important"

LIF fellow

6.3.2 Cohort streaming

Given the different types of fellows on the LIF programme (TTOs, senior influencers and commercially focused academics), it was suggested that to create the maximum benefit, cohorts could be streamed. Within a LIF cohort there could be a track for research LIF fellows and another for TTO staff, with some TTO specific content including:

- technology transfer (TT) case studies or case training with a TT professional from another country
- sales and negotiation (with a TTO context)
- IP valuation
- setting up a TTO.

An additional 'executive track' was suggested for senior administrative staff in universities or potentially government agencies, these LIF fellows could go on to become senior influencers and promoters of E&I.

Table 6: Most commonly suggested alterations to programme content [48]

Suggested changes	Comments/additional detail	Count
Entrepreneur stories	More from Filipino entrepreneurs	5
	Not just tech stories, other sectors, like agriculture	
	More stories from university-based researchers and the opportunity to speak with them	
	How to move past the research and validation phases	
	Success stories from entrepreneurs, including their personal experience, to inspire, not just to provide technical knowledge	
Practical exercises to further develop skills and competence	Areas of particular interest were: • valuation • negotiation • product and service pricing	5
Entering foreign markets	How to do it	2
	Where to get data from	
Manufacturing and distribution	How to find, vet and select; prototype designers, manufacturers and distributors	2
	What networks can LIF fellows use to help	
Accountancy content	Content for SMEs	1
Content on regulations and certification	Optional module	1
Assistance with technical and legal issues	Actually providing assistance in these areas (university resources can be limited and therefore slow)	1
	Training so LIF fellows can draft legal documents (providing templates may be more practical)	
Decision-making tools	Developing tools or frameworks to help LIF fellows make decisions relating to investment and other areas in a structured way	1
Social enterprise training	How do they work, and could this be a potential model?	1
	Pricing, pitching and business models for social enterprises	
Product lifecycle training	Understanding what happens after a project is sold; mapping how a customer will use/interact with a product	1

6.3.3 Additional assistance and connections

Many LIF fellows would like the programme as a whole to be longer so as to provide additional assistance and maintain momentum of their projects. To get the most value from the UK portion of the programme, a stakeholder from a TTO suggested the addition of some pre-LIF 'homework' for LIF fellows involving some initial validation work. An alternative could be to ask LIF fellows to prepare an elevator pitch for their project in advance.

Other suggested ways of continuing momentum on individual projects included:

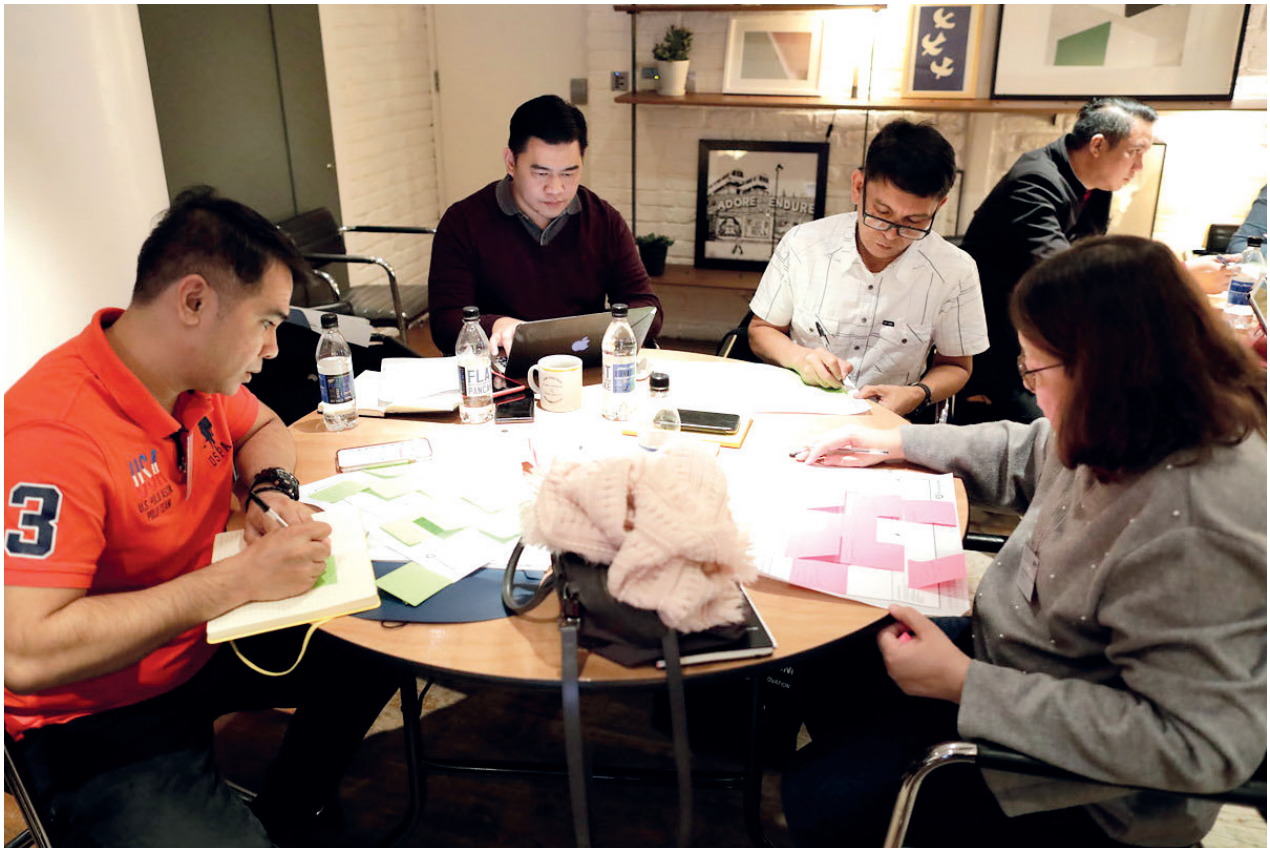
- LIF fellows could be given an action plan with quarterly milestones
- informal networking and contact with other LIF fellows[49]
- newsletters to keep LIF fellows up to date and involved, especially if they do not have time to attend events
- link LIF fellows to incubators and/or have competitions for incubator places

"LIF fellows tend to be senior academics with many demands on their time. Providing them with quarterly milestones and linking them up with their university's TTO could be good ways of helping them to keep their project on track"

TTO Director

- link LIF fellows with other organisations who can create competitions and facilitate commercialisation such as the development finance institutions
- provide industry contacts to LIF fellows
- allow team members to attend follow-on events.

Multiple TTO stakeholders also suggested that TTOs could be more involved in the selection of LIF fellows, and that it would be beneficial for them to be made aware of the projects that were participating, so that they could continue to support them beyond the programme.



6.3.4 Networks

Multiple LIF fellows noted the value of having regional networking opportunities. The regional LIF event in Bangkok (2016) was viewed as a success and a good model for future regional networks; even those who had not previously attended the event suggested a similar model. Other LIF fellows noted the value of interacting with LIF fellows from the region during the UK residency, and recommended that this be considered when building future cohorts (for example, clustering the cohorts to include Philippines, Thailand, Malaysia, Indonesia, and/or China; or clustering the Philippine cohort with Latin American LIF fellows who have a shared cultural heritage). Pairing countries within the same cohort could also be a way of helping fellows overcome country-specific commercialisation barriers. For example, LIF fellows from the Philippines highlighted a lack of prototyping companies and low volume manufacturers as a barrier. Placing Filipino fellows in the same cohort as Chinese fellows, who have access to a more developed manufacturing sector, and encouraging them to network and discuss prototyping and manufacturing could help fellows from the Philippines find manufacturing suppliers in the region.

LIF fellows also requested access to more networking opportunities and offsite visits while in the UK, in particular, visits to innovation centres, businesses and startups. As well as being inspiring, LIF fellows believe that these visits would enable them to expand their networks. Many stakeholders and LIF fellows also highlighted the value of having more opportunities to network with – and hear presentations from – academic entrepreneurs.

Finally (in addition to sector-specific course content), LIF fellows would appreciate the opportunity to be put in contact with sector-specific mentors, networks or even LIF participants and alumni. Agriculture, in particular, was a sector where LIF fellows felt there was a gap in the current programme, as well as access to manufacturing and distribution companies/networks.

6.4 International collaboration

A secondary objective of the LIF programme is to generate opportunities and benefits for the UK. Of the LIF fellows interviewed for this review, only three examples of international collaboration were cited. The most concrete example uncovered by the interviews was with a £20,000 grant for collaboration with the University of Oxford through the Royal Academy of Engineering's Frontiers of Engineering for Development programme. Another fellow was exploring the possibility of Thai LIF fellows acting as distributors for a product she has developed, and a third was holding discussions with several UK universities, Strathclyde, Glasgow and Plymouth, relating to potential collaborations.

There was a very high level of enthusiasm for further links with the UK. To investigate the possibility of developing links and collaborations between the Philippines and UK, LIF fellows were asked to rate how beneficial different types of link to the UK would be in supporting their innovation project. The results are shown in Figure 12.

The three links viewed as potentially the most beneficial were: research collaborations, advice/coaching/mentorship, and investment. Some LIF fellows wanted UK research collaboration to further develop their product. There was also demand for understanding regulations, carrying out clinical trials and understanding or accessing manufacturers. Overall, UK market access was viewed as being less beneficial, in part because some the LIF fellows' products are designed for the Philippine or Southeast Asian market. Other types of links desired by the respondents involved training and capacity building for individuals and institutions (this was a fellow now working in a TTO), links to UK manufacturing and assistance with understanding regulatory/certification barriers.

6.5 Maintaining momentum after the programme

The LIF programme is scheduled to continue to 2021 in the Philippines. LIF fellows and stakeholders were asked how LIF's impact and momentum could be maintained after the programme, both on individual projects and more broadly within the E&I ecosystem of the Philippines. As part of the discussions, potential

Figure 12: Level of benefit conferred by different potential UK links [50]

	Level of benefit to project			
Type of link	High	Medium	Low	N/A
a. UK research collaboration	15	3	2	0
b. UK advice/coaching/mentorship	11	9	0	0
c. UK investment	12	7	1	0
d. UK market access	8	6	5	1
e. Other (please specify)	4	0	0	15
f. None - no further links required	0	0	1	18

mechanisms for furthering LIF's impact were suggested by the Academy and Oxentia team including: the development of an alumni network, an ambassador programme, and a 'franchise' model (for example a programme that could be delivered by other accredited partners in-country to expand participation in and beneficiaries of LIF).

The idea of an alumni network was viewed enthusiastically by LIF fellows (Table 7). LIF fellows felt that it could play a significant role in maintaining the progress of their project by providing support and a forum to exchange ideas. One fellow suggested that there should be a physical location where LIF fellows could meet. Further networking could be carried out between the LIF alumni network and those of incubators such as IdeaSpace, who stated that they would be very willing to engage.

Linking the LIF programme with incubators – either by encouraging LIF fellows to apply or by having a special or invite-only competition in which LIF fellows win entry into a programme – was suggested by several interviewees as a way of helping to progress projects. Other similar avenues may be represented by development organisations that run competitions to identify and give support to promising technologies and startups.

Some LIF fellows are already acting as informal ambassadors for both LIF and entrepreneurship more broadly. There was enthusiasm for some form of ambassador programme, although LIF fellows noted that its success would very much depend on whether they were able to spare the time. One stakeholder pointed out that in certain incubators and entrepreneurship programmes, participants are required to swear an oath to further the aims and goals of the programme; a similar approach for LIF could be applied.

Some LIF fellows have gone on to mentor entrepreneurs, while others are enthusiastic about the prospect of doing so but again will be limited by available time. Universities are looking to pair students with entrepreneurs, and this could be done through a LIF alumni network. AIM's MSIB course, on which students develop a specific technology, could represent a good opportunity for LIF alumni to act as mentors. One of the most effective, and easy, ways of LIF fellows passing on their knowledge and expertise would be for them to hold a debrief session with the TTO or TMO of their home institution.

The idea of some form of LIF franchise was viewed positively, but LIF fellows pointed out that it would require time and funding so could be difficult to implement. However, it may be that DOST, AIM and other possible funding agencies would take a different view as they hold both the funding and motivation to lead this sort of initiative. One fellow felt that there were already many opportunities to attend workshops so in order to standout and be most valuable the programme would need to provide mentoring, which can be resource intensive.

Table 7: Selected comments about mechanisms to evolve and maintain LIF's momentum[51]

Category	Selected comments from interviews
Alumni network	"It would be helpful in maintaining momentum." "This is a very good idea as it will provide a place we can discuss issues and support each other." "Having an alumni network is good for support but also for inspiration and creating competition."
Alumni newsletter	"This is a good way of staying up to date and in touch as there may not always be time to attend events."
Links with incubators and the E&I community	"We could make a link with IdeaSpace, they have an open competition, LIF fellows should be encouraged to apply." "There are new incubators appearing. LIF should engage more with them." "The best LIF project could win a prize of going into an incubator." "There should be more mixers between LIF fellows, entrepreneurs, investors and other groups."
Partnering with other organisations or programmes	"The Asian Development Bank runs funding competitions to develop technologies. LIF could potentially partner with them." "It would be really useful to partner or connect with some kind of manufacturing association."
Ambassador programme	"It's a good idea if they have the time." "Some programmes actually make participants take an oath to give forwards and pass on the message and ideals." "Yes, it's good … I give at least one talk or lecture a month."
LIF franchise programme	"It could work but it would depend on time and money, there are lots of opportunities to go to talks so most valuable thing would be mentoring."

6.5.1 Further opportunities

The ecosystem review identified that the LIF Philippines programme is operating in a changing landscape, where many favourable changes are underway to stimulate entrepreneurship and innovation. However, gaps and barriers, such as a relatively weak manufacturing sector, still exist. There is potential for the LIF programme to help address or mitigate these barriers. Table 8: Opportunities for LIF to have further impact, summarises some of the further opportunities for the LIF programme to address remaining gaps or amplify positive changes that are already underway.

"Looking ahead I think many future fellows could be students or early stage researchers. Schools and universities are teaching entrepreneurship and I think the younger generation may view it as a more attractive career option than older academics"

LIF fellow

Table 8: Opportunities for LIF to have further impact

Ecosystem element	Direction of change	Opportunities for LIF
Research and education	The research landscape in the Philippines is changing. Increases in research activity could lead to a larger pipeline of innovations from academia in the future.	• Consider what types of outcomes and measures are appropriate for LIF, given current and future levels of research activity, and how this links to commercialisation pipelines and outcomes. • Engage with the oversupply of graduates, as this may represent an opportunity to get them involved in E&I or in LIF projects.
Government policy and support	Many recent policies and initiatives have been introduced to stimulate entrepreneurial culture change.	• The LIF programme is already viewed as a valuable part of this change. • Partnering with other programmes could further accelerate the impact for LIF fellows.
University and industry engagement	Although initiatives are underway to increase and facilitate university-industry interactions, there are still many challenges that will impede LIF fellows in the short term. The LIF programme has an opportunity to help mitigate these challenges.	• Provide guidance/training on how to engage with industry when they are not familiar with commercialisation. • Support the LIF fellows in creating a network of testing, manufacturing, distribution partnerships. • Add a specialist training module on supply chains, manufacturing, and/or distribution agreements (either in the residential programmes or via in-country events). • Modify training on commercialisation/ IP, in recognition that companies may not be prepared to license early-stage innovations, and that many universities (in Southeast Asia) are exploring a model of in-house commercialisation via manufacturing or distribution agreements instead of a 'traditional' licence agreement.
Funding and finance	Lack of follow-on financing may continue to be a risk/gap in the short term while the ecosystem is still emerging; however, the emergence of incubator programmes is a favourable shift.	• Developing links with many of the new incubators and accelerators in the Philippines could provide a pathway for some LIF projects to secure further funding and support. • Conducting a further review of the availability (or lack of) translational funding may be useful to understand if this could also be a potential limitation.
Entrepreneurship culture	LIF fellows serve as a showcase and inspiration to others and are already passing on the knowledge they have gained.	• Support this even further by creating more structured opportunities (or pilot programmes) for the LIF fellows to speak to, share with and teach others.

Using skills from LIF to launch a new institute

CASE STUDY

Prof Nilo T Bugatai, Ph.D.

(LIF 3 2017)

Full Professor of Manufacturing Engineering and Management; Programme Head, Philippine Bioengineering Institute, De La Salle University

Nilo's LIF innovation is a motor-actuated laparoscopic surgical instrument (laparoscopy is a form of minimally invasive abdominal surgery). His instrument will improve manoeuvrability and ease of use and help to reduce the incidence of metacarpal injuries suffered by surgeons.

LIF has helped Nilo develop his innovation and gain access to funding for a new institute.

Creating a new institute:

LIF has given Nilo not only the skills to further develop his innovation, it has also enabled him to access the funding needed to start the Philippine Bioengineering Institute (PBI), a one-stop-shop for information and support infrastructure on biomedical devices and equipment in the Philippines. The PBI will house research projects and provide support for those carrying out research on biomedical devices and equipment in different regions of the country.

Influencing standards:

The number of researchers carrying out work at the PBI, combined with those at other universities, has resulted in the Food and Drug Administration (FDA) of the Philippines in developing the standards and certifications for biomedical devices. This is a crucial development in enabling the commercialisation of biomedical devices in the Philippines.

Forming a new spin-out:

Nilo is currently setting up Medens Inc., a planned spin-out company that will commercialise the technologies developed by the PBI.

Gaining customer feedback and validation:

"LIF opened my mind to a lot of things, one of the most important was understanding the customer need that the innovation is solving. As a result of LIF I talked to surgeons, doctors, patients and other stakeholders ... they helped me understand how my innovation needed to change to be most successful."

Pitching:

"I'm quite a shy person so learning how to pitch and then doing lots of practise was really important ... this and learning to understand customer needs has helped my projects to succeed."

Securing funding for a new institute:

"Without the market and pitching skills from LIF I could not have raised $1.9 million for my research projects ... I was actually due to retire this year but now I will continue with work."

Developing an innovation to help the Philippines stay healthy

CASE STUDY

Gia Santos

(LIF 2 2016)

CEO and Co-Founder, Valea Health

Gia is an electronics engineer by training who joined the LIF programme in 2016, shortly after graduating from the University of the Philippines Diliman. Her original innovation, HeartSmart, was aimed at tackling the leading cause of death in the Philippines, heart disease. HeartSmart, a tele-health platform, connected healthcare experts and patients to bring doctor-prescribed and monitored cardiac rehabilitation to those with heart conditions.

LIF helped Gia develop her innovation and gain a place on a local incubator. She has gone on to further develop her proposition and launch a new health startup.

Creating a new health startup:

LIF gave Gia the formal business training and support, often through other LIF fellows, to develop her innovation. It also played an important role in helping Gia win a place with local Manila incubator, IdeaSpace. While at IdeaSpace Gia further developed and refined HeartSmart. This led to the creation and successful launch of Valea Health Coach, a virtual personalised holistic health and wellness service accessed via a subscriber's mobile phone. Valea Health is currently raising seed investment but has already signed deals with four companies and is providing its services to hundreds of users in the Philippines.

Developing health services for low-income communities:

The Valea Health team is also working on deploying the service to low-income communities who typically lack access to health education.

Building networks and community:

"Being connected to my batchmates and various industry experts gave me the confidence and support needed to move my research forward. Aside from the technical learning I got from LIF, it's really the community that's also had a huge impact on me."

Gaining a place on an incubator:

"LIF really helped give us the credibility we needed when applying to IdeaSpace."

Launching a new company:

"Valea has already signed deals with four companies and has started deploying the service to hundreds of users in the Philippines. We are currently raising our seed round of investment to move the venture forward and hopefully reach more people. We are also working on deploying our service to low-income and urban poor communities where people don't really have access to health education. With Valea Health, we provide our service via SMS and chat so that people can easily integrate it into their daily lives."

7. Learnings for other LIF countries

One of the aims of this review is to be able to share the key learnings from the Philippines programme with other LIF countries.
The success of LIF in the Philippines, both in terms of commercialising technologies and creating E&I influencers and enablers who go on to further develop the E&I ecosystem, is underpinned by four main CSFs:

These four points are described in further detail below.

1. Supportive funding bodies and home institutions.
2. Changing mindsets and culture.
3. E&I friendly policies and regulations.
4. Continuing support for LIF fellows.

7.1 Supportive funding bodies and home institutions

DOST has played a critical role by providing funding for LIF, encouraging academics to apply for the programme and developing both the regulatory infrastructure (see Chapter 7.3 - E&I friendly policies and regulations) and the organisational infrastructure in the form of TTOs and TMOs to support projects.

A home university, or other institution that is supportive of E&I, is equally important in creating an environment where activities are encouraged, and academics are allowed to attend programmes such as LIF. TTOs within home institutions have also played an important role in supporting LIF fellows, providing additional support, training, connections and even incubation services. In some instances, TTOs have expedited services such as the provision of documents or agreements to help LIF fellows.

It is therefore crucial that institutions understand the benefits brought about by commercialisation and the ways in which they can facilitate LIF fellows. Very specifically TTOs/TMOs should reach out to LIF fellows before and after the programme to see how they can collaborate; some stakeholders suggested TTOs should be involved in LIF from the earliest stage – selection of LIF fellows.

7.2 Changing mindsets and culture

Changing the mindsets of LIF fellows so that they see commercialisation as patriotic and beneficial to their country rather than a selfish act has been absolutely critical to ensuring buy-in and involvement from LIF fellows: without this

conversion LIF fellows will not engage in the process. This message needs to be spread more broadly within the academic community of the Philippines, something that is currently being carried out by LIF fellows.

Following on from this fundamental change in mindset are some related changes that the programme has been able to bring about:

- Helping LIF fellows understand their work in a broader context and therefore recognise the importance of private sector.
- Giving LIF fellows the confidence and self-belief that they can commercialise their technology and, in some instances, start to see being financially rewarded as a good thing.
- LIF, in conjunction with other programmes, is helping to show academics and students that entrepreneurship is an attractive and viable career path.

7.3 E&I friendly policies and regulations

Over the last decade key E&I enabling policies such as the Philippine Technology Transfer Act have been brought in, without which success could not have been achieved. LIF fellows are building on and adding to these policies to help further enable the E&I ecosystem in the Philippines. Recent key E&I enabling policies, some developed by LIF fellows (Table 5), have been important to the success of LIF. These include:

- incentivising research by providing career promotions for academic staff on the basis of patents, in addition to publications, teaching and administrative duties to incentivise research
- paying academics to carry out research and reducing teaching load (policy created by a LIF fellow)
- enabling academics to continue to draw a university salary while working for a spin-out (policy created by a LIF fellow).

7.4 Continuing support for LIF fellows

Entrepreneurship can be very hard and potentially isolating especially for those who also have an existing demanding career, as is the case for many LIF fellows. Factors that help to mitigate these difficulties have been cited as very important enablers:

- AIM's continuing support for fellows through the AIM Landing Programme: both LIF fellows and non-LIF fellows mentioned the AIM Landing Programme as being crucial to maintaining project momentum and continuing progress. There is also an opportunity to explore the potential and requirement for the AIM Landing Programme to be crafted to further align with the UK residential programme, and for the two programmes to work together.
- Mentoring: other LIF fellows found the mentoring support, especially when combined with back office support, extremely useful. It enabled them to carry out tasks for which they alone did not have the time, data or expertise. Mentoring is provided by both LIF coaches and AIM mentors, and there may be an opportunity to allow the two groups to work more closely together.
- Creating collaborative, cohesive, supportive 'family' cohorts: LIF fellows within cohorts who are willing and able to help discuss, interrogate and refine ideas are also seen as very important. Some LIF fellows referred to their LIF cohort as a 'family', something that was seen as being absent from other programmes.

LIF fellows in the Philippines pass their skills and experiences to other academics:

25% **mentor other entrepreneurs**

28% **teach technology transfer and commercialisation**

45% **hold E&I talks and workshops**

Creating a successful new business tackling water pollution

CASE STUDY

Merlinda Palencia, Ph.D.

(LIF 1 2015)

Chief Operating Officer, Envigor Natural Products Manufacturing Inc.

Water pollution is a serious issue in many parts of the world, including in the Philippines where domestic and agricultural waste are major contributors to the problem. Merlinda's innovation, Vigormin, is a water treatment product that, when added to septic tanks, can be used to treat domestic and agricultural wastewater.

LIF gave Merlinda the skills and knowledge to successfully commercialise Vigormin, which is now being manufactured in the Philippines.

Successful commercialisation of Vigormin:

LIF has played a key role in helping Merlinda develop Vigormin. It has given her the knowledge, especially in terms of understanding the commercialisation process, and helped her to develop the necessary skills. In 2016, DOST and Adamson University co-funded a factory to produce Vigormin, the facility is currently producing two metric tonnes per day but has the capacity to produce up to four. Vigormin is now being sold to resorts, hotels, food processors and the agricultural sector throughout the Philippines. Organisations from the private sector have also supplied Vigormin to 4,000 households to help protect water resources.

New E&I enabling policies at Adamson University:

Adamson University, where Merlinda was previously Dean of the Graduate School, has been highly supportive of commercialisation. Merlinda's negotiations with Adamson University around the commercialisation of Vigormin led to the university developing a new policy enabling academics to work full time on a spin-out while maintaining their university rank and salary.

Developing the knowledge and skills for commercialisation:

"LIF gave me the practical and strategic knowledge to get moving and start to commercialise my innovation. The pitch training was great, understanding what information you should be providing has been very useful."

Funding for a factory:

"In 2016 DOST and Adamson University provided funding for a manufacturing facility for Vigormin, which produces two tonnes a day, but has the capacity to produce four. We are now selling to resorts, hotels, food processors and the agricultural sector throughout the Philippines."

A new E&I friendly policy:

"I negotiated with the university to create a policy which means academics can work full time on the spin-out, while still being employed by the university, providing the university holds equity in the spin-out."

Changing perceptions of commercialisation and developing a lifesaving technology

CASE STUDY

Dr Kristine Mae Magtubo

(LIF 1 2015)

Co-Founder and CEO, Veris Tech. Associate, Ignite Impact Fund

Kristine is a medical doctor who joined the LIF programme in 2015. Her innovation is the RxBox, a device developed to provide better access to life-saving healthcare services in isolated and disadvantaged communities. The RxBox has several different sensors, which can be used to monitor the vital signs of a patient in a remote location. Data from the patient is then transmitted by the RxBox to a physician for diagnosis.

LIF has helped Kristine develop the RxBox, which has now been used to help millions of Filipinos. LIF also changed the path of Kristine's career by showing her that the private sector and commercialisation could be a force for good in the Philippines.

Developing a life-saving technology:

Kristine went on to be awarded a £20,000 grant by the Royal Academy of Engineering's Frontiers of Engineering for Development programme. The grant supported a collaboration with the University of Oxford to help improve the transmission of data from the RxBox. The RxBox has now been deployed in 186 health facilities, by the government of the Philippines, and has been used help over three million Filipinos.

Changing Kristine's career path:

One of the biggest realisations for Kristine was seeing that the private sector and commercialisation could play a positive role in getting technologies to the people who needed them. This has led to her taking on a new career in entrepreneurship. In 2017, Kristine co-founded Veris Tech, a company that helps medical clinics use technology to deliver better quality and more efficient services. Kristine is currently negotiating to license the IP behind RxBox. If successful, Veris Tech will develop the RxBox further by embedding machine learning for it to aid healthcare providers in making decisions about their patients in areas and situations where hospital services or clinical specialists are not easily accessible.

Changing perceptions:

"Becoming an entrepreneur, founding my own company, getting involved in innovation – all these never even crossed my mind before LIF. When I joined LIF, I realised that entrepreneurship and innovation was what I really wanted to do, what I needed to do. LIF changed my career path and I am very grateful for that."

"For me LIF was life-changing. I remember coming back from London and saying I have to start spreading the word [about commercialisation]. In my university commercialisation is not strongly encouraged but seeing researchers who didn't lose their soul to capitalism was life-changing – really inspiring. In universities in the Philippines the mindset is against commercial gain."

8. Appendix

8.1 LIF entry, exit and alumni survey data

The LIF fellows are surveyed at specific points during the programme. Surveys include an entry and an exit survey as part of the residential programme and the follow-on programme, and an alumni survey after the end of the LIF programme. The purpose of these surveys is to assess personal and project development before versus after LIF.

The following section includes a subset of the data gathered in these surveys:

- Figure 13 shows that after the programme, LIF fellows successfully access a greater proportion of their funding from sources other than research grants (such as proof of concept and seed funding).
- Figure 14 demonstrates the commercial progress achieved after the programme, with projects moving from early stages such as protecting IP, to later stages such as speaking to customers and growing a customer base.
- Figure 15 demonstrates how the stage of product development has advanced. Before the LIF programme, more projects were categorised in the three earlier stages (ideas/concept, laboratory demo, or prototype). After the programme, more projects were reported to be in the three later stages (prototype, final product, or commercial production).
- Figure 16 shows achievements made after the LIF programme. Oxentia's August 2018 survey concentrates on later stage achievements such as licences and spin-out revenues.

Figure 13: Sources of project funding before and after LIF (LIF cohorts 2-3) [52]

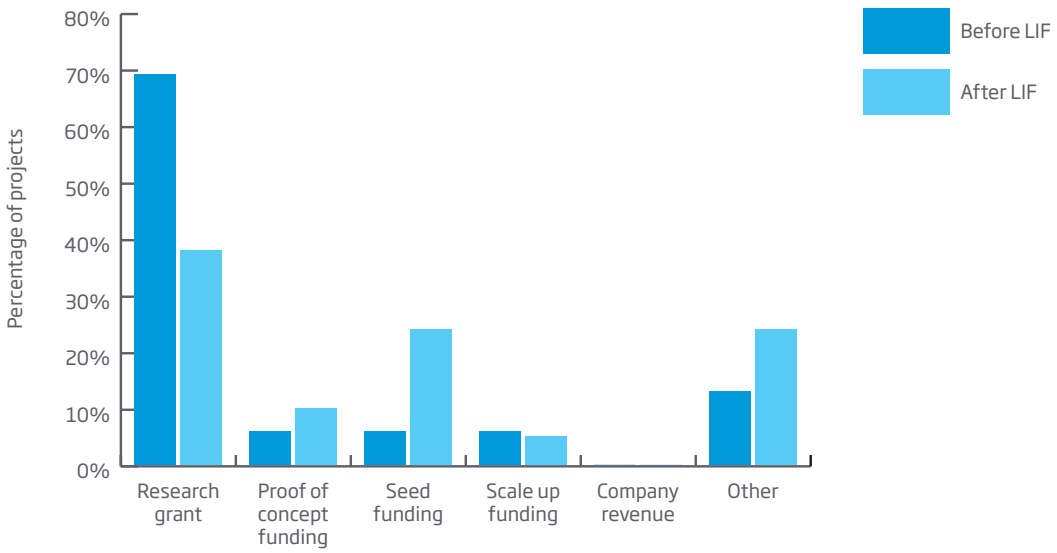


Figure 14: Commercial progress of projects before and after LIF (LIF cohorts 2-3) [53]

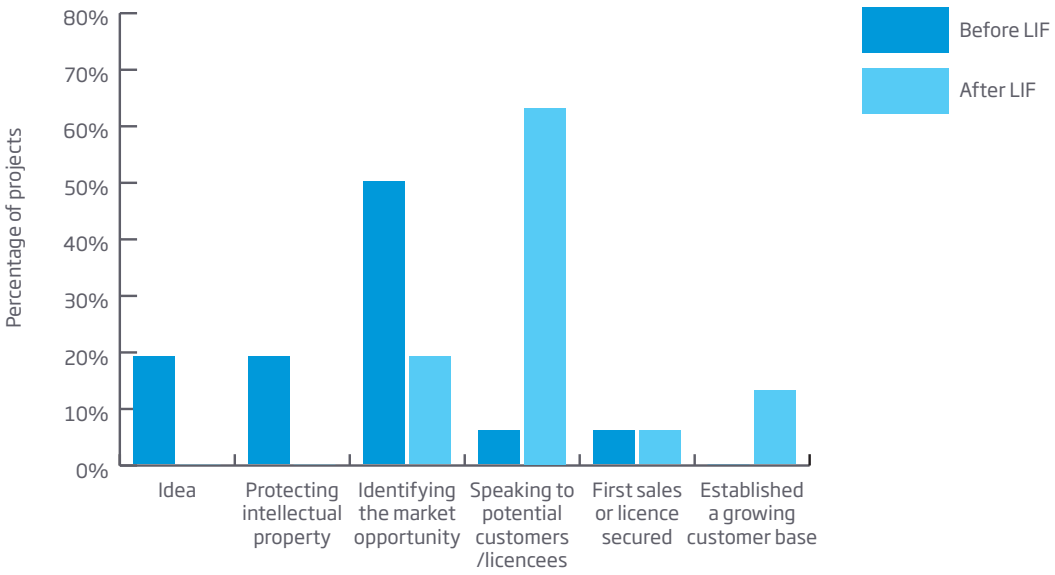


Figure 15: Stage of project development before and after LIF (LIF cohorts 2-3) [54]

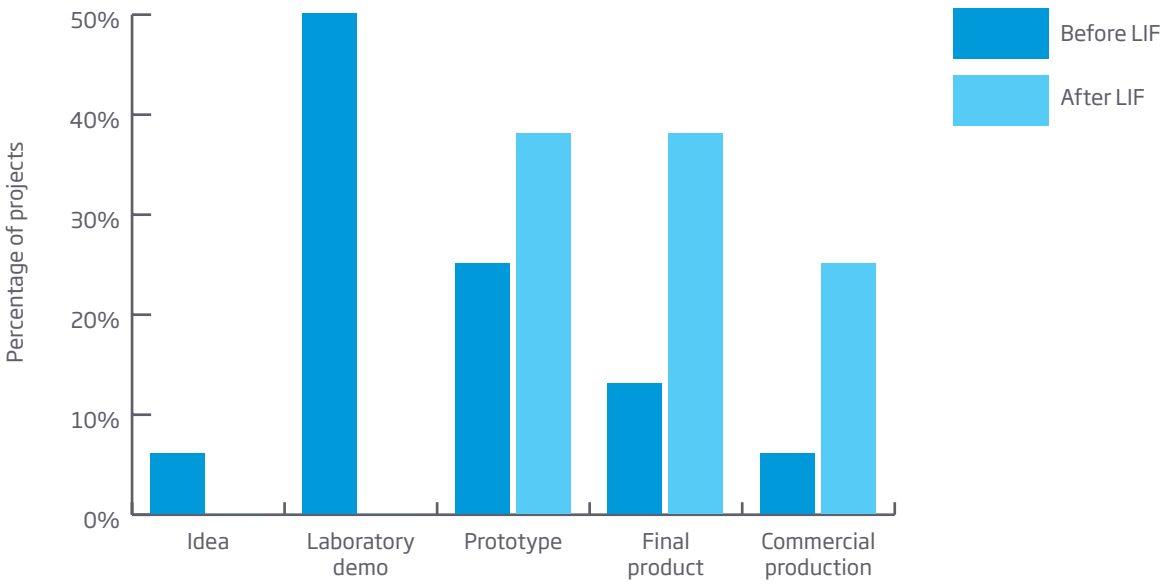
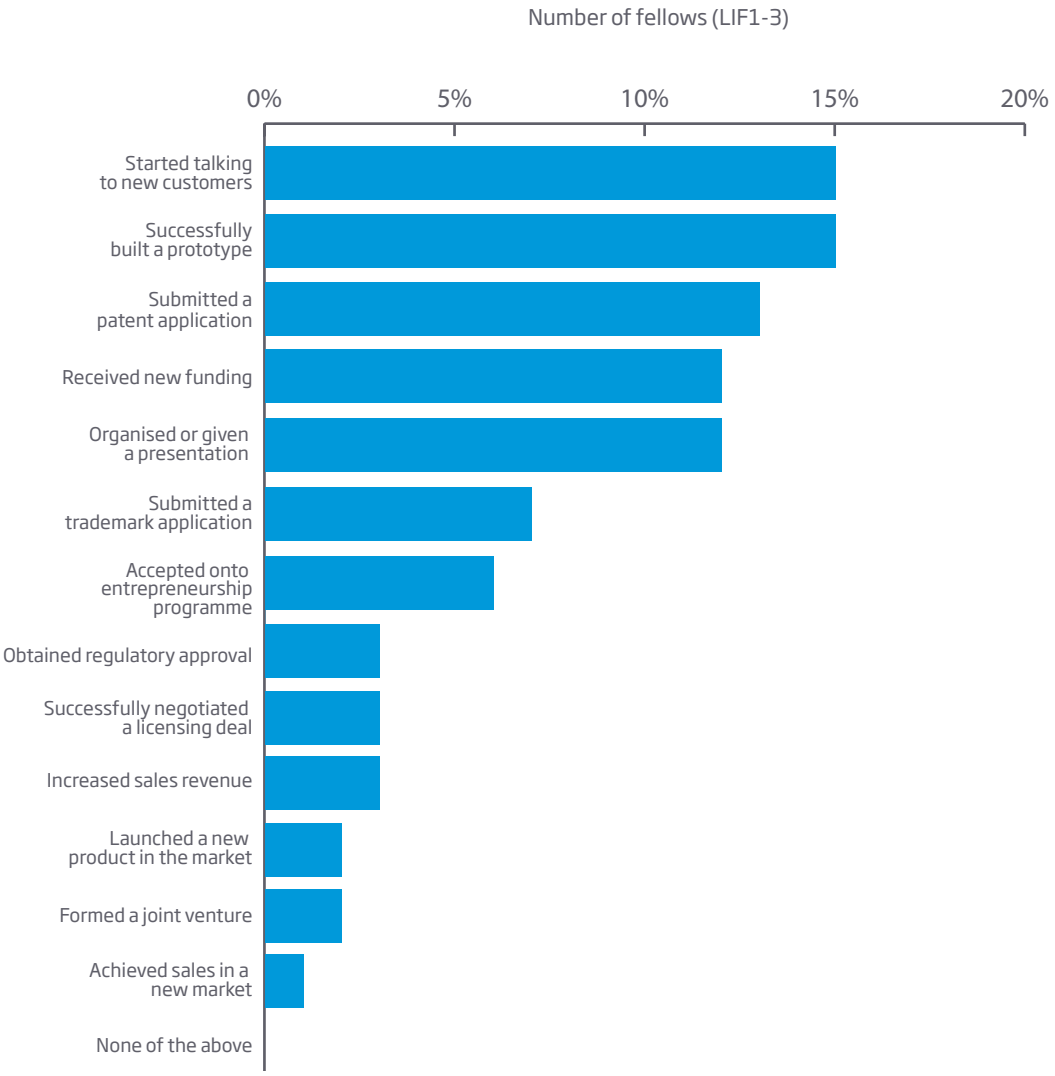


Figure 16: Achievements since LIF (LIF cohorts 1-3) [55]



8.2 August 2018 survey data

The following data is from Oxentia's survey of the LIF Philippines fellows in August 2018. Thirty-nine LIF fellows responded to the survey.

8.2.1 Funding amounts and sources

Collectively, respondents have raised almost US$11 million across all cohorts. The majority of this funding came from government grants. The second biggest source was foundations, charities and trusts followed by university grants and angel investors.

Figure 17: Funding raised by LIF projects, by cohort

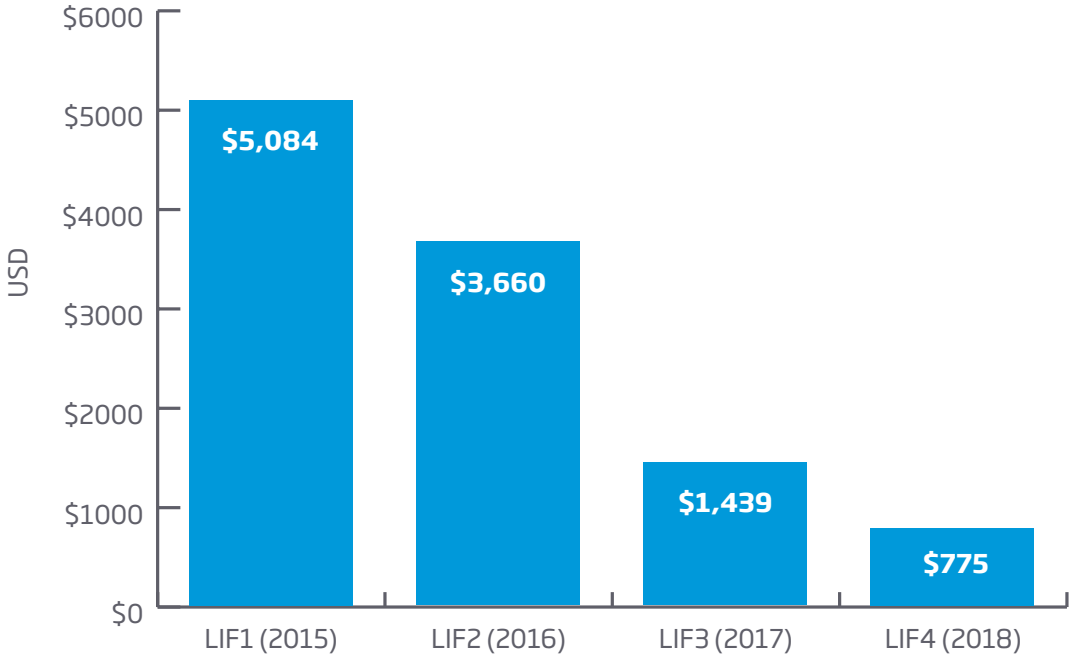


Figure 18: Amount of funding raised from different sources for LIF projects

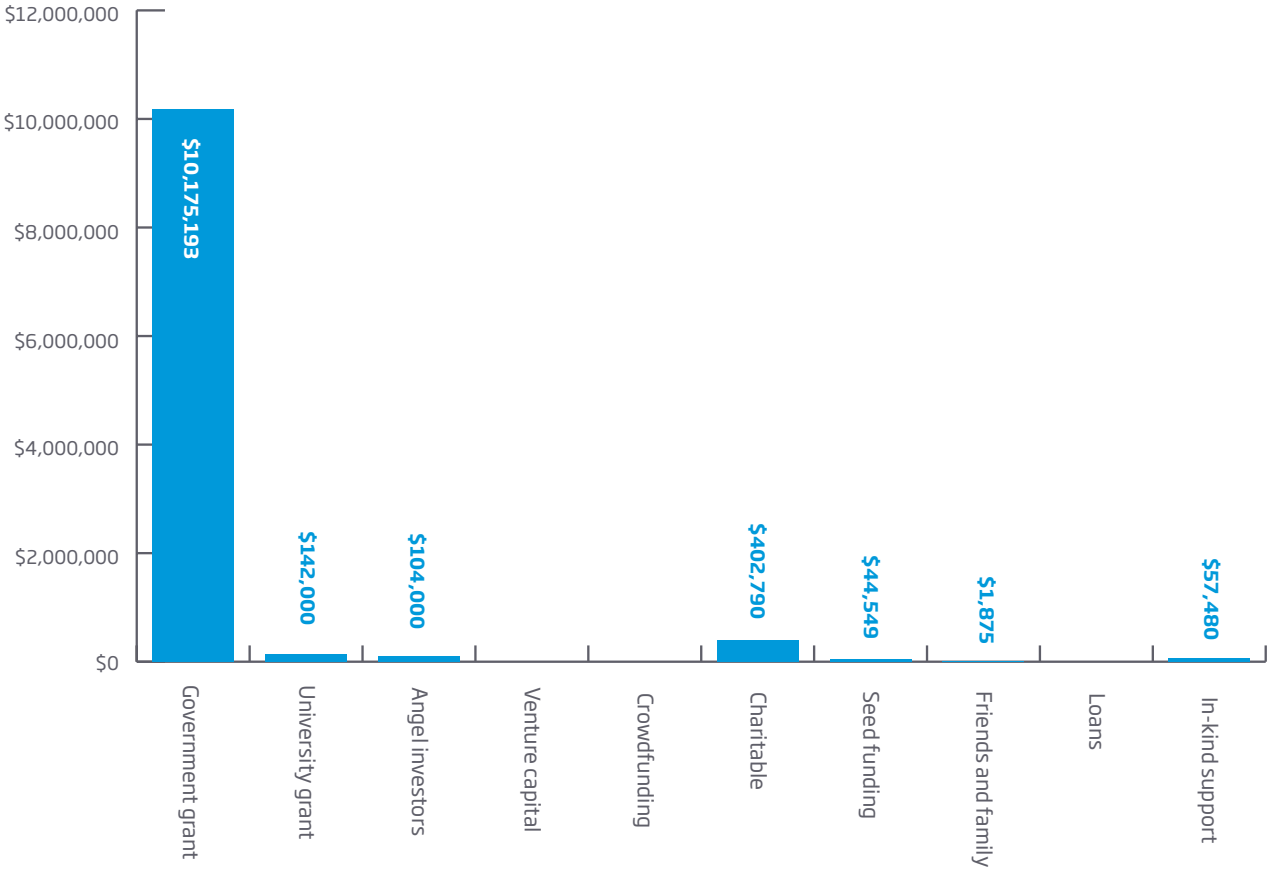


Figure 19: Amount of funding raised from different sources for LIF projects, by cohort

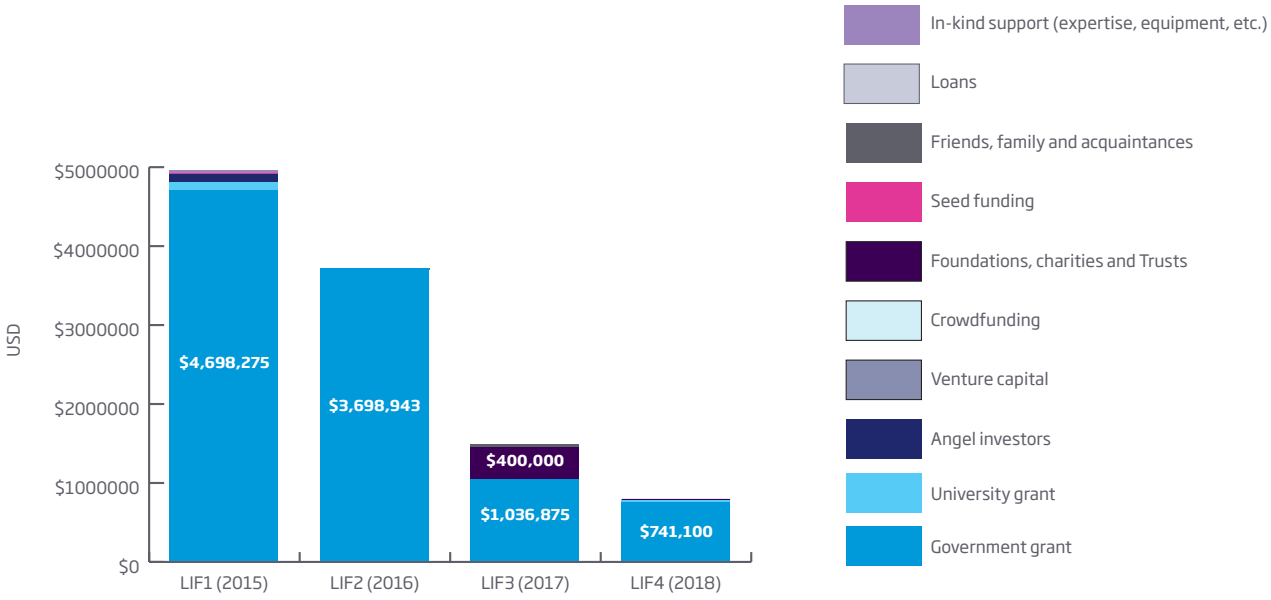
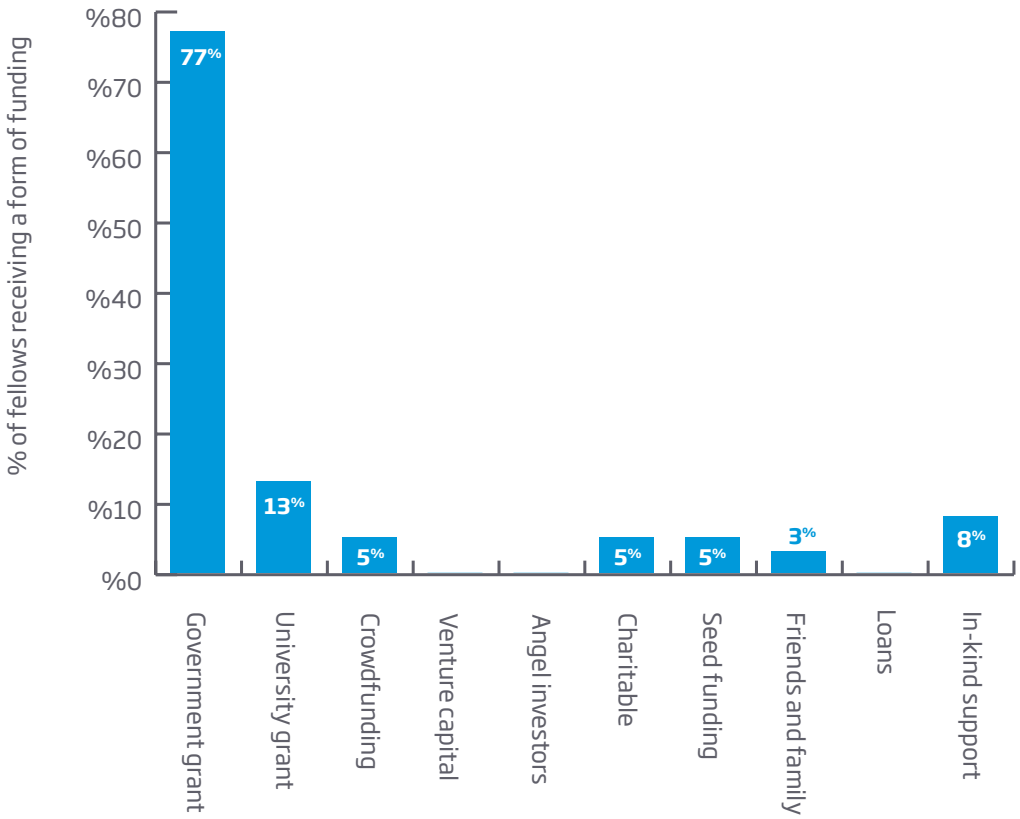


Figure 20: Percentage of projects receiving the different forms of funding



8.2.2 Commercialisation status

Most projects are still actively undergoing commercialisation with only six currently on hold because of changes in project priorities and funding challenges. In some cases, the project objectives changed to focus on a new/different markets or application. This means 33 projects are still going ahead, although two are being developed by other team members.

Figure 21: Current commercialisation status of LIF project

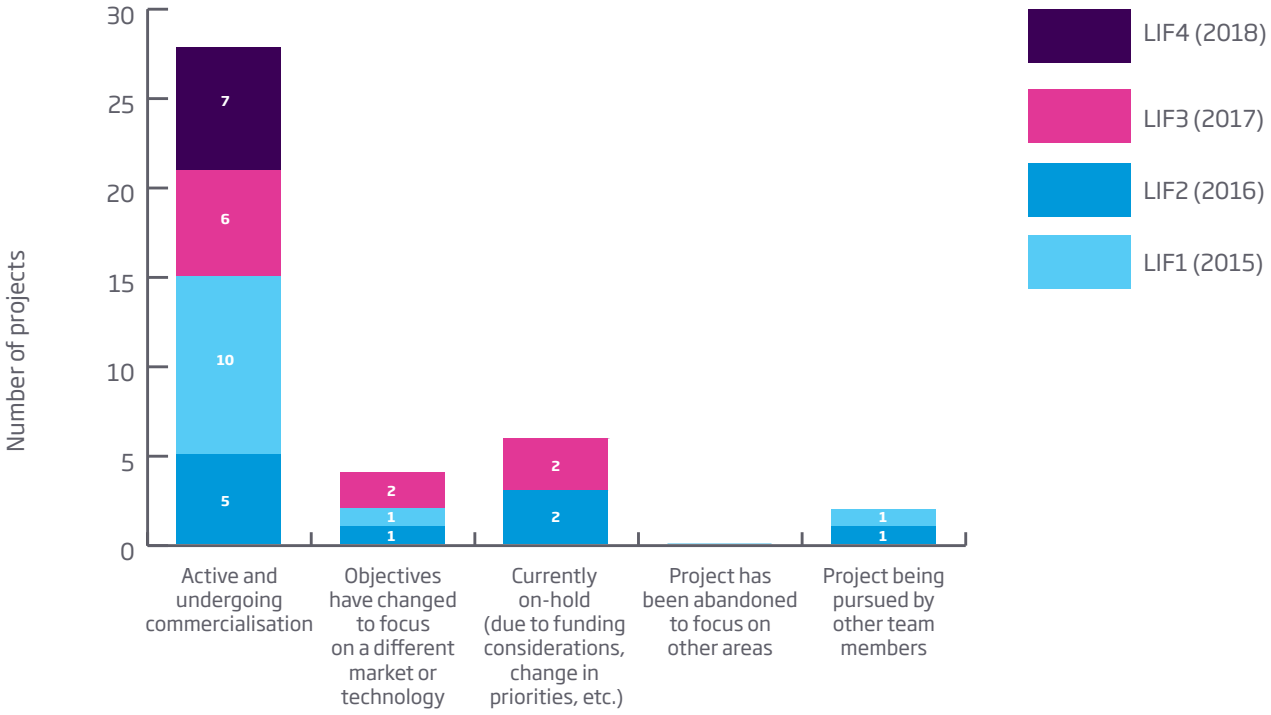
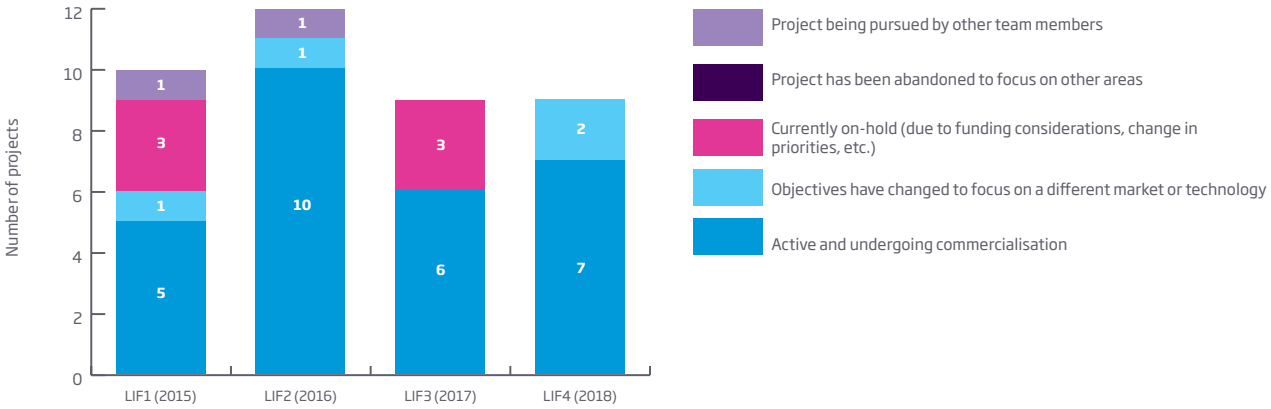


Figure 22: Current commercialisation status of LIF projects, by cohort



8.2.3 Development stage of LIF product or service

Twenty LIF fellows reported that their projects are at the prototype stage, 11 have developed a final product and nine projects are at commercial production. None of the projects were still at the idea/concept stage. Despite many being ready for commercial production, most projects have not yet completed a licence or spin-out (see next sections).

Figure 23: Current development stage of LIF projects

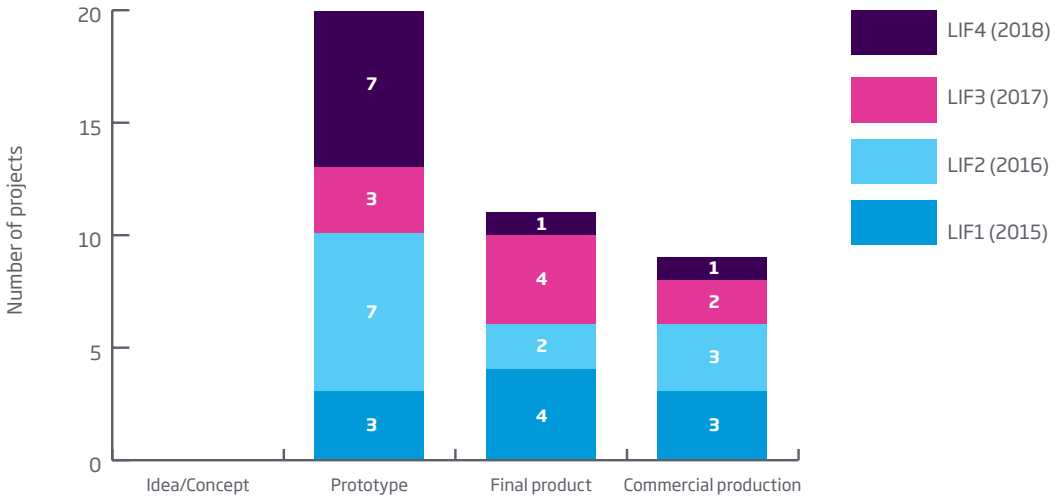
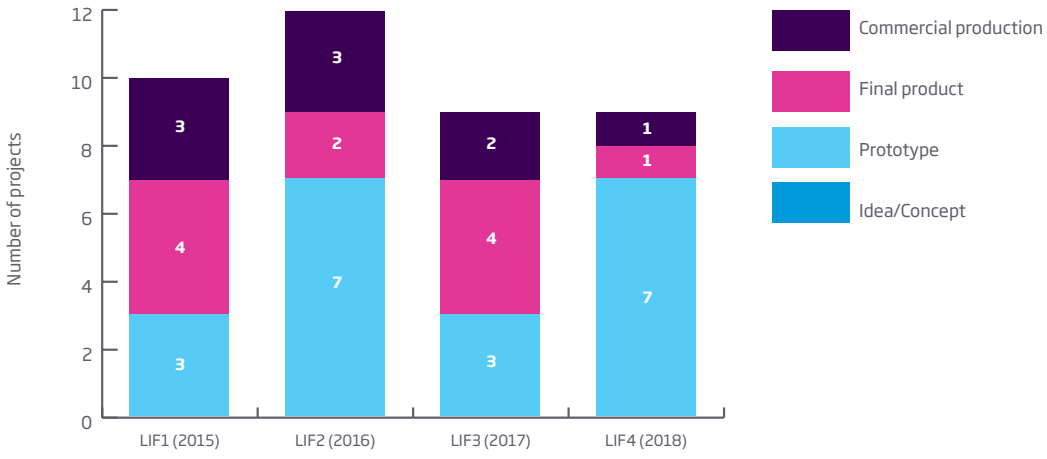


Figure 24: Current development stage of LIF product or service, by cohort



8.2.4 Exploitation plans

LIF fellows reported on the ways in which they are looking to exploit their technologies. Forming a spin-out/startup was the most frequently chosen route to market for LIF projects. Please note some survey respondents reported that they plan to exploit their technologies in several different ways.

Figure 25: Ways in which LIF fellows hope to exploit their technologies, by cohort

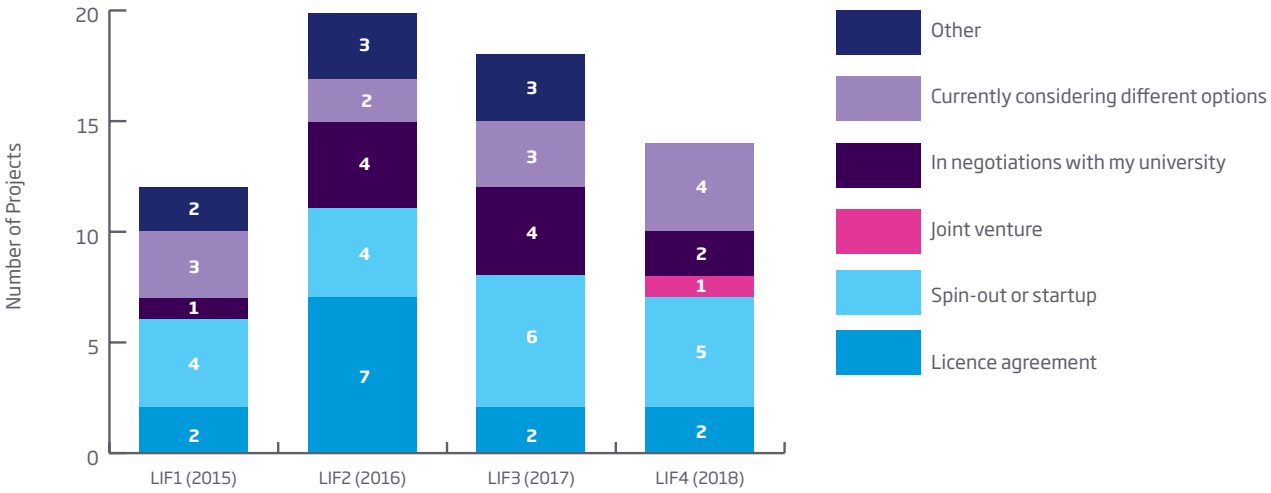
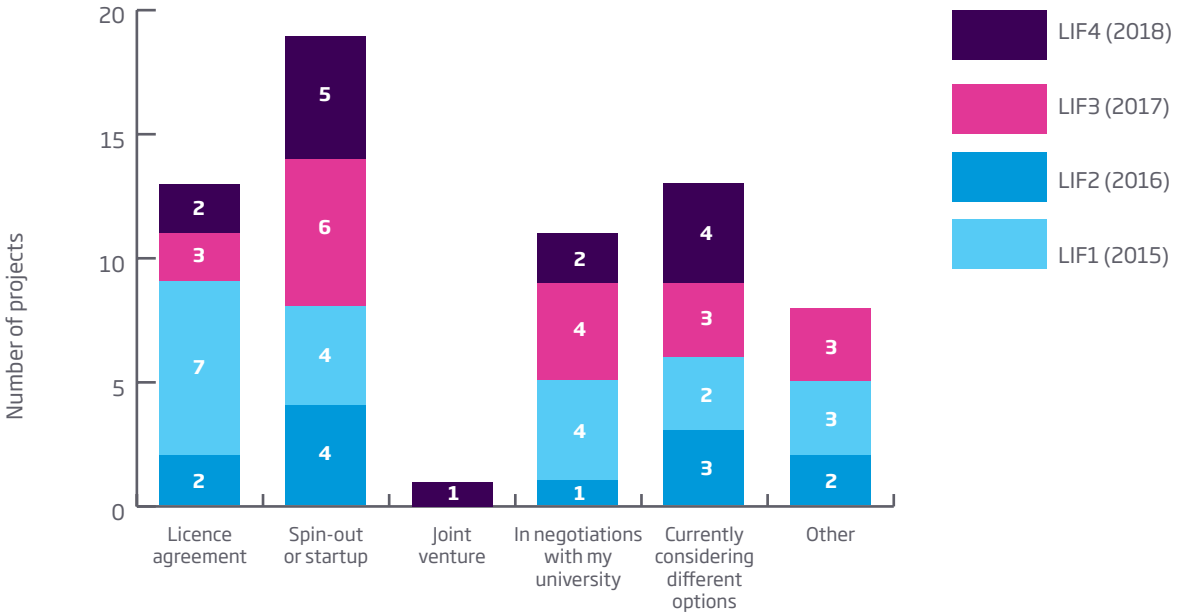


Figure 26: Ways in which LIF fellows hope to exploit their technologies



8.2.5 Licensing outcomes

LIF fellows who selected 'licensing' as a potential exploitation plan were asked to report on the status of their licence negotiations, and any income received. Four projects have concluded licence deals, and two of these projects have reported receiving income from their licence deals in the past 12 months. In both cases the total amount was lower than US$10,000. Another 11 projects are in licence negotiations and/or expect to receive licence income within 12 to 24 months. Around half of these expect their licence income to be below US$50,000.

Figure 27: Number of licence deals signed

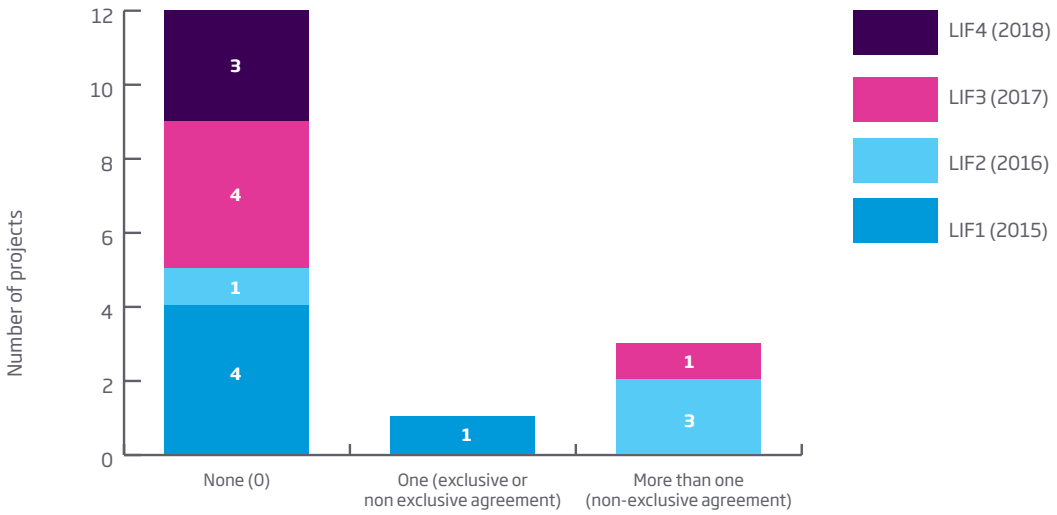


Figure 28: Number of licence agreements signed, by cohort

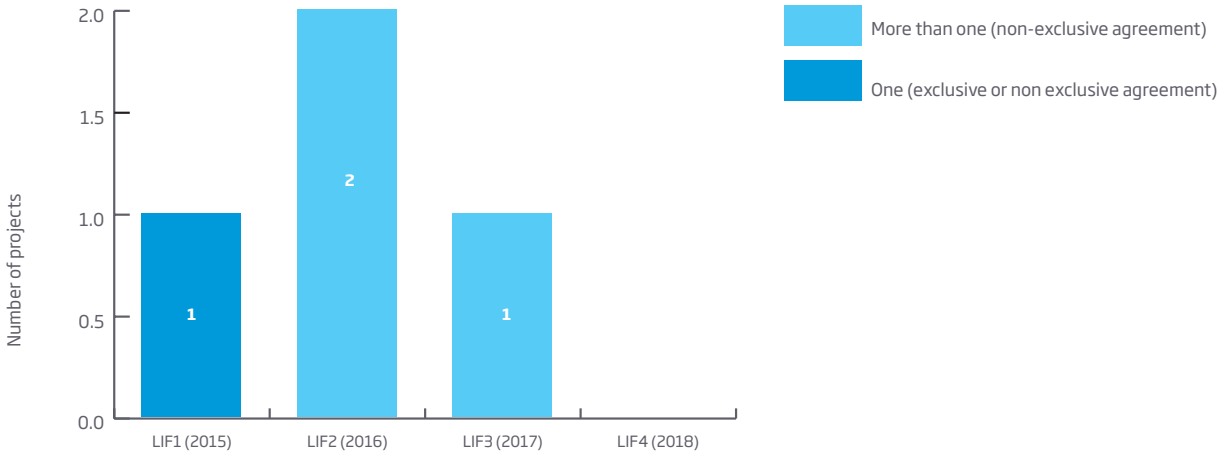


Figure 29: Number of projects receiving different levels of licensing income in the past 12 months, by cohort

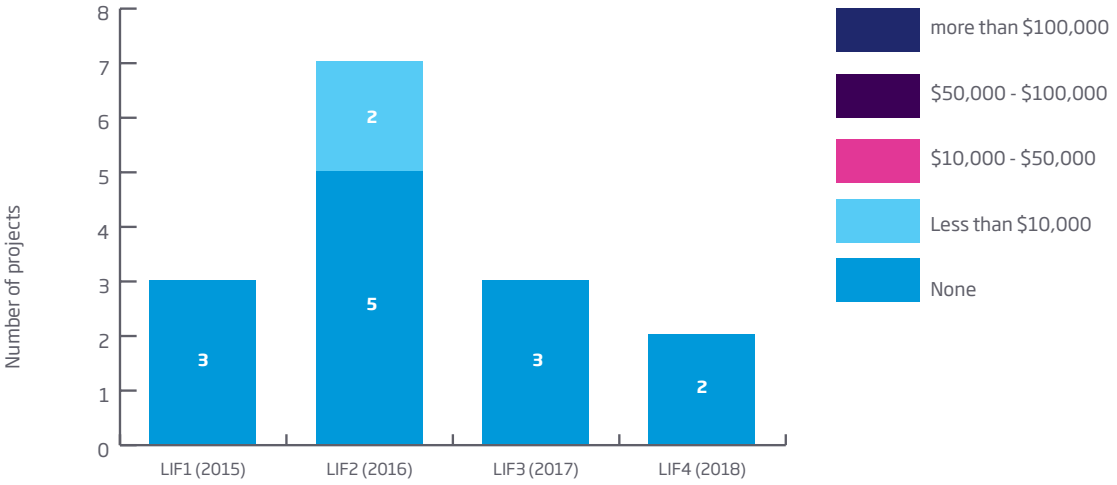


Figure 30: Period of time before projects expect to receive an income from licence agreements, by cohort

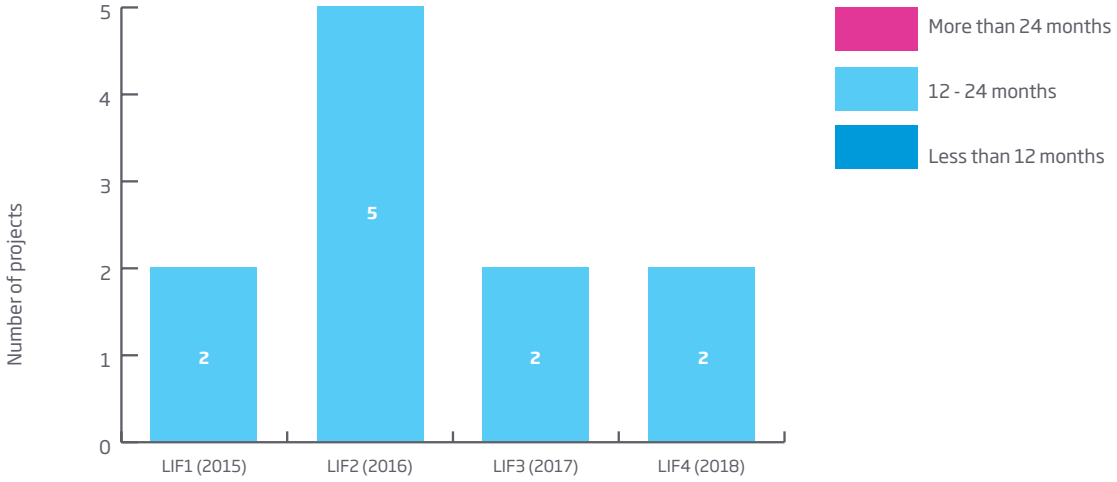


Figure 31: Level of licence income anticipated over the next five years

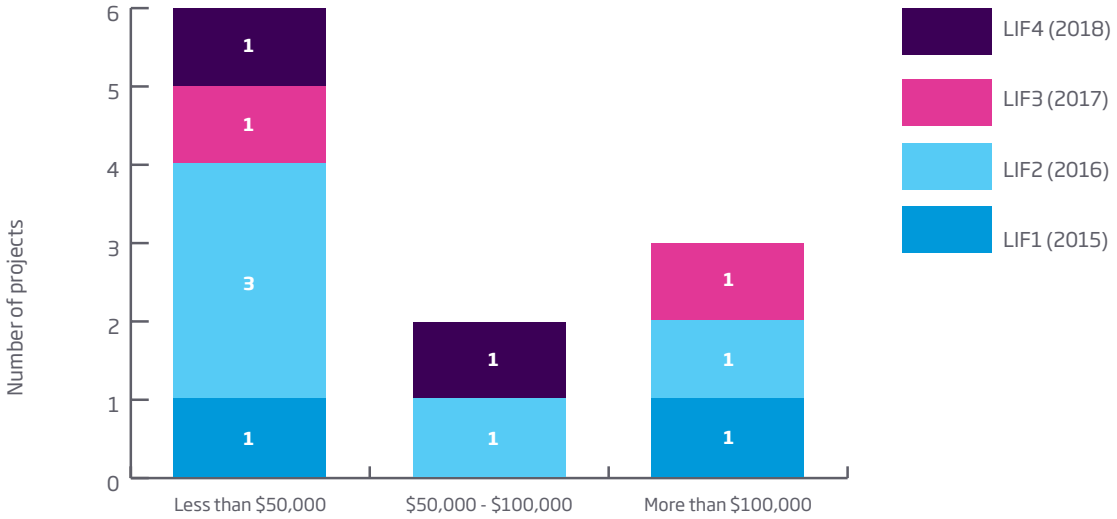
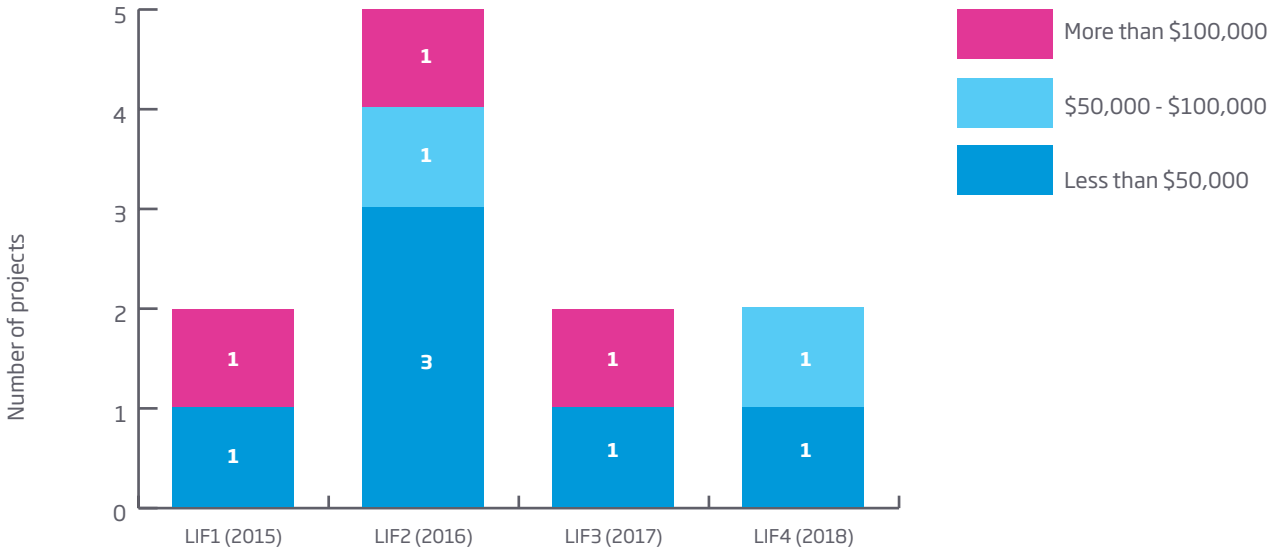


Figure 32: Level of licence income anticipated over the next five years, by cohort



8.2.6 Spin-out outcomes

LIF fellows who planned to form a spin-out as a way of commercialising the technology were asked to report on the current status of the spin-out. Of the 18 respondents who are considering this route, three have formed companies; two of these are generating income and one is dormant. Two other spin-outs from LIF1 and LIF2 reportedly are generating income, although neither of appears to be registered yet so this data may not be accurate. The majority of respondents reported their spinout status as 'other'; their comments indicate that many of these are still in the process of incorporating and registering their companies.

Figure 33: Current status of the company formed, by cohort

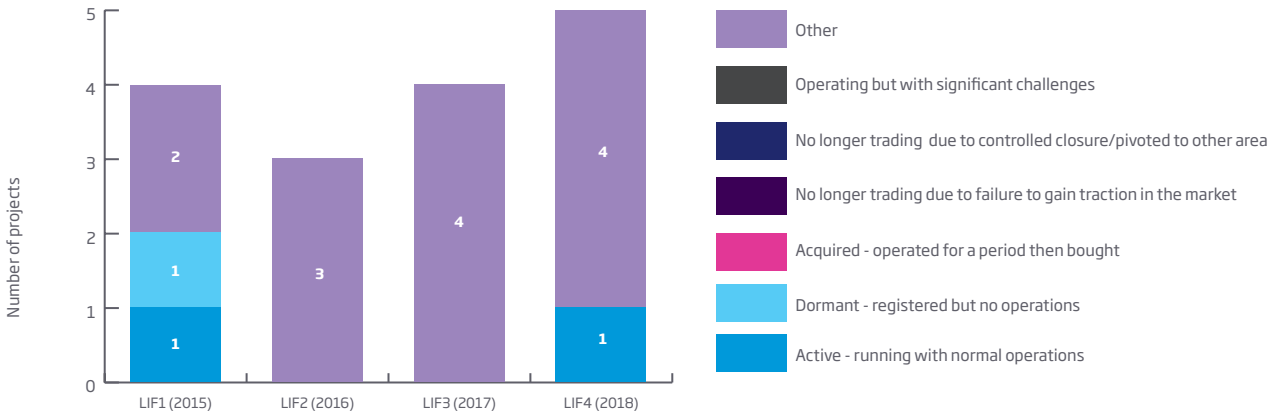


Figure 34: Revenues generated by spin-outs in the last 12 months

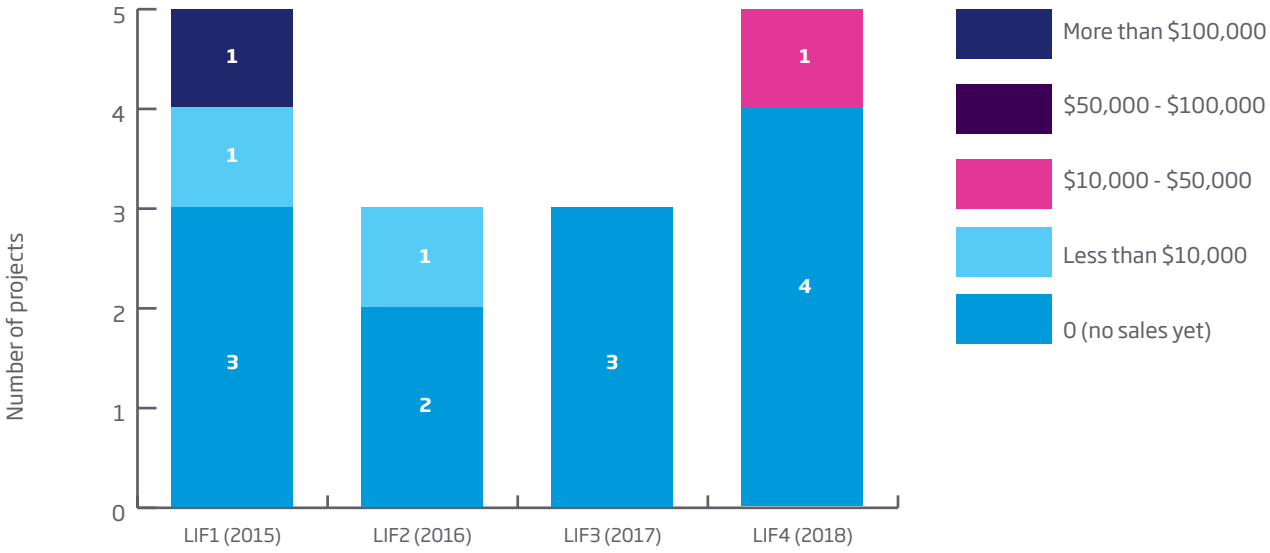


Figure 35: How companies with low or no sales are demonstrating traction in the market

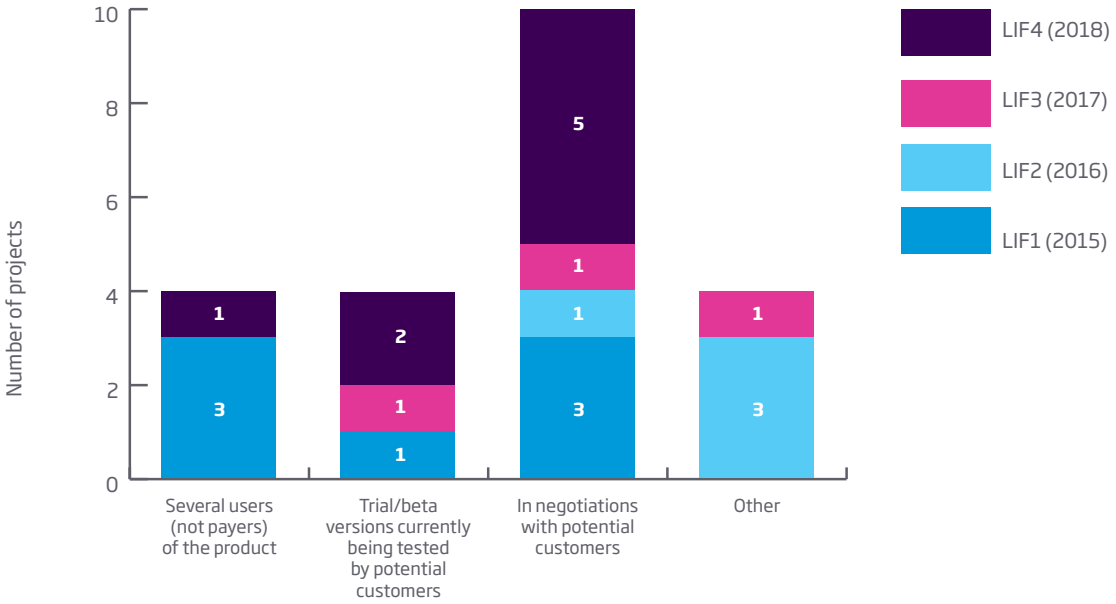


Figure 36: Number of employees in LIF spin-outs

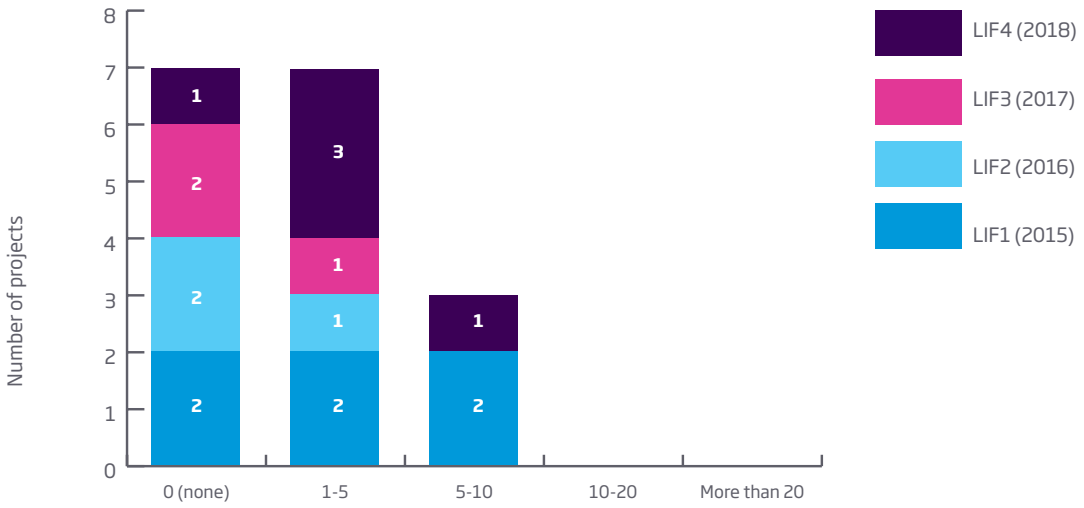


Figure 37: Number of employees in LIF spin-outs, by cohort

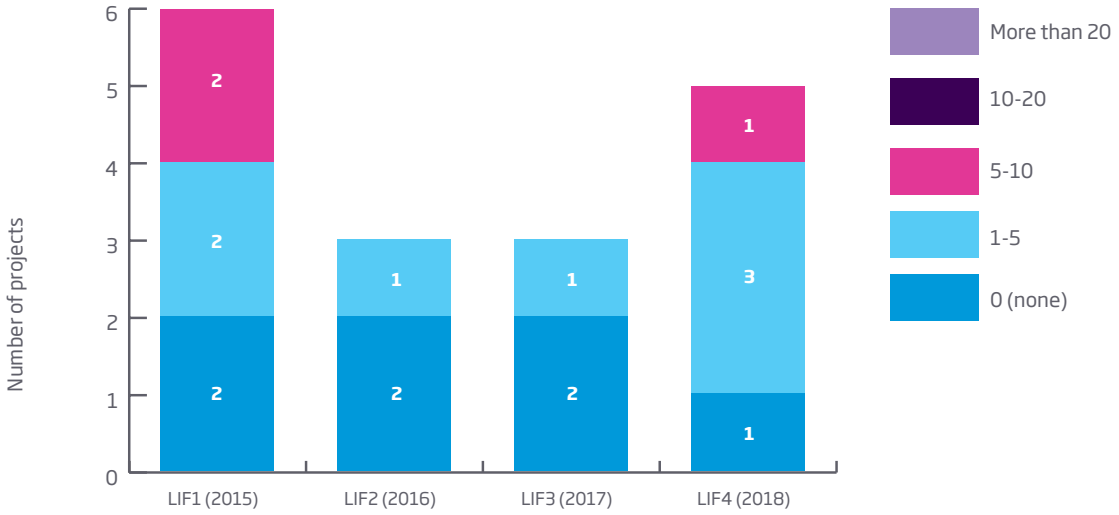
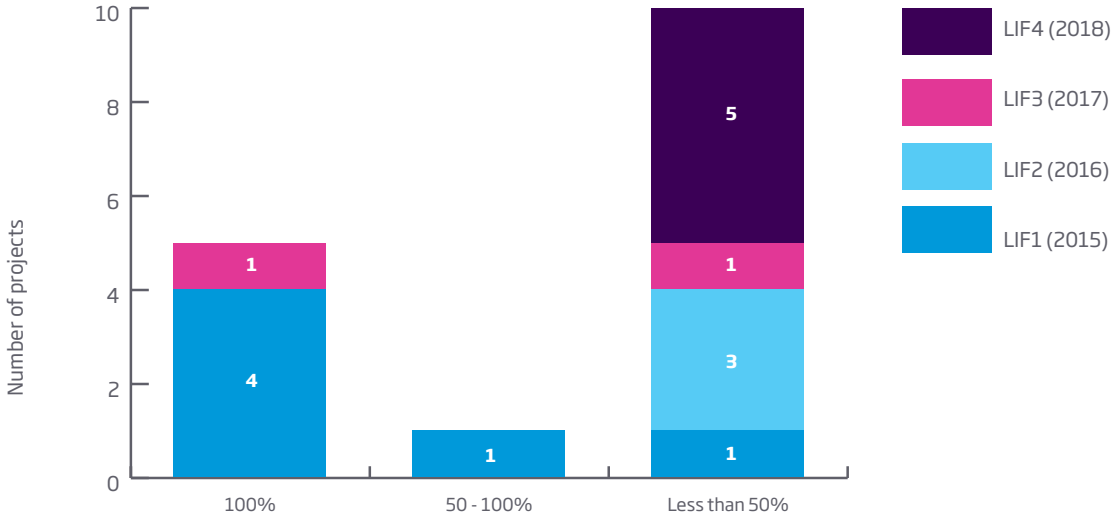


Figure 38: Percentage of full-time employees in LIF spin-outs, by cohort



8.3 Profile of the Philippines research base

The following data was supplied by the Newton Agham Programme Country Brief (September 2018).

8.3.1 Philippines research and development indicators

Table 9: R&D Indicators 2011 (available figures) [56]

Category	2011	UNESCO recommendation for developing countries
Total R&D personnel (headcount)	19,151	
No. of researchers	14,867	
Population size (in million people)	95	
No. of R&D personnel per million population	201	380
No. of researchers per million population	156	
GDP (current prices in million pesos)	9,735,000	
Total R&D expenditures (in million pesos)	12,046	
R&D expenditures as % of GDP	0.124	1%
Public R&D expenditures (in million pesos) % share of public to total RDE	11,103 34	
Private R&D expenditures (in million pesos) % share of private to total RDE	7,899 66	

8.3.2 Philippines publications

Figure 39: Philippines – publications by subject area (2003-2013) [57]

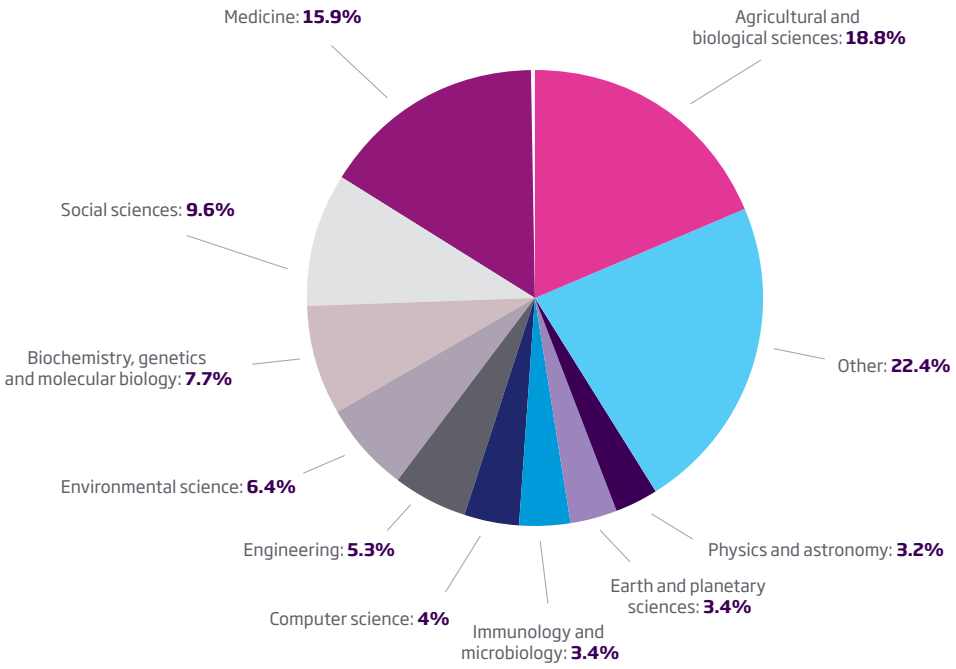
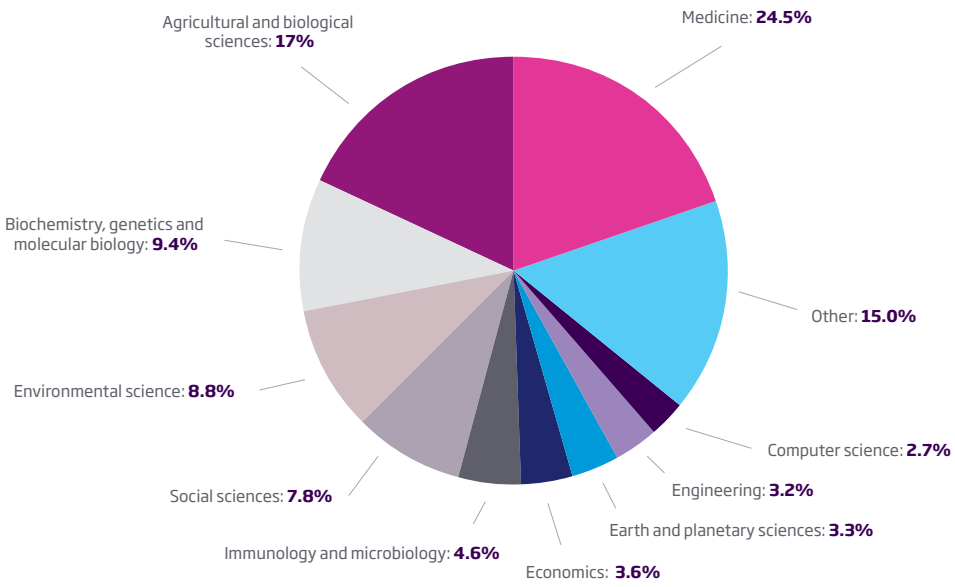


Figure 40: Philippines-UK joint publications by subject area (2003-2013) [58]



8.3.3 Philippines publications in comparison with ASEAN Nations [59]

Figure 41: Number of scholarly papers published annually by each of the five selected ASEAN nations (Source: Scopus)

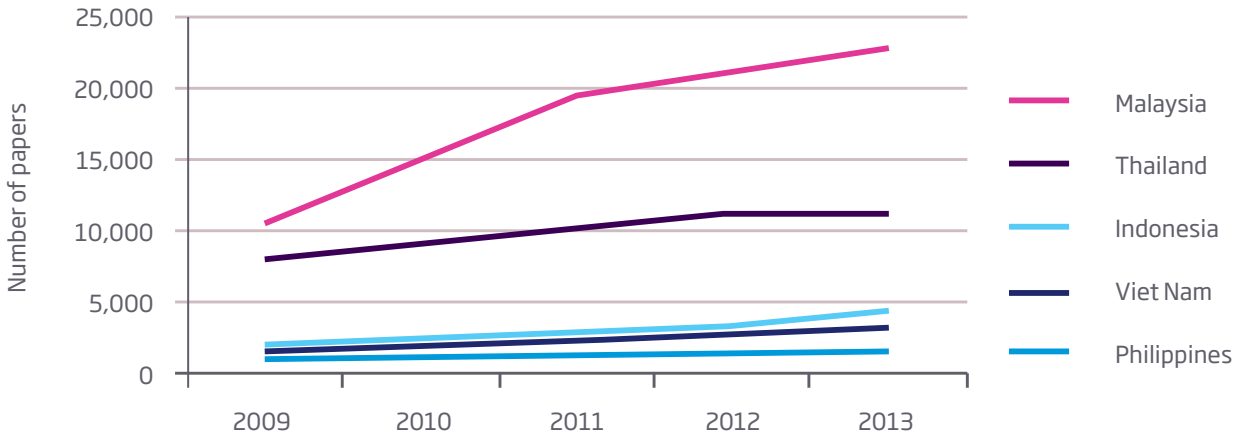


Figure 42: Share of annual world citations for each of the five selected ASEAN nations (Source: Scopus)

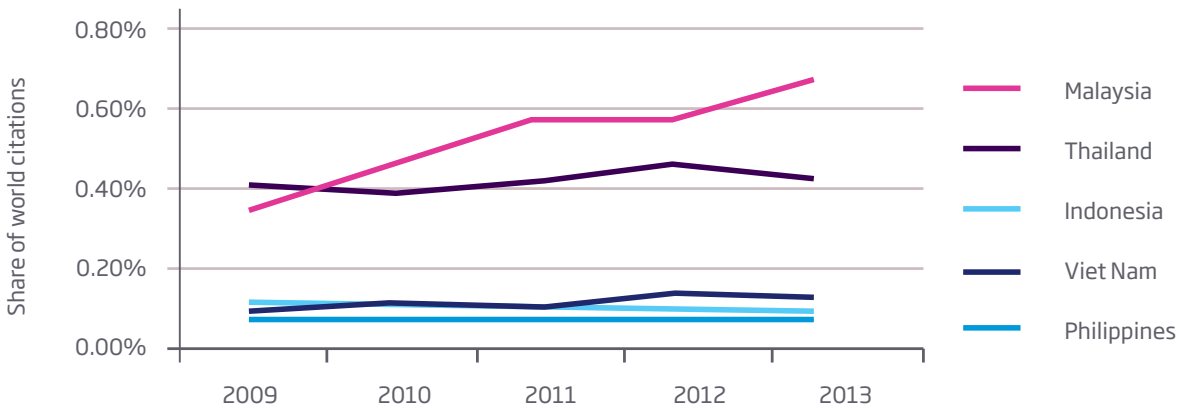
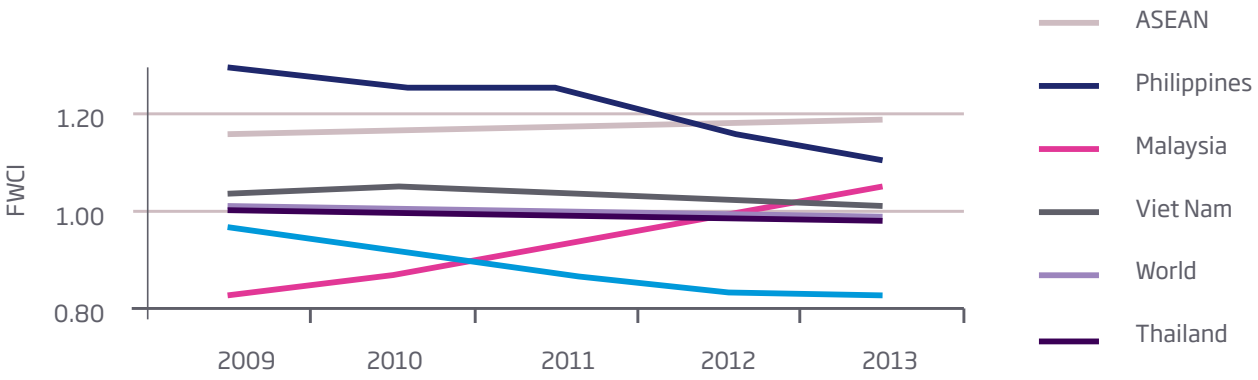


Figure 43: FWCI of ASEAN countries individually and as a whole (Source: Scopus)



**Field Weighted Citation Index: how the number of citations received by an entity's publications compares with the average number of citations received by all other similar publications in the data universe.*

8.4 Feedback on LIF programme content

The following table provides examples of the types of content that were especially well received by the LIF fellows (Source: Oxentia In-Person Interviews, September 2018).

Table 10: Aspects of the LIF programme that were especially popular

Aspects LIF fellows/stakeholders particularly liked	Count
Negotiation	2
Hoxton venue	1
The London visit was a highlight	1
Interacting with LIF fellows from other countries	1
Setup and training	1
Pitching	1
Understanding financials and cost structure	1
Access to mentors with a global perspective	1
Management and operations	1
The mentoring was very good	1
Oxentia's market research in the follow-on programme	1

9. References

1. www.newtonfund.ac.uk/about/
2. Data from: Oxentia and the Asian Institute of Management
3. *Entrepreneurial Ecosystems and Growth Oriented Entrepreneurship*, OECD LEED, Mason, C. and Brown, R., 2014 (www.oecd.org/cfe/leed/Entrepreneurial-ecosystems.pdf)
4. Rabelo, R. and Bernus, P. A Holistic Model of Building Innovation Ecosystems, 15th IFAC Symposium on Information Control Problems in Manufacturing, Volume 48, Issue 3, Pages 2250-2257. (2015) (https://doi.org/10.1016/j.ifacol.2015.06.423) Spigel, B. (2015) The Relational Organization of Entrepreneurial Ecosystems. Entrepreneurship Theory and Practice. Forthcoming.
5. Spigel, B. The Relational Organization of Entrepreneurial Ecosystems. Entrepreneurship Theory and Practice. (2015) (https://onlinelibrary.wiley.com/doi/full/10.1111/etap.12167)
6. *Startup Communities: Building an Entrepreneurial Ecosystem in Your City*. Feld, B, 2012
7. *Science, Technology, Research and Innovation for Development (STRIDE): Philippines Innovation Ecosystem Assessment*, USAID, 2014 (www.stride.org.ph/wp-content/uploads/2016/07/Full-Report.pdf)
8. *Developing research culture in Philippine higher education institutions: Perspectives of university Faculty.* Salazar-Clemeña, R. M. and Almonte-Acosta S. A., 2007 (http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.535.5909&rep=rep1&type=pdf)
9. *Developing research culture in Philippine higher education institutions: Perspectives of university Faculty.* Salazar-Clemeña, R. M. and Almonte-Acosta S. A., 2007 (http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.535.5909&rep=rep1&type=pdf)
10. Clarete, R., Pernia, M., Gaduena, A, and Mendoza, A. The role of science, technology and research in economic development. University of the Philippines. Discussion Paper No. 2014-07. (2014)
11. *Science, Technology, Research and Innovation for Development (STRIDE): Philippines Innovation Ecosystem Assessment,* USAID, 2014 (www.stride.org.ph/wp-content/uploads/2016/07/Full-Report.pdf)
12. Newton Agham Programme: Philippines Brief (Sept 2018)
13. *Science, Technology, Research and Innovation for Development (STRIDE): Philippines Innovation Ecosystem Assessment,* USAID, 2014 (www.stride.org.ph/wp-content/uploads/2016/07/Full-Report.pdf)
14. *Science, Technology, Research and Innovation for Development (STRIDE): Philippines Innovation Ecosystem Assessment,* USAID, 2014 (www.stride.org.ph/wp-content/uploads/2016/07/Full-Report.pdf)
15. *The Global Innovation Index 2018: Energizing the World with Innovation*, Cornell University, INSEAD, and the World Intellectual Property Organization, 2018 (www.

globalinnovationindex.org/Home)

16. English-language translation of the Philippine Technology Transfer Act of 2009: *(www.wipo.int/wipolex/en/details.jsp?id=9605)*

17. https://ttbdo.up.edu.ph/wp-content/uploads/2016/08/Technology-Transfer-Clinic-v3.pptx

18. *Science, Technology, Research and Innovation for Development (STRIDE): Philippines Innovation Ecosystem Assessment*, USAID, 2014 (www.stride.org.ph/wp-content/uploads/2016/07/Full-Report.pdf)

19. www.usaid.gov/philippines/partnership-growth-pfg/stride

20. www.opengovasia.com/articles/startup-training-programme-from-dost-philippines-to-help-commercialise-research-projects

21. *http://region5.dost.gov.ph/archives/164-dost-technicom-program-offers-assistance-to-commercially-viable-and-locally-developed-research-and-development-projects*

22. http://tapitechnicom.dost.gov.ph/about-technicom/

23. *Science, Technology, Research and Innovation for Development (STRIDE): Philippines Innovation Ecosystem Assessment,* USAID, 2014 (www.stride.org.ph/wp-content/uploads/2016/07/Full-Report.pdf)

24. www.channelnewsasia.com/news/startup/articles/money-matters/funding-possibilities-for-startups-in-the-philippines-8875158

25. Data from: Oxentia Stakeholder Interviews, September 2019

26. *Off to a great start. The Philippine startup ecosystem. PwC. 2017 (www.pwc.com/ph/en/ceo-survey/2017/pwc-qbo-2017-philippine-startup-survey.pdf)*

27. *Science, Technology, Research and Innovation for Development (STRIDE): Philippines Innovation Ecosystem Assessment*, USAID, 2014 (www.stride.org.ph/wp-content/uploads/2016/07/Full-Report.pdf)

28. *Science, Technology, Research and Innovation for Development (STRIDE): Philippines Innovation Ecosystem Assessment*, USAID, 2014 (www.stride.org.ph/wp-content/uploads/2016/07/Full-Report.pdf)

29. *Science, Technology, Research and Innovation for Development (STRIDE): Philippines Innovation Ecosystem Assessment*, USAID, 2014 (www.stride.org.ph/wp-content/uploads/2016/07/Full-Report.pdf)

30. Data from: Oxentia Stakeholder Interviews, September 2018

31. http://tapi.dost.gov.ph/

32. Logic models are common tools used to evaluate the effectiveness of a programme. They utilise information such as programme inputs (what the programme has invested), outputs in the form of activities (what the programme does) and participation (who the programme has reached), and outcomes (short, medium, and long-term). Short-term impact are results like learning, awareness, knowledge, attitudes, skills, medium-term impact are results like action, behaviour, decision-making, policies, and long-term impact such as social, economic, civic, and environmental conditions.

33. Data for all Academy inputs sourced from Oxentia: Academy UK residential programme data uses approximated data for LIF1 cohort. N.B. The Academy's follow-on programme was started during LIF2. Participation data sourced from

DOST. Outcomes data sourced from Oxentia surveys. AIM data provided by AIM.

34. Residential programme numbers are based on a list of fellow names provided by the Academy. Follow-on programme numbers based on Oxentia project records

35. Data provided to Oxentia by DOST 2018

36. Oxentia exit survey data collected from LIF2 and 3 at the end of the Academy's follow-on programme

37. This graph combines data from two surveys: Oxentia Alumni survey sent to LIF1 and 2 in February 2018 and Oxentia's LIF3 exit survey sent in January 2018 at the end of the Academy's follow-on programme

38. There is one outlier who stated that they had raised US$2.1 million, we could not verify this as they did not respond to further questions

39. This may be an underestimate as two respondents were unclear of the status of their negotiations and did not respond to clarification questions

40. The study found that 22% of older projects succeeded in market access within ten years after start of the project, while 15% of younger projects succeeded within five years after start. Source: *Teams' boundary-spanning capacity at university: Performance of technology projects in commercialization,* Taheri and Geehuizen, 2016 (https://doi.org/10.1016/j.techfore.2016.06.003)

41. Data from: RAEng Residential Programme Entry and Exit Survey (for LIF3 March 2017 and LIF4 January 2018)

42. Data from: Oxentia in-person interviews August 2018

43. www.fao.org/economic/est/est-commodities/bananas/bananafacts/en/#.W_QYumj7SUk

44. Data sourced from two Oxentia surveys: Alumni survey sent to LIF1 and 2 LIF fellows in 2018 and a LIF3 Exit survey sent in January 2018 at the end of the RAEng Follow-on Programme

45. Oxentia survey of LIF fellows from the Philippines, to gather additional data on the outcomes from their commercialisation activities (n=39); August 2018

46. Data from: Oxentia in-person interviews with 13 LIF fellows and 11 other stakeholders from the Philippines, September 2018

47. www.setsquared.co.uk/research-commercialisation/applications-cohort-15-open

48. Data from: Oxentia in-person interviews with 13 LIF fellows and 11 other stakeholders from the Philippines (September 2018)

49. A LIF online community launched in December 2018 to help LIF fellows to stay in contact, exchange ideas and network

50. Data from: Oxentia International Collaboration email survey of LIF fellows November 2018 (N=19) programme.

51. Data from: Oxentia In-Person Interviews, September 2018

52. Data from: Exit surveys for LIF2 and LIF3 after the Academy's follow-on programme.

53. Data from: Exit surveys for LIF2 and LIF3 after the Academy's follow-on programme.

54. Data from: Exit surveys for LIF2 and LIF3 after the Academy's follow-on programme.

55. Data drawn from two surveys: The Alumni survey sent to LIF1 and LIF2 in February 2018 and the LIF 3 exit survey at the end of Academy's follow-on programme

56. Data from: DOST Survey on R&D Expenditures and Human Resources. DOST S&T Resource Assessment and Evaluation Division. 2011

57. Elsevier Scopus. 2014.

58. Elsevier Scopus. 2014.

59. Elsevier. 2015. ASEAN Research Position and Main Collaboration Partners.

ROYAL
ACADEMY OF
ENGINEERING

Royal Academy of Engineering

Engineering matters. It underpins our daily lives, drives economic growth, plays a critical role in addressing major societal challenges and helps ensure our readiness for the future, from providing a sustainable supply of food, water and clean energy, to advancing healthcare, and keeping us safe and secure.

As the UK's national academy for engineering and technology, the Royal Academy of Engineering brings together the most talented and successful engineers – our Fellows – to advance and promote excellence in engineering for the benefit of society.

We harness their experience and expertise to provide independent advice to government, to deliver programmes that help exceptional engineering researchers and innovators realise their potential, to engage the public with engineering, and to provide leadership for the profession.

Drawn half from business and half from academia, and from all branches of engineering including areas of emerging technology, our 1,600 Fellows give their time and expertise voluntarily.

We have three strategic priorities:

- Make the UK the leading nation for engineering innovation and businesses
- Address the engineering skills and diversity challenge
- Position engineering at the heart of society

We bring together engineers, policymakers, entrepreneurs, business leaders, academics, educators and the public in pursuit of these goals

Engineering is a global profession addressing global challenges, so we work with partners across the world to advance engineering's contribution to society on an international, as well as national scale.

Royal Academy of Engineering
Prince Philip House, 3 Carlton House Terrace, London SW1Y 5DG

Tel: +44 (0)20 7766 0600
www.raeng.org.uk @RAEngGlobal #InnovationLeaders

Registered charity number 293074

Front cover image: istockphoto.com

ISBN: 978-909327-45-0