



Creating  
university-based  
entrepreneurial  
ecosystems  
**evidence from  
emerging  
world leaders**

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# Executive Summary

Governments across the world are looking to technology innovation as a driver for national economic growth, and to universities as the incubators of this national capacity. Universities operating within established technology-driven innovation hubs, such as Silicon Valley and Kendall Square in the US, offer robust models for success within these environments. However, an increasing number of universities located within more challenging environments are establishing strong entrepreneurship and innovation (E&I) profiles and reputations, some of whom will undoubtedly become future national and international leaders.

This emerging leaders group (ELG) of universities offers insights for the international academic community in two important domains:

- how to drive and manage a process of *institutional transformation* towards a more entrepreneurial model;
- how university-based ecosystems can be nurtured in cultural, economic and socio-political *environments that may not be naturally conducive to E&I*.

A phased benchmarking study was commissioned by the MIT Skoltech Initiative to draw on the experiences of the ELG and gain insight into the conditions and strategies associated with successful E&I transformations for universities operating in more challenging environments. In particular, it asked: (i) “*which are the world’s most highly-regarded university-based entrepreneurial ecosystems operating outside the established technology hubs?*”, and (ii) “*what can the international academic community learn from the experiences of these institutions?*”.

Conducted between early 2012 and early 2014, the two phases of the study were informed by interviews with technology transfer scholars, E&I professionals and thought leaders in the field, each with an in-depth knowledge of university-based E&I ecosystems across the world. Drawing on their experiences, Phase 1 of the study sought to identify the world’s most highly-regarded entrepreneurial universities and characterise the approach taken by these top-ranked institutions (61 interviews). Using a case study approach involving 130 interviews, Phase 2 focused specifically on a small group of the ELGs, to understand the context within which these universities have developed their E&I capacity. Each with a strong reputation for playing an active, positive role in growing a vibrant and strengthening ecosystem, the four case studies were selected to represent a range of cultural, economic and institutional contexts (Aalto University, Imperial College London, Tomsk State University of Radioelectronics and Control Systems and the University of Auckland).

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## **Which are the world’s most highly-regarded entrepreneurial universities?**

Over 200 universities, representing every continent of the world, were identified by experts as demonstrating established or emerging leadership in entrepreneurship. Three universities, however, were consistently cited as the world leaders – MIT, Stanford University and the University of Cambridge. The most highly-regarded universities operating in more challenging conditions included Technion,

Aalto University, University of Michigan, Kaist and the University of Auckland. The challenging environments in which the universities operated were typically characterised as cultures that did not support E&I, geographic isolation and/or a lack of venture capital.

### Why and how has an entrepreneurial agenda developed at the ELG universities?

Taken together, Phases 1 and 2 indicate that most universities within the ELG had achieved national and global recognition by following one of two paths to development. The models are strongly linked to the drivers for the university's original adoption of an E&I agenda and can be characterised as:

- **Model A: 'bottom-up' and community-led, catalysed by students, alumni and entrepreneurs in the regional economy.** Often responding to economic and societal challenges, E&I development is triggered by a desire to stimulate regional economic growth, and thereby create graduate jobs, research opportunities and broader avenues for university support through the creation of a vibrant localised entrepreneurial ecosystem. Typically driven by the university grassroots, students and alumni, a dynamic and inclusive ecosystem is created through strong partnerships of trust between the regional entrepreneurial community and the university. The investment is focused on regional rather than institutional capacity; universities often downplay the importance of IP ownership and startup affiliation, regarding these as secondary to the overarching goal of developing the broader ecosystem. However, with many E&I activities operating outside the university itself, the model can face difficulties when the university seeks to regulate and institutionalise its entrepreneurship profile.
- **Model B: 'top-down' and university-led, working through established university structures.** This model is typically triggered by the desire to realise income from university research, with the E&I agenda driven by and focused on a strong and ambitious technology transfer office (TTO) (or equivalent). Often building on established university research strengths, this model offers a robust and fully institutionalised approach. However, there is a danger that the university's E&I policies become "*synonymous*" with those of the TTO, leading to a culture where "*only university-protected IP is seen as worthwhile*". As a result, student, alumni and regional entrepreneurial communities are often marginalised.

### What distinguishes the E&I approach taken by the ELG universities?

Evidence from the expert interviews (Phase 1) and the case study evaluations (Phase 2) pointed to shared success factors amongst the ELG universities, despite differences in their development model (Model A and B above) as well as their geography, culture and institutional profile:

1. **University senior management:** Strong university leadership, actively promoting a clear and prominent E&I agenda that is heard and understood by staff, students and the regional community. Priority is given to establishing a market for the university's innovative output, developing an approach that is responsive to regional constraints and opportunities.
2. **University departments:** An academic culture that acknowledges, supports and rewards E&I within a cross-disciplinary context, helping to nurture influential discipline-based role-models, curricular and co-curricular activities, and champions for institutional change.
3. **University-led E&I activity:** Distributed responsibility for E&I delivery across multiple university agencies, with a range of support services and participation routes for both students and staff throughout each stage of their personal entrepreneurial growth.

4. **Student-led E&I activity:** An empowered, cohesive, inventive, bold and well-connected student-led entrepreneurial community, benefitting from sustained low-level funding, seasoned entrepreneurial mentors and direct connections to university senior management.
5. **External E&I community:** Robust relationships built on trust and mutual benefit between the university and the regional/national E&I community, with a platform for these individuals to play a visible and influential role in university life.

Evidence from the ELG suggests that synergies between these features provide the foundations for the establishment of institutional entrepreneurial cultures and capabilities. It also highlighted the critical role played by a small number of university champions for change, whose conviction of the importance of E&I for the university and the region, as well as a set of personal connections with industry and the regional entrepreneurial community, often proved critical to the university's emergence as an entrepreneurial centre. In addition, many universities in the ELG have benefitted significantly from responsive, flexible and sustained financial support from regional, national or governmental agencies, who, in turn, "*bent a lot of their own rules to fund what we were doing*".

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### What are the key constraints to E&I growth amongst the ELG?

The findings suggest that ELG universities share two common barriers to long-term success, each of which has the potential to constrain the growth and institutionalisation of their E&I capacity. The **first challenge** relates to the disconnect between the two key mechanisms that appear to be driving entrepreneurial growth:

- the grass-roots community-led effort to build E&I engagement and strengthen the regional entrepreneurial skills base, labelled Component 1 in Figure 1;
- the university-led effort to drive corporate engagement and commercialise university-owned innovations, labelled Component 2 in Figure 1.

Evidence from the study suggests that universities in the ELG tend to establish their E&I focus through one of these routes, leaving it imbalanced during its early development. In addition, where, and if, the



Figure 1. Three components that appear to be critical to the establishment of an entrepreneurial university.

second domain is added, there is often a considerable tension at their interface and the two domains often operate in relative independence from one another. As this suggests, the division between university-owned IP and non-university IP casts a long shadow.

The **second challenge** is perhaps more deep-rooted and relates to the issue of embedding E&I into the vision and mission of a university, indicated as Component 3 in Figure 1. While not inherently in conflict, entrepreneurship at many universities in the ELG has yet to be aligned with the core university functions of teaching and research. Despite vocal commitment to the E&I agenda by university leadership and a suite of high-profile and engaging entrepreneurship activities offered by various support functions, interviewees frequently reported that “*entrepreneurship is virtually invisible*” in university departments. For many, “*the incentives built into the university*” were the root causes of the problem, which, in almost every case, remained “*the same as any research university*”, and had not been adapted to reflect the university’s transition to an entrepreneurial institution. In the globalised market in which universities operate, research income and research rankings are the metrics that count, goals seen by some to “*directly conflict*” with an entrepreneurial agenda.

As this suggests, if university-based entrepreneurial growth is a priority, university performance metrics need to be revised to reflect this. Widely accepted measures of university E&I (research-related invention disclosures, patents, number of spin-offs, licensing revenue etc.) are relatively easy to capture. However, such established metrics only reflect one dimension of institutional E&I capacity – typically the immediate output from its TTO and corporate research functions (represented by Component 2 in Figure 1). Metrics that capture the university’s institutionalisation of and commitment to E&I (Component 3) as well as its E&I culture, connectivity and influence on the regional and national entrepreneurial community (Component 1) are rarely considered. However, the benchmarking study suggests that it is these wider infrastructural features that are driving E&I capacity in the ELG and are likely to be vital to a university’s long-term capacity to create and support E&I. As the experts consulted in Phase 1 made clear, additional metrics are required to shift the characterisation of a ‘successful entrepreneurial university’ away from those who have “*got lucky*” with one or two successful research commercialisation “*blockbusters*”, and towards those institutions with an E&I commitment, culture and capacity that will enable sustained regional and national entrepreneurial growth.

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# INTRODUCTION TO THE STUDY

## 1. Overview of the study

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### 1.1. Context and aims

In 2011, Skolkovo Institute of Science and Technology (Skoltech) was established in partnership with MIT with a mission “to educate global leaders in innovation, advance scientific knowledge and foster new technologies to address critical issues facing Russia and the world”. A central component of this collaboration is the creation of an entrepreneurial infrastructure and culture within Skoltech that responds to and builds on its regional context.

Embedding entrepreneurship into the university mission and culture in distinctive – and often challenging – environments is an ambition not unique to the MIT Skoltech Initiative. Governments across the world are looking to technology innovation as a driver for national economic growth and to universities as the incubators of this national capacity. Many universities are therefore seeking to enhance their entrepreneurship and innovation (E&I) capabilities.

Universities operating within established technology hubs, such as Silicon Valley and Kendall Square in the US, clearly offer robust models for success within these environments. In addition, an increasing number of universities located within more challenging environments are establishing strong E&I profiles and reputations, some of which will undoubtedly become future national and international leaders. From here on, this group will be referred to as the ‘emerging leaders group’ (ELG).

The ELG offer insights for Skoltech and the wider academic community in two important domains:

- how to drive and manage a process of *institutional transformation* towards a more entrepreneurial model;
- how university-based ecosystems can be nurtured in cultural, economic and socio-political environments *that may not be naturally conducive to E&I*.

A phased benchmarking study was commissioned by the MIT Skoltech Initiative to draw on the experiences of the ELG and gain insight into the conditions and strategies associated with successful E&I transformations for universities operating in more challenging environments. In particular, it asked “which are the world’s most highly-regarded university-based entrepreneurial ecosystems operating outside the established technology hubs?” and, “what can Skoltech and the international academic community learn from the experiences of these institutions?”. As well as supporting the on-going development of Skoltech, the study outputs have been designed to inform the development of future university-based ecosystems across the world.

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## 1.2. The study approach

The primary data source for the study is one-to-one semi-structured interviews. This approach offered two particular advantages. Firstly, it directly tapped the expertise of the comparatively small group of individuals with direct experience of the world's leading and emerging university-based entrepreneurial ecosystems. Secondly, unlike a larger-scale study, the process could be conducted quickly, enabling the findings to inform the on-going development of Skoltech.

The study was conducted between February 2012 and February 2014 and adopted a two-stage process:

- **Phase 1:** The first phase of the study sought to identify the world's most highly-regarded university-based technology driven ecosystems and characterise the approach taken by these top-ranked institutions. It focused both on universities with an established E&I capability, as well as on those whose profile was seen to be emerging, often within more challenging environments. The evaluation drew on interviews with 61 experts from 20 countries, each with personal experience of building world-class entrepreneurial ecosystems and oversight of international best practice in university entrepreneurship. These interviews with thought leaders in the field provided insight into the international landscape for university-based E&I as well as the established and emerging leaders in the field. It also captured information on the range of metrics the experts used to underpin their recommendations and the critical success factors apparent for each top-ranked institution. Expert feedback was complemented by data gathered on each top-ranked university to characterise their E&I approach and performance.
- **Phase 2:** The second phase of the study focused specifically on the ELG, as identified by the expert interviewees in Phase 1. From this list, four highly-regarded universities were selected for detailed case study evaluation: Aalto University (Finland), Imperial College London (United Kingdom), Tomsk State University of Radioelectronics and Control Systems (Russia) and the University of Auckland (New Zealand). Taken together, they represent entrepreneurial ecosystems that have developed within very different – and often challenging – cultural, economic and political environments over the last 25 years. Case study evaluations focused on the drivers, conditions, change strategies and barriers associated with their E&I transformation. The major data-gathering tool for the case study evaluations was site visits to the selected institutions and one-to-one anonymised interviews with multiple ecosystem stakeholders, from both within and outside the university. With between 30 and 35 interviews conducted for each case study, a total of 130 individuals were consulted for this phase of the study.

The two phases of the study are informed by almost 200 interviews with individuals with an in-depth knowledge of some of the world's most highly-regarded university-based E&I ecosystems. As such, the study as a whole paints a rich picture of the opportunities and constraints facing emerging entrepreneurial universities across the world.

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## 1.3. Structure of the Report

This document provides a summary of the study findings. It is structured around the two key phases of the benchmarking study, as outlined below.

The first section, **Phase 1: the world's leading entrepreneurial ecosystems**, (Chapters 2-6) presents the results of Phase 1 of the study, summarising the outcomes of the expert interviews, including their recommendations on the world's most successful university-based technology innovation ecosystems, including those operating in more challenging conditions, and the most appropriate metrics to evaluate

their performance. The section also provides a summary of the expert feedback on the success factors underpinning these leading university-based ecosystems as well as data summarising the E&I approach and performance of selected institutions.

The second section, ***Phase 2: case studies of well-regarded practice*** (Chapters 7-11) presents the outcomes of Phase 2 of the study, presenting case study evaluations of four highly-regarded universities whose international E&I profile was seen to be emerging. Each case study focuses on the context and process by which the university's entrepreneurial capacity developed, the nature, impact and strengths of the E&I infrastructure established and the barriers to its growth.

The final section, ***Conclusions and recommendations*** (Chapters 12-13) provides a discussion of the study outcomes and draws broader recommendations for other universities wishing to strengthen their E&I capabilities. It considers in turn: (i) key features of the global landscape for university-based E&I, (ii) key features of the emerging leaders, (iii) models of E&I development amongst emerging leaders, and (iv) concluding comments and recommendations.

The report **Appendices** provide the full versions of each case study evaluation (Appendix A–D) as well as the background data and references for the cross-institutional E&I data presented.

# PHASE 1

THE WORLD'S  
LEADING  
ENTREPRENURIAL  
ECOSYSTEMS

## 2. Introduction to Phase 1

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### 2.1. The Phase 1 approach

The initial phase of the benchmarking study was concerned with identifying the world's most highly-regarded university-based ecosystems, including those operating in more challenging conditions, and characterising the approach taken by these top-ranked universities. It was conducted over a six-month period, between February and August 2012. The cross-institutional E&I data presented in Section 6 was subsequently updated during March–June 2014.

Phase 1 of the study started with a snapshot synthesis of current knowledge in the field to identify, (i) frequently-referenced international experts to target during the interview process, (ii) available performance metrics relevant to university-based technology innovation ecosystems, and (iii) existing benchmarking studies in the field.

The major component, however, was the consultations with international experts. These focused on the experts' views and recommendations in four areas: (i) the most appropriate metrics to evaluate the performance of a university-based technology innovation ecosystem, (ii) the world's most successful university-based ecosystems, (iii) the world's most effective university-based ecosystems operating in a challenging environment, and (iv) the critical factors seen to be underpinning the success of the top-ranked universities.

The interviews were complemented with performance and institutional data gathered for a selection of the top-ranked universities, collected via publicly-available sources or via direct requests to the institutions. The information collected was designed to characterise three aspects of each top-ranked university: (i) the institutional context (e.g. international ranking, student/staff numbers, research income etc.), (ii) their innovation and entrepreneurship approach (e.g. mechanisms offered to support faculty/student technology transfer, educational programmes in innovation and entrepreneurship, regional partnerships, etc.), and (iii) the research commercialisation output.

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### 2.2. The experts

A total of 83 individuals, drawn from 23 countries, were invited for interview as part of this phase of the study. Invitations were sent out to an initial group of individuals recommended by the MIT/Skoltech team and identified through the literature. A 'snowballing' method was then used to identify further individuals for consultation, based on interviewee recommendation. Particular priority was given to individuals who were recommended by two or more experts.

Of those initially contacted, a total of 61 individuals across 20 countries were interviewed for the study, as illustrated in Figure 2.

Interviews were typically of one hour in length. The questions used to frame each interview are provided in Figure 3.

During the later stages of the study, interviewees located at the emerging top-ranked universities were asked a broader set of questions to explore the E&I strategy and performance of the university ecosystem in more depth. All questions were provided to each expert in advance. Two individuals chose to respond to these questions by email.

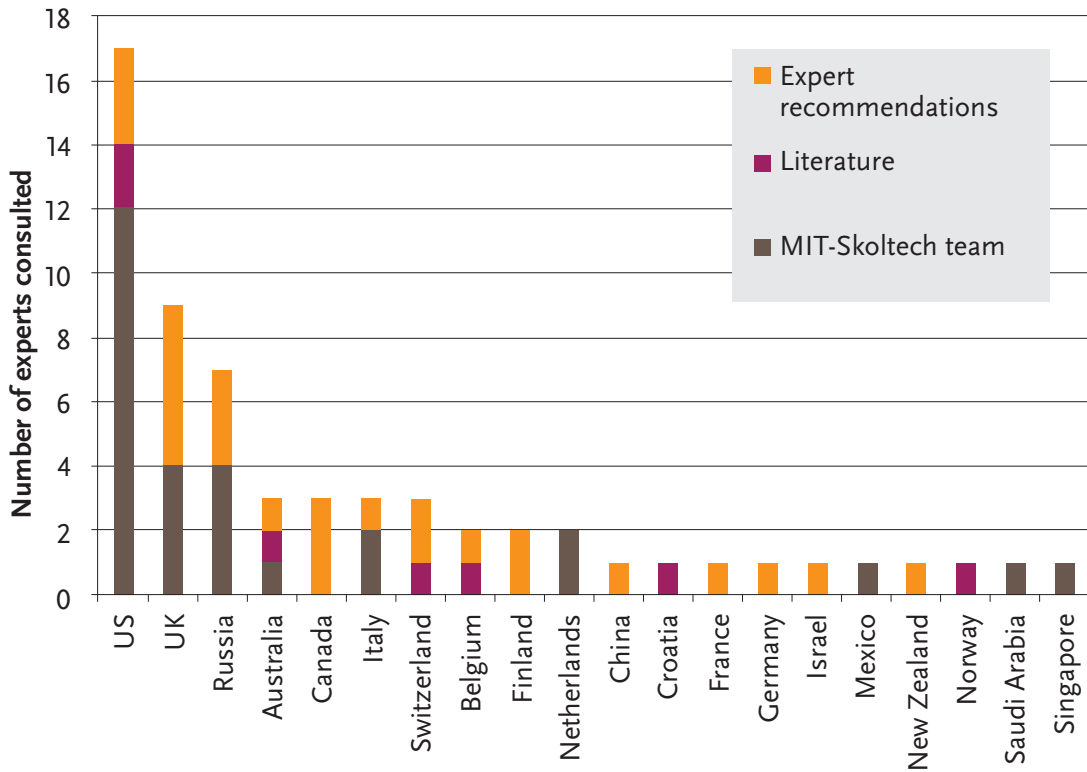


Figure 2. Experts interviewed, n=61, by country and how the individual was initially identified as a candidate for consultation (three categories: by the MIT/Skoltech team, by the study literature review or through recommendation from another expert).

1. What do you consider to be the most appropriate metrics to evaluate the performance/success of a university-based technology innovation ecosystem?
2. Which universities would you identify as having created/supported the world's most successful technology innovation ecosystems? For each university-based ecosystem, what factors do you feel are most responsible for their success?
3. Which universities, from across the world, would you identify as having created/supported highly effective technology innovation ecosystems despite a challenging environment? For each university-based ecosystem, what factors do you feel are most responsible for their success?
4. What do you see as the critical factors in achieving success within your technology innovation ecosystem? What role have university activities/policies played?
5. Could you recommend any other individuals whom you feel should be consulted as part of this study?

Figure 3. Overarching questions used to frame expert interviews in Phase 1 of the study.



Two groups of experts were targeted for invitation:

1. Highly-cited research experts in the field with professional experience across multiple regions of the world. These individuals comprised around 25% of those invited for interview and they were largely identified through the snapshot literature review conducted as part of this study.
2. Individuals with direct experience within a technology innovation ecosystem at a well-regarded university and with professional experience across the world. These individuals comprised around 75% of those invited for interview, of which around a half were based within the university TTO (or equivalent) and the remaining half were engaged in other key roles (entrepreneur, government funding sponsor, company manager, university president etc.). These experts were identified as suitable candidates for interview either through recommendation from the MIT/Skoltech team or through recommendation from other interviewees.

## 3. Metrics of ecosystem success

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### 3.1. Metrics recommended by experts

All experts were asked to identify metrics through which the performance/success of a university-based technology innovation ecosystem should be measured (see question 1 in Figure 3). A wide range of indicators was considered to be relevant. The metrics most commonly identified by the experts are summarised in Figure 4, where they have been grouped into three broad categories:

1. **Input indicators: metrics concerned with the university strategy and approach.** Such metrics were seen to highlight, in the words of one expert, “*whether entrepreneurship and innovation is at the core of the [university’s] mission*”, a metric widely-regarded to be a key measure of institutional commitment to supporting long-term ecosystem development. Interviewees with a research background in innovation and entrepreneurship were particularly likely to identify metrics of this type. Two sets of metrics were described in particular: firstly, the prominence of E&I in the university’s policies and activities including resourcing levels and, secondly, the extent to which E&I education and training are available to all staff and students.
2. **Process indicators: metrics concerned with entrepreneurial culture and innovation capacity within the university.** Three types of metric were described: firstly, attitudes to and participation in entrepreneurial activities by staff and students; secondly, the extent of connectivity between the university and industry and/or other ecosystem stakeholders, particularly where no short-term monetary gain was involved for any party; thirdly, the research quality and reputation of the university and the extent of its relevance to industry. As one expert commented, “*... it is important to measure the climate, the entrepreneurial behaviour or intention to do something – how many people inside and outside of the university are capable of working together, how many students are interested in joining entrepreneurship classes – all of these things will tell you where [the university] is and where they will be going in the future*”.
3. **Output indicators: metrics concerned with the impact of the university on the ecosystem.** Four types of metrics were recommended; firstly, the standard metrics for technology transfer throughput; secondly, the extent to which university-generated intellectual property (IP) has led to the creation of sustainable companies; thirdly, the entrepreneurial impact and wealth creation of university graduates; fourthly, the broader development of the ecosystem and beyond. US experts in particular talked about the significant role played by university graduates in ecosystem

development and the value of the Kauffman Foundation study of the impact of MIT alumni<sup>1</sup> in this regard – “... *this tells us about the number of entrepreneurs we are turning out. This tells us about creating the fishermen and not the fish*”.

Experts were also asked to identify metrics of early ecosystem development, against which it may be possible to measure the performance of newly-established universities with an E&I focus, such as Skoltech, five years after their foundation. Generally speaking, their recommendations focused on two categories of *process indicator*; firstly, the *individual student/staff attitudes and aspirations* listed in section 2.1 of Figure 4; secondly, the *relevance and quality of the university research*, listed in section 2.3 of Figure 4. Most also cautioned against “*overly ambitious targets in terms of research commercialisation*”. They noted that the stable development of such activity, outside a one-off “*blockbuster*” innovation, would take at least 10-15 years.

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### 3.2. Overall expert feedback on the influence of ecosystem metrics

Most experts noted that identifying a set of metrics to evaluate the performance of a university-based ecosystem was a considerable challenge, with concerns expressed about whether the standard metrics collected by organisations such as AUTM (Association of University Technology Managers)<sup>2</sup> were fit for purpose. Indeed, the issue of metrics was clearly an emotive topic for a high proportion of the experts consulted. Many spoke at length about how the application of currently-accepted metrics (see section 3.1 in Figure 4) can be misleading at best and retard ecosystem growth at worst. Expert feedback centred around two key issues: firstly, that these measures do not adequately reflect the true knowledge transfer capability or performance of a university; secondly, that their widespread application has had a significantly detrimental impact on entrepreneurship and innovation strategy at an institutional level in universities across the world. Each of these issues is addressed in turn below.

Many experts, particularly those based outside the US, were highly critical of the “*standard metrics*” (see section 3.1 in Figure 4) that are “*convenient to collect, keep the funding bodies happy but do not tell you much about what is really happening*”. Many also saw them as highly “*manipulable*” and “*easily distorted by a single blockbuster*”. Their primary focus on the university outputs was also noted as a cause of concern – “*...you can't understand a system by only looking at the outputs and not the inputs... At a lot of the so-called successful universities, the input is enormous amounts of government funding and what comes out is only a tiny fraction of that*”. Overall, the views are well summarised by the feedback from one expert, “*... there is no doubt that these metrics are easy to measure and no doubt that they tell us something about what is happening. But it is just one tiny piece of the whole picture. They tell us something about the outputs of the licensing office and the number of US Dollars that has been put into maintaining that. They tell us much less about the university as a whole and its contribution to the economy and its contribution to society*”.

Given these concerns, it is perhaps not surprising that many experts spoke of the need to develop a new set of metrics. Like the existing metrics, these would capture and track activity at an institutional level, but would provide a much richer picture of the university's role in knowledge transfer and ecosystem development. A number of experts noted that the 2008 Unico-commissioned report<sup>3</sup> “*has probably come*

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<sup>1</sup> Roberts, E. B and Eesley, C. *Entrepreneurial Impact: The Role of MIT*. Kauffman Foundation, Feb 2009.

<sup>2</sup> The US-based AUTM Licensing Survey gathers information such as the number of university startups, number of licences, number of invention disclosures, numbers of patents filed and licensing income.

<sup>3</sup> Holi, M. T., Wickramasinghe, R., & van Leeuwen, M. (2008). *Metrics for the evaluation of knowledge transfer activities at universities*. Cambridge: Library House.

## 1. Input indicators: institutional approach

### 1.1 *University policies and activities:*

- Extent to which knowledge transfer and E&I activities are apparent within each school/centre in the university
- Connections between the E&I activities/policies across the university
- Whether the university has sought to employ international experts in E&I to deliver programs
- Breadth of activity/resources in place at the university (e.g. incubator/accelerator, student competitions, proof of concept centre)
- Level of university resource allocated to university/industry interactions
- Extent to which innovation and entrepreneurship are considered in faculty recruitment/promotions procedures
- Whether opportunities are offered by the university for partnership with regional companies

### 1.2 *Education and development opportunities offered:*

- Amount of curricular time devoted to entrepreneurship and innovation across all engineering and physical science disciplines
- Whether entrepreneurship and innovation training are offered to all university employees (including post-docs)

## 2. Process indicators: entrepreneurial culture and innovation capacity within the university

### 2.1 *Individual student/staff attitudes and aspirations:*

- Student and staff career intentions and options (self reported)
- The prominence of faculty entrepreneurs as role models
- The extent to which peer entrepreneurial talent is recognised and admired amongst the student body
- Percentage of engineering/technology students and staff involved in voluntary entrepreneurship and innovation activities
- Whether student and staff participation in voluntary entrepreneurship activities is increasing
- Faculty attitudes towards and level of trust in the university technology transfer office (or equivalent)
- Percentage of faculty engaged in disclosures/patenting activity

### 2.2 *Connectivity and university/industry engagement:*

- Levels of web connectivity between the university and industry
- Number of students who combine study with jobs with high-tech firms
- Proportion of engineering/technology students undertaking industry-based projects
- Numbers of joint publications between faculty and industry
- The number of joint university/industry initiatives launched (for any purpose)
- Involvement of practitioners in teaching and mentorship (numbers of professors of practice, entrepreneurs in residence etc.)
- The free movement of faculty in and out of the university
- Growth in external attendee numbers (professional service providers, industry and investors) at networking events
- Number of university patents that are transferred to industry partners at no cost
- Amount of pre-transactional interaction with industry (i.e. engagement that is not directed at securing a contract or licence)

### 2.3 *Relevance and quality of university research:*

- Volume of industry-sponsored research (for some, this should be measured as a percentage of the total R&D budget)
- Average impact factor of faculty publications
- Volume of faculty consultancy with industry (measured by both the percentage of faculty engaged and by the total income)
- International league table ranking for university

## 3. Output indicators: Ecosystem impact

### 3.1 *Technology transfer office throughput (from university generated IP):*

- Number of disclosures and patents
- Number of start-ups/spin-offs
- Number of licences or licensing success rates (number of licences per year/number of invention disclosures)
- Number of licences bearing royalties
- Income generated from licences

### 3.2 *The creation of sustainable companies (from university generated IP):*

- Company survival rate after 10-15 years
- Numbers of companies with more than 20 employees (for some, total number of jobs created by companies)
- Total money raised from external investors (for some, this should be measured as a percentage of research income)
- Total sales in the marketplace resulting from commercialisations
- Total financial value of the companies created

### 3.3 *The impact of the university graduates:*

- Percentage of alumni remaining in or returning to ecosystem
- Percentage of graduates working in technology-related businesses
- Percentage of alumni (aged 30-40) engaged in starting new companies or engaged in innovation (self-reported)
- Wealth created by companies founded by university graduates

### 3.4 *Broader development of the ecosystem and beyond:*

- Whether people (companies, entrepreneurs, investors, professional service providers) are moving into the region for opportunities
- Growth rate of all startups and high tech companies in the region (job growth, new investment etc.)
- The extent to which university PhD students are employed by startup and new companies in the ecosystem
- Total employment generated by the ecosystem
- Whether the university attracts entrepreneurially-minded, successful and ambitious students and faculty
- Whether the university has contributed to changing policies in the country/region (such as creating national IP legislation)

Figure 4. A summary of expert responses to the question “What do you consider to be the most appropriate metrics to evaluate the performance/success of a university-based ecosystem?”

as close as anyone” to achieving this to date. One expert commented, “the [Unico] metrics report appeals to me because it was very culturally sensitive. The matrix varies by institution and country, and the spider graphs are very different for each university”.

The second major focus of expert feedback was how “the easy-to-measure metrics of technology transfer office performance have somehow become a proxy [measure] for the university’s approach to E&I”, thereby skewing the strategy and focus of the whole institution. As a result of the widespread use of these metrics, universities were seen to have been focused on “making sure the graph of their patent numbers or startup numbers goes up and to the right” and “churning the handle of the licensing office” rather than developing a long-term strategy for ecosystem development. In particular, an overriding focus on faculty-generated IP is seen by many to have come at the cost of elements such as alumni entrepreneurship or long-term strategic industry collaborations – “universities develop the entrepreneurs of the future not the ventures of today... We need to be measuring our activity not our output”. As one expert noted, “...a few startup companies will make little difference in the long-run. It is our students that will make by far the biggest impact [to the ecosystem], but we pay this very little attention”. Indeed, when describing the world’s most effective universities for this study, experts commonly spoke about “enlightened leadership” who “understand that knowledge transfer is not all about making a fast buck” and developing broad-reaching and long-term strategies that “look[ed] beyond the short-term gains of licences or spin-offs and nurture[ed] a culture of entrepreneurship in the staff and students that will stand the test of time”.

## 4. The expert ecosystem ‘rankings’

### 4.1. The most highly-regarded university-based ecosystems

All the experts were asked to identify the universities that they felt had created/supported the world’s most successful technology innovation ecosystems (see question 2 in Figure 3). A total of 120 different universities across 25 countries were identified by the 61 experts consulted.

The ten institutions most commonly cited by experts are summarised in Figure 5. It makes clear the dominance of MIT, Stanford University and the University of Cambridge, identified by over 80% (MIT and Stanford) and over 60% (Cambridge) of the experts.

To ensure that the leading positions held by these three institutions in the experts’ ‘top ten’ was not skewed by the relatively high proportion of interviewees from the US and UK, the data were reanalysed to take account of the country of residence of the expert. This second analysis excluded from the experts’ ‘top ten’ those institutions located in their country of residence; for example, it excluded recommendations for US universities made by US-based experts. As Figure 6 indicates, MIT, Stanford and Cambridge retain their premier position within this revised ranking. We can therefore be confident that the high proportion of US- and UK-based experts is not skewing the results.

Figure 7 presents the data on the leading universities by their country location. As expected, successful technology innovation ecosystems are seen as most firmly embedded in the US and the UK. Again, the analysis has taken account of the country of residence of the experts.

Experts were also asked to discuss the reasons for their selections and the critical success factors for each of these universities. Selected feedback is summarised in Section 5 of this report.

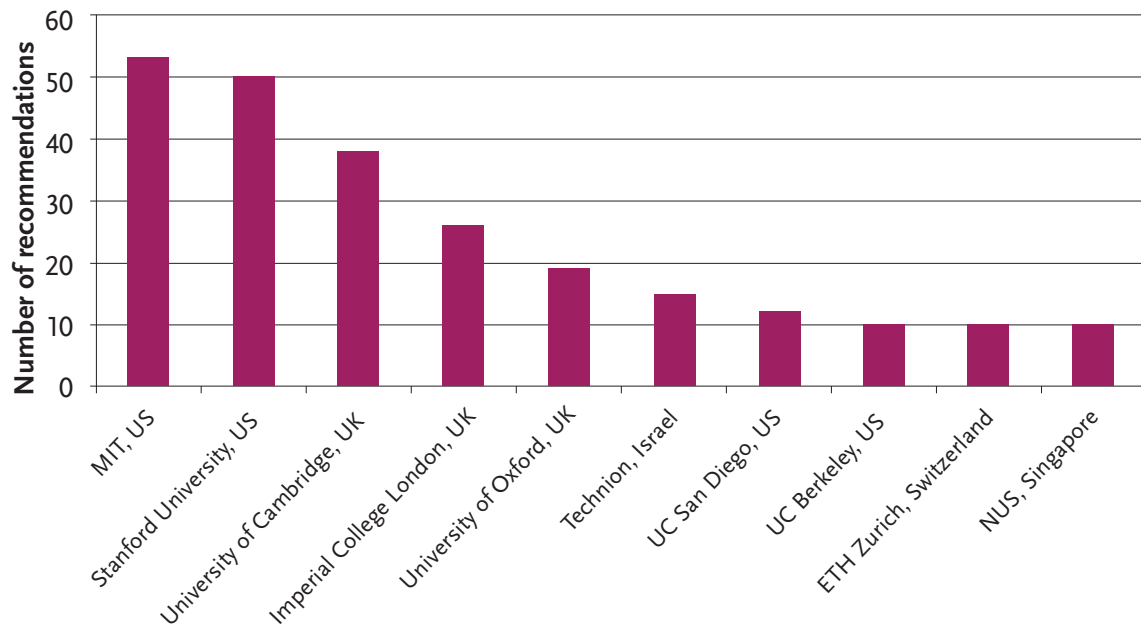


Figure 5. Top ten responses to the question ‘Which universities would you identify as having created/supported the world’s most successful technology innovation ecosystems?’

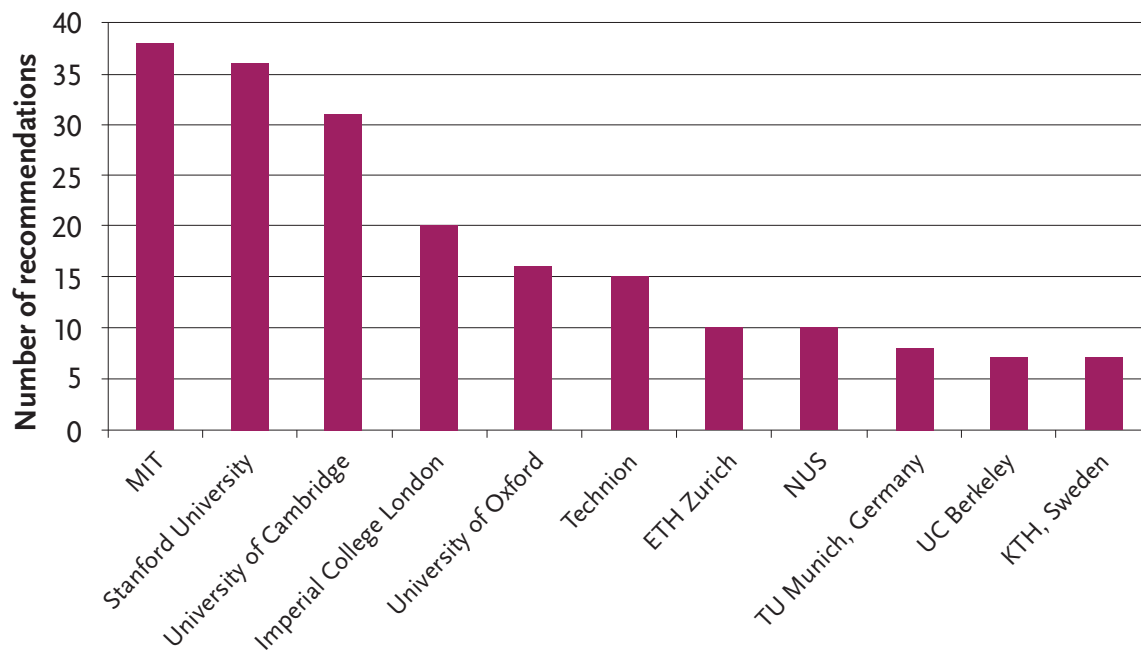


Figure 6. Top ten responses to the question ‘Which universities would you identify as having created/supported the world’s most successful technology innovation ecosystems?’, with the results adjusted for country of residence of the interviewee.

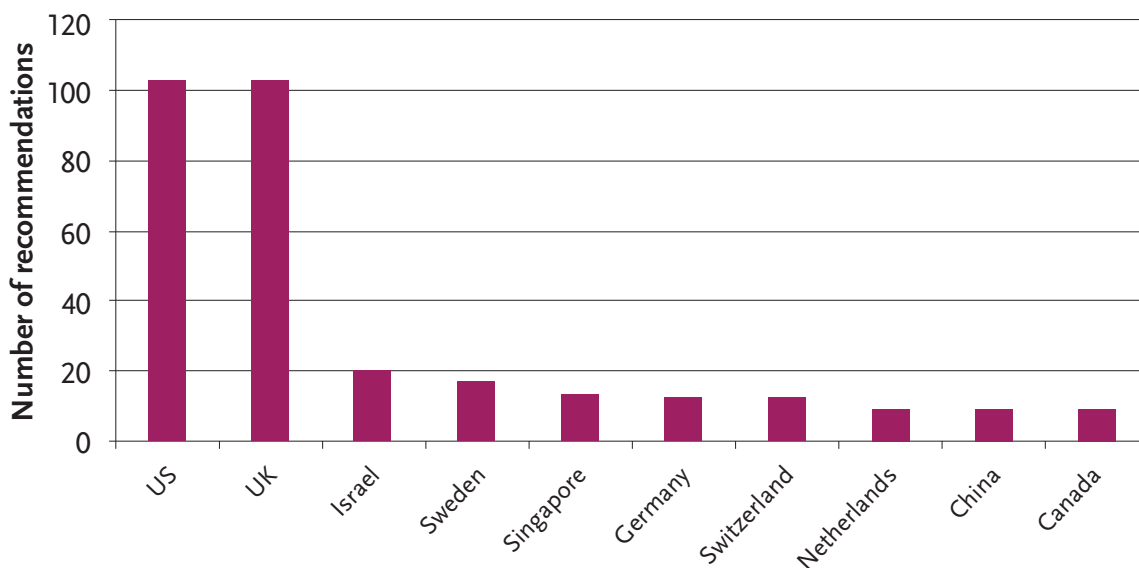


Figure 7. The most frequently cited countries in response to the question ‘Which universities would you identify as having created/supported the world’s most successful technology innovation ecosystems?’, with the results adjusted for country of residence of the interviewee.

#### 4.2. The most effective university-based ecosystems despite a challenging environment

All experts were asked to identify the universities that they felt created/supported an effective technology innovation ecosystem despite a challenging environment (see question 3 in Figure 3). In response to this question, experts identified a total of 131 different universities across 35 countries. The institutions/ecosystems most frequently cited are detailed in Figure 8.

Figure 8 points to a wider spread of views, and without the dominance of a few institutions that emerged from the experts’ assessments of the universities most successful in facilitating technology innovation ecosystems (Figure 5).

When discussing the perceived challenges faced by the universities being recommended, experts were most likely to identify the following factors: (i) a national culture that does not support entrepreneurial behaviour and risk-taking, (ii) geographical isolation and/or limited local market, (iii) lack of venture capital or multinational companies in the region, and (iv) no existing high-ranking research-led university within the ecosystem base.

Figure 9 presents the data on the most highly-regarded universities by their country location, with account taken of the country of residence of the experts.

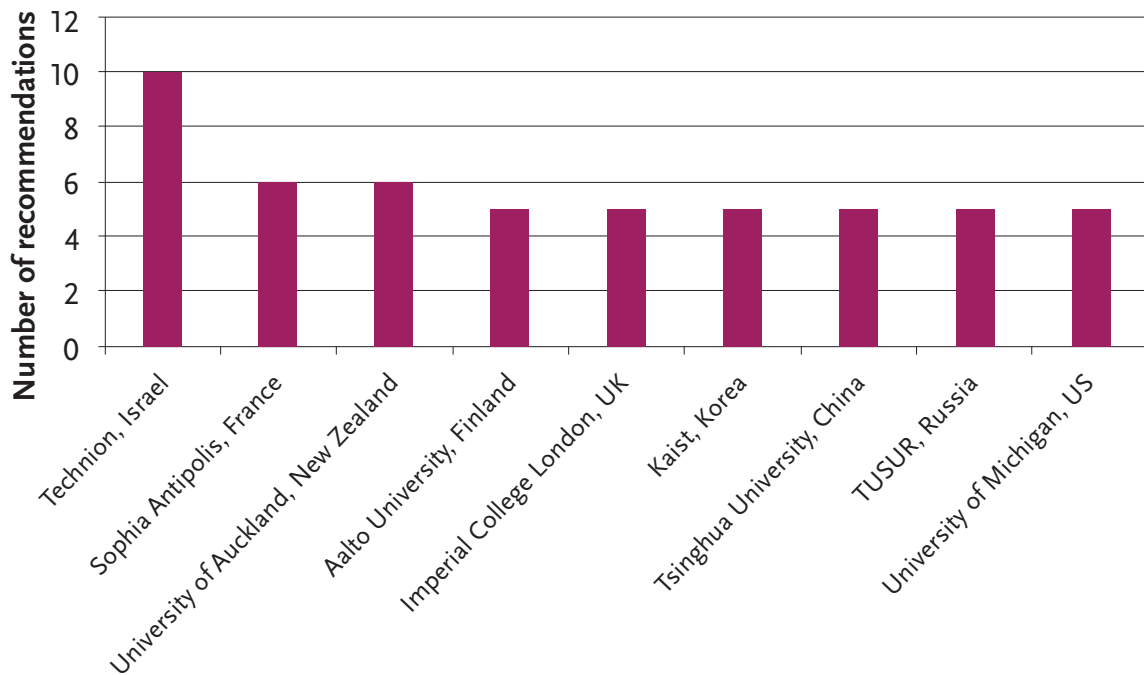


Figure 8. Top responses to the question ‘Which universities would you identify as having created/supported highly effective technology innovation ecosystems despite a challenging environment?’<sup>4</sup>

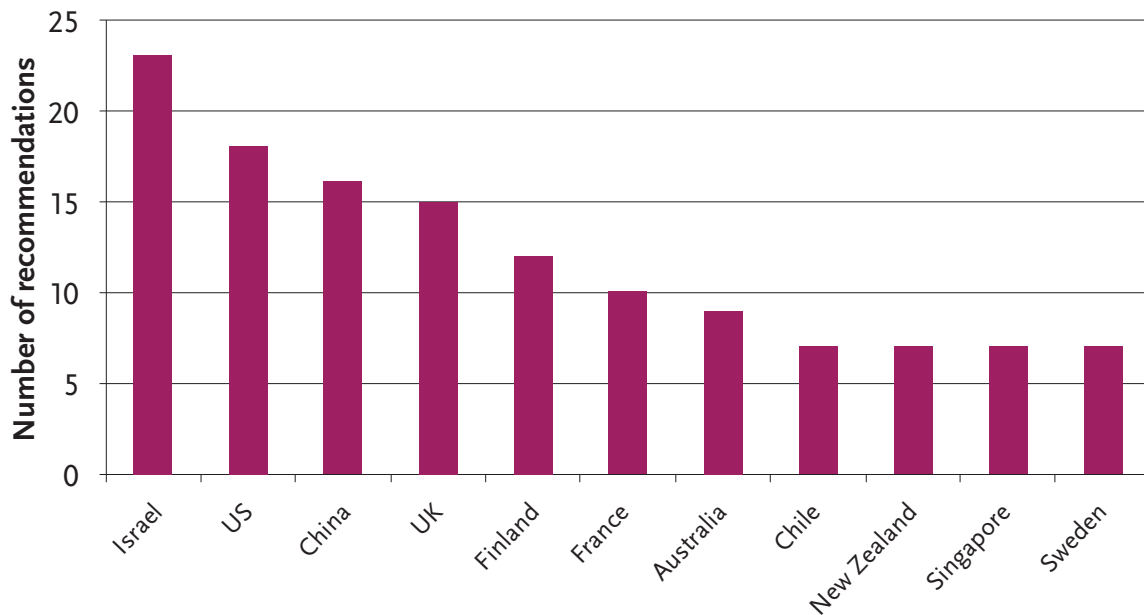


Figure 9. The most frequently cited countries in response to the question ‘Which universities would you identify as having created/supported highly effective technology innovation ecosystems despite a challenging environment?’, with the results adjusted for country of residence of the interviewee.

<sup>4</sup> It should be noted that Sophia Antipolis was one of the few expert recommendations that described a technology park rather than a university.

## 5. Success factors for the most highly-regarded universities/regions

After their recommendations for the world-leading university-based ecosystems were recorded (see section 4), experts were asked to discuss their reasons for these selections and the factors perceived to underpin the universities' success. This section provides a brief summary of their responses.

### 5.1. Broad feedback on the top-ranked universities

When asked to describe the world's most highly-regarded universities, experts often described the institutions using one of the following three characterisations:

1. Universities that had benefitted significantly from a *"rising tide that floats all boats"* at a national/regional level or from very significant government subsidies. In other words, the university is seen to have played a relatively limited role in the development of the ecosystem; instead its success is largely credited to contextual factors, such as strategic government policy/investment, a strengthening national economy or the influx of new entrepreneurial talent.
2. Universities whose strong international reputation for knowledge transfer is not necessarily supported by evidence of their performance. Some universities were described by experts as *"presenting some good-looking numbers and talking the talk"* but were regarded, on closer inspection, to have relatively limited entrepreneurial activities and made a relatively modest contribution to their regional ecosystem.
3. Universities who had played an active, positive role in a vibrant and strengthening ecosystem. In other words, the success of the universities was viewed to have been genuinely a product of effective university-based strategies/activities rather than circumstance or national/regional fortune.

It is the strategies and approach of the universities within the third of these groups that are likely to provide the greatest insight into the design of future ecosystems. Expert feedback highlighted, in particular, universities whose distinctive path in their E&I policy was designed in response to the particular barriers faced in their environment.

Many experts also observed that the ecosystem rankings emerging from this study should not be considered to be static. With an increasing engagement with the E&I agenda, they reported a rapid improvement in the impact and reputation of many universities and the likely emergence of *"new leaders from outside the US"* in the coming five to ten years.

The continuing dominance of MIT and Stanford, however, was not questioned. These institutions were seen by almost all experts to be *"far and away the world leaders"*. Their long-standing success did lead a number of experts to observe that universities wishing to emulate the fortunes of MIT and Stanford *"would be much better off studying their early history than trying to copy what they are doing now"*. Expert feedback also highlighted a number of *"emerging giants"*, such as Technion and Imperial College London, whose reputation had grown considerably in recent years.

Finally, experts spoke about the *"rising stars"* – universities whose current trajectory suggested a strong international presence in the future. Examples consistently identified by experts included the University of Auckland, Aalto University and the University of Michigan. A number of universities in China and Brazil were also discussed in this context, although no particular universities dominated amongst



the spread of recommendations made within each country. Although many US-based experts noted considerable interest in the early ecosystem development in New York (*“young entrepreneurs are flocking there”*), most also commented that it was *“too early to say whether this will come together”*.

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## 5.2. Success factors amongst the leading universities

Experts were asked to identify the factors underpinning the success of their selected university-based ecosystems. Their responses painted a rich and often very consistent picture of the elements contributing to ecosystem impact and reputation in each case. When looking across these descriptions, seven types of success factor were repeatedly highlighted by experts. Each is briefly discussed below.

- **Institutional E&I culture:** Institutional E&I culture was almost universally described by experts as an *“essential”* ingredient of a successful ecosystem. For a number of the world-leading universities, their E&I ethos was seen to have been either *“sewn into the fabric of the universities from their very foundation”* (as credited to MIT and Stanford) or as having benefitted from a national *“ethos to make things happen”* (as credited to Technion). However, most of the feedback focused on other universities and the challenges they faced in catalysing a change in their E&I culture. Many experts noted that *“British universities are the most interesting examples”* of those that had successfully implemented such a change. As one expert explained, *“...they had excellent universities, but no venture industry, no internal industry and not much entrepreneurial spirit. They have been able to overcome a lot of this”*. The University of Cambridge was noted as a primary, and on-going, example of a university whose successful cultural change was challenged by *“800 years of history”* and *“active hostility to setting up technology transfer activities”*. Through celebrating the achievements of faculty role models, a relatively unstructured mix of E&I activities across campus, and a freedom for faculty to devote time to entrepreneurial ideas, the university is now seen to enjoy an increasingly entrepreneurial culture.
- **Strength of university leadership:** The names of particular university leaders were repeatedly raised as playing a pivotal role in establishing a strong E&I strategy and sowing the seeds of a vibrant university ecosystem. Some such individuals were seen as the driving force behind the establishment of new ecosystems from a greenfield site – such as the case of Pierre Lafitte at Sophia Antipolis. However, more frequently identified were leaders associated with changes in previously underdeveloped ecosystems. They were credited with enacting a fundamental change in university E&I culture and strategy that led to a significant strengthening of ecosystem performance. For example, a name strongly associated with the strengthening E&I reputation of Imperial College London was Richard Sykes, who served as university Rector between 2001 and 2008. Previously CEO of GlaxoSmithKline, Richard Sykes was seen to bring a culture of *“celebrating the success of entrepreneurs, sending the message that academics can get rich without losing their credibility as a world class researcher”*. Richard Sykes also exerted pressure on the existing technology transfer office, Imperial Innovations, to *“demonstrate the value of their activities”*. In the years that followed, Imperial Innovations was transformed into *“something very unique – an independent company that handles the whole technology transfer process for the university”*.
- **University research capability:** Many universities in the expert rankings have a long history as international research powerhouses, and this quality and capacity was seen as a cornerstone of the ecosystem’s success. For example, at ETH Zurich, the university’s *“long-standing history of excellence in research”* with a considerable international focus was noted by experts as key to the ecosystem’s strength.
- **The local or regional quality of life:** The attraction of the locality itself was seen as a major benefit to ecosystem growth. For example, many experts described the *“gorgeous location”* of Sophia

Antipolis as the “key to its success”. As one commented, “...it sounds trivial, but location and lifestyle is a big factor. They were taking the Silicon Valley summery lifestyle and setting it up in the south of France”. The design of the park itself was also seen as an influencing factor – “... it is not a science park as you would expect. The buildings are scattered throughout the hills. It is like nothing else I have seen”. The pre-existing tourist industry also made the region “open to the world”, with international schools, an international airport and high-speed train lines to the rest of Europe.

- **Regional or government support:** Many universities featured in the expert rankings have clearly benefitted from significant external support for ecosystem development in the form of generous government subsidies and advantageous regional policies. In some cases, experts observed that these interventions allowed universities to present a highly successful façade that masked an ineffective or very limited E&I contribution by the institution itself. However, experts also highlighted a significant number of cases where regional or government interventions had achieved much more positive and sustainable results. For example, the collaborations across universities, business and local government in the city of Tomsk, Siberia, were seen as a major factor in the emerging E&I environment at Tomsk State University of Control Systems and Radioelectronics (TUSUR). When describing the growing vibrancy of this university ecosystem, one expert commented, “[TUSUR] did not do this alone. There was an openness between the university and the [rest of the] ecosystem. They have combined the general city facilities with the university facilities with business facilities”. Through this mutually-reinforcing collaboration, the city is seen to have become open and attractive and a place where “entrepreneurs would want to move their ideas”.
- **Effective institutional strategy:** Experts described at length the university strategies associated with successful ecosystem growth. Some effective strategies appeared to be relatively independent of the university size, location and profile. Examples included approaches where the institutional focus for E&I did not reside within a single group or centre, but was allowed to emerge as multiple, and often unconnected, activities operating across and beyond the campus. Other strategies described were specifically tailored to the university context, often in direct response to the challenges faced in that environment. For example, the size and geographical isolation of New Zealand together with the absence of multinational companies led the University of Auckland to develop a strategy of “associating our capabilities with the needs of other nations”. Experts pointed, in particular, to the performance of UniServices, an autonomous but university-owned institution managing all research contracts and commercialisation activities for the University of Auckland. UniServices have focused on the development of long-term strategic partnerships with large multinational companies and carefully positioned themselves “in specific segments and markets”. One expert described how they had created “a support environment in New Zealand that allows people to think globally about their business”.
- **Powerful student-led entrepreneurship drive:** “Student energy in entrepreneurship” was viewed by experts as an increasingly prominent driver of ecosystem development, particularly amongst emerging ecosystems and those operating in more challenging environments. One university highlighted by experts in this context was the recently established Aalto University in Helsinki. The university was formed through the merger of three highly-regarded schools of business, engineering and design, with an explicit focus on “innovation based entrepreneurship”. Many experts commented that, after only two years of operation, the “levels of student engagement [in E&I] are phenomenal”, supported by an array of activities and resources across campus. The decreasing dominance of the major employers of Finnish graduates, such as Nokia, was also seen to have supported a wave of interest in entrepreneurial careers amongst student populations within the country, with emerging national role models such as the developers of *Angry Birds*.<sup>5</sup>

<sup>5</sup> *Angry Birds* is a video game developed in Finland in 2009

## 6. Data to characterise each top-ranked university

This section presents a range of data through which it is possible to characterise and compare the profiles, E&I approaches and research commercialisation performances of ten of the most highly-regarded universities emerging from the study.

The universities considered are:

- Aalto University (Finland)
- University of Auckland (New Zealand)
- University of Cambridge (UK)
- Imperial College London (UK)
- University of Michigan (US)
- MIT (US)
- University of Oxford (UK)
- Stanford University (US)
- Technion (Israel)
- UC San Diego (US)

The data for these universities is presented in Figure 10. Most of the information has been gathered from publicly available sources. Where not available in the public domain, data was requested directly from the universities concerned. National and institutional differences in data collection procedures, performance metrics and reporting periods, however, mean that the data are unlikely to be strictly comparable. With this caveat, Figure 10 provides an overview of the broad differences and similarities between the ten universities. Further information is provided in Appendix E, including more detailed definitions of the metrics reported in Figure 10 as well as data sources and details of relevant ecosystem components for each of the ten universities.

Unless otherwise indicated, all data relate to the year 2013. For all non-US institutions, financial information has been converted to US Dollars, using the exchange rates detailed in Appendix E.

The commercialisation data for nine of the ten universities<sup>6</sup> has been checked and approved by a representative of each institution concerned.

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<sup>6</sup> Commercialisation data corresponding to Stanford University has not been checked by the university

University profile	Aalto	Auckland	Cambridge	Imperial	Michigan
<b>University ranking</b>					
Expert rating for the most successful ecosystems <sup>a</sup>	>20	>20	3	4	15=
Expert rating for effective ecosystems in adverse env. <sup>a</sup>	4=	2=	>20	4=	4=
THE World University Rankings 2013/14	301-350	164=	7	10	18
QS World University Rankings 2013/14	196=	94	3	5	22
<b>Institutional size and budget</b>					
University revenue (USD)	\$581m	\$801m <sup>c</sup>	\$2.5b	\$1.4b	\$5.3b
University endowment (USD)	\$1.3b	\$49m <sup>c</sup>	\$1.8b	\$160m	\$8.4b
Sponsored research income (USD)	\$68m	\$197m <sup>c</sup>	\$542m	\$547m	\$1.3b
Industry sponsored research income (USD)	\$31m	\$63m <sup>c</sup>	\$49m	\$66m <sup>c</sup>	\$72m
Number of undergraduate students (full- plus part-time)	19,993	26,915 <sup>b,c</sup>	12,140	8,810	28,283
Number of graduate students (full- plus part-time)	1,711	5,686 <sup>b,c</sup>	7,245	7,195	12,724
Number of academic faculty	366	2,160 <sup>b,c</sup>	4,915	3,825	3,059
<b>E&amp;I approach</b>					
Are there university centres actively promoting E&I?	✓	✓	✓	✓	✓
Are E&I courses offered to students across campus?	✓	✗	✓	✓	✓
Are there university-wide E&I competitions?	✓	✓	✓	✓	✓
Are there E&I student clubs and societies?	✓	✓	✓	✓	✓
Does the university offer seed funding?	✓	✗	✓	✓	✓
Does the university offer proof of concept funding?	✓	✓	✓	✓	✓
Does the university offer an accelerator/incubator?	✓	✗	✓	✓	✓
Default IP ownership for government funded research?	University	University	University	University	University
Default IP ownership for industry funded research?	Industry	Industry	University	University	University
Do they offer support to other ecosystems?	✓	✓	✗	✗	✗
Are external E&I bodies actively driving the ecosystem?	✓	✓	✓	✗	✓
<b>Research commercialisation</b>					
IP disclosures per year	150	128	124	329	421
Patents filed per year (all filings, all jurisdictions)	53	21	204	90	395
Patents issued per year	10	23	48	67	130
Number of licences per year	5	22	76	32	108
Number of licences to spin-outs per year	6	3	11	4	9
Licensing revenue per year	\$250k	\$13m	\$7m	\$2.3m	\$13.4m
IP expenses per year	\$400k	\$0.7m	\$2.1m	\$1.9m	\$7m

<sup>a</sup> From expert consultations in Phase 1 of this study (n=61)

<sup>b</sup> Full-time equivalent (rather than headcount, part-time plus full-time, as for other universities)

<sup>c</sup> Data from 2012

**Figure 10. Comparative information to characterise the institutional profile, E&I approach and research commercialisation activity of ten universities identified as highly-regarded in this study. All data refers to the year 2013 unless otherwise stated. Further information is provided in Appendix E.**

	MIT	Oxford	Stanford	Technion	UCSD
	1	5	2	6	7
	>20	>20	>20	1	>20
	5	2=	4	201-225	40=
	1	6	7	183=	63
	\$3.2b	\$1.8b	\$4.1b	\$678m	\$3.0b <sup>c</sup>
	\$11b	\$1.1b	\$18.7b	\$1.6b	\$642m
	\$674m	\$725m	\$1.2b	\$84m	\$985m
	\$106m	\$93m	-	\$7m	\$120m
	4,528	16,745	6,980	9,754	23,805
	6,773	8,925	8,897	3,499	6,505
	1,030	5,965	1,429	616	1,196
	✓	✓	✓	✓	✓
	✓	✓	✓	✓	✓
	✓	✓	✓	✗	✓
	✓	✓	✓	✓	✓
	✓	✓	✓	✓	✓
	✓	✓	✓	✓	✓
	✓	✓	✓	✓	✓
	University	University	University	University	University
	University	University	University	University	University
	✓	✓	✓	✓	✓
	✓	✓	✓	✓	✓
	698	326	502	81 <sup>c</sup>	296 <sup>c</sup>
	932	197	613 <sup>c</sup>	235 <sup>c</sup>	322 <sup>c</sup>
	290	119	201 <sup>c</sup>	89 <sup>c</sup>	164 <sup>c</sup>
	68	105	103	6 <sup>c</sup>	60 <sup>c</sup>
	16	8	9	8 <sup>c</sup>	12 <sup>c</sup>
	\$70m	\$14m	\$87m	\$22m <sup>c</sup>	\$16.2m <sup>c</sup>
	\$19m	\$5.1m	\$9.3m	\$1.6m <sup>c</sup>	\$1.9m <sup>c</sup>



# PHASE 2

CASE STUDIES  
OF WELL-REGARDED  
PRACTICE

## 7. Introduction to the case study evaluations

The second phase of the benchmarking study provides detailed analyses of four well-regarded university-based technology-driven entrepreneurial ecosystems, each seen to be operating in more challenging conditions.

The case studies were designed to explore the drivers, facilitators and barriers to the development and growth of key entrepreneurial university centres around the world. Each case study provides an evaluation of the specific university context, drawing on interview feedback from a range of targeted stakeholders. Taken together, the case studies offer insights into the common features associated with successful university E&I transformations, as well as the key challenges commonly faced by these institutions; findings that are explored in the conclusions section of this report, Section 13.

The selected case studies are:

1. Aalto University, Finland
2. Imperial College London, United Kingdom
3. Tomsk State University of Control Systems and Radioelectronics (TUSUR), Russia
4. University of Auckland, New Zealand

This section provides an introduction to the case study evaluations, detailing the rationale for their selection, the process adopted to conduct each evaluation and the focus of the analysis in each case. The following four sections provide a summary of each university evaluation; the full case studies are provided in the document Appendices.

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### 7.1. Rationale for case study selection

During Phase 1 of the benchmarking study, a simple 'ranking' was constructed of the world's most highly-regarded university-based ecosystems operating in more challenging conditions, as nominated by a group of international experts (see Figure 8). Detailed interviews with thought leaders in the field also provided information on the key characteristics of each of these university-based systems. As discussed in Section 5.1 of this report, experts often described university-based ecosystems using one of the following three characterisations: (i) those that had benefitted significantly from a *"rising tide that floats all boats"* at a national level or benefited from substantial government investment, (ii) those whose strong international reputation for knowledge transfer is not necessarily supported by evidence of their performance, and (iii) those who had played an active, positive role in establishing and/or growing a vibrant and strengthening ecosystem.

The universities considered for case study analysis were confined to those consistently nominated by experts as falling into the third of these groups, as identified by 10% or more of the 61 interviewees in Phase 1. Candidates for case study analysis were further refined by considering only those universities:

- whose critical entrepreneurial development is still in its 'startup phase' and where the key E&I components driving this change are still in place;
- that have taken a distinctive path in their entrepreneurship and innovation policy in response to the particular barriers faced in their environment;
- that have a significant focus on engineering and technology in their entrepreneurship activities.

These selection criteria allowed the study to focus on technology-driven ecosystems where the key architects of the distinctive university E&I approach were still traceable and the details of the change process were within interviewees' recent memories. From the institutions which met each of the above criteria, the final case study selection was made such that, taken together, they would represent a range of geographical, cultural, economic and institutional contexts.

Guided by the criteria above, the four universities selected for case study evaluation were Aalto University, Imperial College London, TUSUR and the University of Auckland.

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## 7.2. Case study evaluation process

A formal request was submitted to each of the four nominated universities, seeking permission to proceed with the case study and stating that the completed evaluation would be held in confidence by its author pending their approval for release of the document. As such, case study universities were all given the opportunity to amend any inaccuracies or omissions in the draft evaluation document on completion of the analysis. All four universities agreed to proceed on this basis.

Each case study was undertaken over a three to six month period between early 2013 and early 2014. Evaluations were conducted by an independent consultant, the report author.

The major data-gathering tool used for each case study was one-to-one semi-structured interviews with multiple ecosystem stakeholders. For each case study, the interviews were complemented with:

- A snapshot literature search and review to identify pre-existing evaluations or documentation on the university or its regional entrepreneurial ecosystem;
- On-site observations of the university's E&I facilities, classroom activities/courses and events (as appropriate) as well as informal interaction with associated participants;
- Data on the performance and impact of the university ecosystem, provided by the university directly, accessed from publicly-available sources or collected via regional, national or international contacts.

These supplementary sources provided important background information; however, as noted above, the key focus of the evaluations was the stakeholder interviews. A total of 130 one-to-one interviews were conducted across all four case studies, with between 31 and 35 individual consultations conducted in each case. The majority were one-hour interviews, conducted face-to-face during an on-site visit to the university. Where this was not possible, interviews were conducted remotely, by telephone or Skype. For each case study, a small number of individuals who played a critical role in the evolution of the university's E&I capacity were interviewed on multiple occasions, before, during and after the institutional visits. Anonymity was protected; all interviews took place on the understanding that no information or opinions would be attributed to named individuals in the report.

For each case study, targets for interview were identified through a review of the literature as well as recommendations from key interviewees from Phase 1 of the study, primary university contacts, regional university peers and key regional and national E&I agencies. From there, a 'snowballing' method was used to identify key architects and practitioners of and observers to the university E&I ecosystem, while ensuring that a range of experiences, perspectives and roles was represented across all interviewees. The total number of interviewees for case studies was limited at 35. Interview requests targeted individuals who were directly engaged with the university's E&I activities as well as observers to the



university and its entrepreneurial activities. In all cases, interviewees were drawn from the following five groups:

- current and previous university senior management, including university Presidents;
- university students, faculty and alumni, both those directly engaged and not directly engaged in entrepreneurship and innovation activities;
- representatives from key university-based E&I agencies, such as technology transfer functions, business schools, student-led entrepreneurship societies, corporate-liaison functions, curricular and non-curricular entrepreneurship courses and activities, university-based incubators and/or accelerators;
- members of the regional and national E&I community, including those actively engaged in supporting entrepreneurship activities at the university, such as entrepreneurs, venture capitalists, directors of regional accelerators/incubators, university business partners, representatives from regional E&I support agencies;
- observers from outside the university, such as the regional government, peer regional and national universities, international partners in E&I, international E&I experts and visitors.

Figure 11 illustrates the number of interviewees within each of these stakeholder groups consulted in the four case studies. For the purposes of this figure, each individual has been affiliated with the stakeholder group in which they have made the most significant contribution to the ecosystem. So, for example, regionally-based alumni entrepreneurs have been affiliated to the *Member of the regional and national E&I community* group, and students driving major E&I activities have been affiliated to the *Representatives from key university-based E&I agencies* group.

STAKEHOLDER GROUP	AALTO	IMPERIAL	TUSUR	AUCKLAND	TOTAL
University senior management	3	8	6	5	22
University students, faculty and alumni	9	9	8	8	34
Representatives from key university-based E&I agencies	9	6	4	7	26
Members of the regional and national E&I community	6	7	8	7	28
Observers from outside the university	4	5	7	4	20
TOTAL	31	35	33	31	130

**Figure 11. Distribution of interviewees by stakeholder group for each case study.**

Interview questions were tailored by case study context and stakeholder group, but, where appropriate, were designed to explore the interviewees' perspectives on the following topics:

- **Regional and national landscape for E&I:** the regional and national strengths and weaknesses in supporting entrepreneurship activities; the university E&I environment, culture, profile and activities before the ecosystem was developed to its current form; the primary regional agencies supporting entrepreneurship;
- **Development and architecture of the university's E&I approach:** distinguishing features of the university's E&I approach; the drivers that shaped the university's E&I priorities, including specific events that precipitated or accelerated change; the critical components of the university's E&I infrastructure and the role played by each element; the university's policies and procedures to support E&I; strengths and weaknesses of the approach adopted;
- **Entrepreneurial culture and community:** attitudes to and engagement in the E&I agenda by each of the key university-based populations (senior management, faculty, researchers and students); the apparent change in culture and attitudes to E&I over time by these university populations; the university's formal and informal partnerships with the external entrepreneurial and business community; the key functions/individuals/groups supporting and nurturing these external relationships;
- **Impact of the university's E&I approach:** the role played by the university in building regional/national engagement and capacity in E&I; the key performance metrics used by stakeholders to evaluate the university's entrepreneurial success and the extent to which these are being/will be met; critical success factors underpinning the university's entrepreneurial growth; the role played by university vision, policy and leadership in the university's E&I performance; key functions/individuals/groups underpinning the university's E&I strengths;
- **Next steps:** upcoming changes and developments to the university's E&I infrastructure and approach; the on-going and future challenges faced by the university in further strengthening its ecosystem.

On completion, each case study was documented in a 25-30 page report, accompanied by a three-page summary. All case studies were approved by the relevant university prior to submission to the MIT Skoltech Initiative and their subsequent inclusion in this report. All universities were given the opportunity to suggest amendments to the case study document. Through this process, some data was omitted from the final published case studies due to institutional, regional or national sensitivities.

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### 7.3. Focus of case study evaluations

The benchmarking study is concerned with technology-driven entrepreneurial ecosystems, with a clear focus on engineering and technology. This disciplinary focus is reflected in the case study evaluations. In consequence, entrepreneurial activity in domains outside these sectors, for example, in life sciences or healthcare, is not addressed in the case studies. In addition, university E&I activities that cannot be accessed by faculty and students from the engineering and technology disciplines or do not directly influence the engineering and technology components of the regional ecosystem are not considered. An example of such an activity would be a university business school whose E&I offering is focused primarily on its own student population or whose entrepreneurship output primarily concentrates on the national/international community rather than the regional ecosystem.

The case study reports (Appendices A-D) share a common structure and contain six subsections. The focus and content of each subsection is outlined below.

1. **Ecosystem context:** the first case study section provides an overview of the national and regional environment for E&I as well as the apparent barriers to entrepreneurship;
2. **Historical development of E&I at the university:** this section charts the key stages in the university's entrepreneurial growth and development, from the point when its E&I focus/agenda first starts to emerge through to the present day;
3. **University approach to entrepreneurship:** this section describes (i) the university's approach to technology transfer, (ii) the university's policies and procedures for supporting and rewarding engagement in entrepreneurship, and (iii) the key components of the university E&I infrastructure and their inter-relationship;
4. **Achievements and impact:** this section provides stakeholder feedback and available performance data on the university's E&I impact, including, where appropriate, (i) technology transfer performance, (ii) impact through corporate engagement, (iii) engagement and participation levels in entrepreneurship amongst the university's student, faculty and alumni populations, and (iv) university impact on entrepreneurial capacity and engagement at a regional/national level;
5. **Success factors:** this section highlights the key factors that the case study evaluations identified as underpinning the university's successes in the creation of a university-based technology innovation ecosystem;
6. **On-going issues and challenges:** this final section outlines the barriers that the evaluations suggest are constraining and challenging the further growth of the regional ecosystem or the full realisation of the university's entrepreneurial ambitions.

The following sections provide a three-page summary of each case study evaluation. The full case studies are provided in the Appendices to this report (Appendices A-D).

## 8. Summary of the Aalto University evaluation <sup>7</sup>

Aalto University is located in Espoo, a city within the metropolitan area of Helsinki, Finland's economic and political hub. High-technology manufacturing, including major telecommunications and electronic companies, underpins the Finnish economy. These key export industries have been supported by a strong R&D base and cooperation between universities and big business – features which have been harnessed by Aalto University and its rapidly-developing ecosystem.

Aalto University was established in 2010 through the merger of three existing and well-regarded universities in the Helsinki area, with the aim of combining their strengths in engineering, design and business to create a new world-class university. Aalto University is seen as the flagship of a new national approach to higher education which has industry-informed research and innovation at its core. Supporting this ambition, the new university has benefited significantly from inward investment,

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<sup>7</sup> The full case study for Aalto University is provided in Appendix A

both from industry and, through a programme of matched funding for technology innovation, from government. The Finnish Funding Agency for Technology and Innovation (Tekes) has also played an important role in offering financial support to many of the E&I activities that have emerged from the ecosystem in recent years.

The immediate Aalto ecosystem is relatively contained: a 4km<sup>2</sup> area around the university site of Otaniemi, the original home of the largest of the three merged universities. This area of Espoo is Finland's major R&D centre: it is home to other higher education institutions and research institutes as well as large population of students and technology professionals. While the Aalto ecosystem is at an early stage of development – it is only three years since Aalto University was formally opened – it is emerging as a vibrant region for technology-driven entrepreneurship. The stakeholders interviewed for the case study recognised the importance of the region's pre-existing R&D base and the strong links with major companies. However, they highlighted two additional factors as integral to the ecosystem's early success: a dynamic student-led entrepreneurship movement and a university leadership that has been proactive in its support for strengthening the entrepreneurial ecosystem.

**The student-led entrepreneurship movement** emerged in late 2008. It was an anti-establishment movement borne of frustration with the lack of regional and university support for entrepreneurship and a passionate drive to create an alternative, vibrant startup environment. Started by a small core of students, innovative events and activities quickly engaged the local startup community and attracted a widening pool of students. Building on these foundations, the student group promoted an inclusive approach: open to all those engaged at any stage of the entrepreneurial process in Northern Europe and Russia, regardless of their nationality and background. Central to its operation is the Aalto Entrepreneurship Society (AaltoES), a not-for-profit student-run society with over 5000 members, drawn largely from the undergraduate and postgraduate population at Aalto and other Helsinki-based universities. The ambition, vibrancy and design of the student-led activities are undeniably impressive; described by many external observers as *“unlike anything I have seen anywhere in the world”*. Equally impressive has been their success in harnessing the talents of the regional startup community to support and inform their vision to establish Aalto as a key hub for high-growth technology-driven entrepreneurship within Northern Europe and Russia.

The student-led movement is widely viewed as the cornerstone of Aalto's emerging reputation as an entrepreneurial environment and, in the view of many interviewees, has been the catalyst for a wider cultural change in national attitudes towards startup activities and entrepreneurship more generally.

**The university's senior management** has been a highly vocal supporter of the entrepreneurship movement at Aalto since its early beginnings in 2008. Despite the university having no explicit E&I policy, its senior managers have played an important role in creating the conditions for the organic growth of entrepreneurial cultures, activities and communities in and around Aalto. In particular, their approach has been to *“support but not direct”* the student-led entrepreneurial movement, for example by providing public endorsement, financial help and physical space for its activities. The environment created was one where a somewhat eclectic range of activities could be developed by a group of passionate individuals in a very short time period, which could easily be adapted to the changing needs of the emerging ecosystem. The university adopted the same *“hands-off”* approach when, from 2010, entrepreneurship activities started to spread beyond the student body and take root within the university support functions; again, it allowed the expertise and interests of activity founders to steer the direction taken. Inspired by the early success of the student-led movement, these university-based E&I support activities focused on the creation of a regional hub for high-growth entrepreneurship, supported by active partnerships with the existing local startup community.

This university investment in regional rather than institutional capacity is rare. Indeed, the stakeholder interviews indicate that the university has deliberately downplayed the importance of its IP ownership and startup affiliation, regarding these as secondary to the overarching goal of developing the broader ecosystem. For example, in early 2013, Aalto University established AppCampus, a mobile application accelerator sponsored by Nokia and Microsoft. Only a small minority of the teams accepted onto the accelerator programme are affiliated to the university and no IP, revenue share or equity are taken from any participant. It is an approach that has paid wider dividends, enabling the university to demonstrate institutional influence and impact at a time when it was wrestling with the significant challenge of merging three distinctive and well-established institutions.

There is no doubting the considerable potential of the emerging ecosystem at Aalto. As the case study makes clear, in the five years since its early foundations, the ecosystem is already demonstrating considerable impact in *“creating a revolution in attitudes in young people towards entrepreneurship”* as well as catalysing *“phenomenal levels of participation”* in its entrepreneurship activities. After this highly successful founding phase, however, the university is aware that it must take steps to embed entrepreneurship within its institutional fabric to provide a more stable base for future ecosystem growth.

To do this, it faces some important challenges. Growing from the student body into the university's support functions, the entrepreneurship movement has been driven by enthusiasm and volunteerism. It is now poised to spread into the heart of the university; its academic departments. However, like the wider university, the primary academic focus has been the establishment of a world-class research environment. In line with this emphasis, the university's policies and procedures are squarely aligned with its research mission, which is well understood by its postgraduate and academic populations. The ethos, as one interviewee put it, is *“publish or perish”*, a culture seen to have become more entrenched over time. Faculty reported that there was little evidence that efforts to commercialise research ideas or embed E&I into the curriculum will be rewarded or supported by institutional policies. However, Aalto's senior management are aware that wider changes are needed if the university is to become a world-leading entrepreneurial hub.

The student-led movement has been the engine driving the startup explosion at Aalto. It is a constituency that is dynamic and dependent on the constant renewal of the leadership which has been key to its success. There may therefore be a limited time-window in which this movement can maintain its vibrancy, integrity and influence. If the Aalto ecosystem is to continue to thrive and progress, the university needs to give priority to embedding an E&I agenda within its core policies, supporting and rewarding within its faculty a culture of enterprise and innovation. The evidence from the interviews suggests that the future of the Aalto ecosystem may well turn on changing departmental incentives and curricula, a change that would help to build a platform for the next wave of E&I expansion as well as withstand any loss of momentum among its student entrepreneurs. With such a policy shift, the formidable combination of strong leadership commitment, passionate stakeholder engagement and an effective national support system is likely to drive Aalto towards becoming a major international powerhouse for university-based entrepreneurship over the next decade.

## 9. Summary of the Imperial College London evaluation<sup>8</sup>

Imperial College is located in the South Kensington region of London, the city's museum district. The university was established in 1907 through the merger of the City and Guilds College, the Royal School of Mines and the Royal College of Science, bringing together the disciplines of engineering and natural science. The disciplinary profile of the university was later broadened following the merger with St Mary's Hospital Medical School and the establishment of the Imperial College Business School. The university describes itself as the *"only UK university to focus exclusively on science, technology, engineering, medicine and business, and the only one to have had the application of its work to industry, commerce and healthcare central to its mission since its foundation"*. This commitment to knowledge transfer, as laid out in its founding charter, has played a critical role in shaping the culture and priorities within the university over the past 100 years.

Imperial College is one of three UK institutions consistently placed in the top ten of the world university rankings. Its research performance and reputation strengthened considerably during the 1990s and 2000s, as did its capacity to bring together expertise from across disciplines to *"tackle many of the emerging challenges facing society and industry today"*. The mid 2000s also saw the start of a series of major changes to the university's technology transfer function, Imperial Innovations. Until this point, Imperial Innovations had been a wholly-owned subsidiary of Imperial College, operating under *"a pretty standard technology transfer model"*. Imperial Innovations now operates as an independent listed company, in which Imperial College is a 30% shareholder, and is structured around two core functions: (i) a technology transfer arm, providing services exclusively for Imperial College on the basis of a 15-year Technology Pipeline Agreement, and (ii) a ventures arm, building and investing in technology and healthcare businesses emerging from the University of Cambridge, the University of Oxford, University College London and Imperial College.

In the context of establishing an entrepreneurial ecosystem, many interviewees noted the advantage of the university's central London location; one which was variously described as *"the financial heart of Europe"* and *"one of the best places in the world to start a business"*. However, interviewees also highlighted five additional factors that underpin Imperial College's strength in E&I:

- **A world-class science and technology base**, described by interviewees as *"one of the world's great centres of learning and research"* which houses *"the highest calibre of researchers and students from all corners of the world"*.
- **A long-standing emphasis on innovation and the application of scientific knowledge** to the benefit of industry and society. An additional consequence of the university's innovation culture has been the *"exceptionally strong set of industrial ties"*, helping to establish Imperial as the one of the largest academic recipients of corporate R&D funding outside the US.
- **An "inter-disciplinary attitude to research and innovation"** with a high degree of *"cross-fertilisation between research ideas, disciplines and industry contacts"*; an approach that is emphatically endorsed and supported by the university at the highest level.

<sup>8</sup> The full case study for Imperial College London is provided in Appendix B

- A **“lean and dynamic” university structure**, with the ability to react quickly and decisively to shifts in the external and internal landscape; *“Imperial is a tightly-run, highly-structured university where it is possible to make decisions”*.
- **The reputation and profile of two key university centres:** (i) Imperial Innovations, noted for its *“highly professional approach to technology transfer”* and *“incredible success in raising finance for startups”*; and (ii) the Imperial College Business School, whose reputation has grown significantly over the past decade and whose research on *“entrepreneurship and how it relates to science, technology and medicine”* was noted by many to be *“world-leading”*.

Without doubt, Imperial College offers *“one of the best industry-informed research environments in the world”*, which is supported by a web of embedded strategic corporate partnerships. Some interviewees noted, however, that the environment this creates was not necessarily conducive to the development of risk-taking, entrepreneurial behaviour. Interviewee feedback suggested that two particular issues may be holding back ecosystem growth, barriers that may disproportionately affect the university’s student populations. These relate to (i) the culture supporting entrepreneurship within the university and (ii) the visibility of the entrepreneurial community on campus. Each issue is discussed below.

**Extension of an entrepreneurial culture:** Imperial Innovations plays a key role in exploiting high-potential ideas emerging from the university’s research community. The faculty engaged with Imperial Innovations in these activities are typically *“highly influenced by the experience, becoming much more commercially aware”* as a result. This group, however, *“represents a tiny proportion of the staff and students in the university and the entrepreneurial mindset is slow to extend beyond them”*.

Three particular challenges to the further expansion of an entrepreneurial culture across the campus were highlighted by interviewees. The first relates to the university’s entrepreneurial strategy and governance. There was a strong consensus amongst Imperial-based interviewees, including many from the university’s senior management, that *“there is no [top down] entrepreneurship strategy at Imperial”*. As a result, some reported that *“the policies of Imperial Innovations and the policies of Imperial [College] have become synonymous”*, leading to a culture where *“only university-protected IP is seen as worthwhile”*. The second challenge relates to a lack of clarity over student IP ownership rights, which appears to have led to some of the university’s most entrepreneurially-minded students intentionally taking their ideas and activities off campus. The third challenge relates to perceptions of, and attitudes to, entrepreneurship amongst science and technology students. Perhaps as a result of the prominence of the City of London as a key employer of Imperial College graduates, many students appear to associate entrepreneurship with a career in finance rather than a career that aligns with their interests and capabilities in science and technology. Such attitudes appear to have limited the potential impact of many student entrepreneurship activities to date.

Imperial College are well aware of these challenges and are committed to addressing them. Indeed, this case study appears to have been undertaken during a period of considerable change in Imperial’s entrepreneurial landscape. Developments include the establishment of Imperial Create Lab. Since its establishment in 2011, the Imperial Create Lab has quickly grown in scope and ambition and is poised to catalyse a vibrant on-campus student-led activity that actively embraces the regional entrepreneurial community.

**Establishment of a visible, on-campus, entrepreneurial community:** Imperial College is a *“trusted partner of the mature corporate technology world”*, and these strategic relationships are highly visible, cutting across each department and cross-disciplinary research centre in the university. A theme running through the case study interviews was the perceived lack of visibility of an equivalent technology-based

entrepreneurial community on campus: angel investors, alumni entrepreneurs, local accelerators, etc. Evidence from the interviews suggests that the connection between the regional startup community and university staff and students is limited.

The apparent lack of on-campus entrepreneurial community appears to be linked to three factors. The first relates to location: Imperial is located in one of the most expensive footprints in the world and the establishment of new small-scale startups in this vicinity is *“almost impossible”*. In consequence, most university-affiliated startups are widely scattered, limiting their ability to contribute to a geographically clustered entrepreneurial community. The second relates to the limited role of alumni entrepreneurs on campus and the resulting lack of accessible role models for current students. Tracking and connecting with alumni represents a particular challenge because of the very high proportion of non-EU students studying at the College. The third factor relates to university relationships with the external entrepreneurial community, most of which are currently nurtured and maintained by Imperial Innovations. As a result, interviewees suggested that the entrepreneurial community is *“held at arm’s length”* from the university and the relationships formed tended to *“focus on specific projects rather than creating informal opportunities for them to mix with staff and students”*.

The Imperial West campus development, which is currently under construction, is likely to address all these factors. In addition to accommodating *“top ten global organisations within key sectors”*, this new 23 acre university campus in the west of London will offer significant capacity for *“translational university research”* alongside competitively priced spaces for new startups; *“suddenly we have this new opportunity to expand our translational activities, and entrepreneurship will be a big part of that”*.

With the Imperial West development, Imperial Create Lab and a new impetus for strategic change, Imperial College is embarking on a new and very exciting phase in its development as a world-leading, internationally-recognised entrepreneurial university.

## 10. Summary of the TUSUR evaluation<sup>9</sup>

Tomsk State University of Control Systems and Radioelectronics (TUSUR) is a small, specialist IT and robotics university located in Tomsk, western Siberia. Despite a population of only half a million inhabitants, Tomsk is a key academic centre within Russia, housing six universities in total. Established in 1962, TUSUR’s historic focus has been in the *“military and space exploration”* sectors, necessitating a *“closed culture of strict confidentiality”* across the university. Its specialist nature, size (compared to other larger, long-established universities in Tomsk) and the confidential nature of its activities are seen to have created a highly collegial and trusting atmosphere amongst its student and faculty populations.

During the 1990s, the political and economic landscape changed dramatically in Russia. These conditions triggered two sets of events that precipitated the formation of the Tomsk technology-driven entrepreneurial ecosystem – one at the regional level and one at the university level – as outlined below.

The first set of circumstances concerned the region round the university. The Tomsk regional economy, for many decades, has been underpinned by the oil and gas sector. In the early 1990s, *“oil prices dropped significantly in international markets”* and the Tomsk regional budget *“dropped two to three times as a result”*. The experience led the Regional Administration to conclude that, *“we cannot rely on only one*

<sup>9</sup> The full case study for TUSUR is provided in Appendix C



*industry*” to support the region’s economy; in consequence, they started to explore alternative, stable sources of revenue. Recognising the strength of the region’s engineering skills base, particularly in the IT sector, they looked to the concentration of research and education professionals in Tomsk as a means of realising *“economic benefit to the region”*. From 2003, the Regional Administration developed and implemented an ambitious strategy to establish Tomsk as *“the first entrepreneurial region in Russia”*. In the decade that followed, the Tomsk Regional Administration played a critical role in raising the profile of Tomsk as Russia’s first entrepreneurial hub and creating a unified platform from which the town was able to successfully bid for federal funding to establish its E&I infrastructure. One important element of this infrastructure was the establishment of the Special Economic Zone in 2005.

The second set of circumstances driving the formation of Tomsk’s entrepreneurial ecosystem concerned the university of TUSUR. During the late 1990s, the funding underpinning many of TUSUR’s research and teaching activities fell sharply. All Russian universities were significantly affected by hyperinflation, which reduced the value of the core support they received from the federal government. The impact on TUSUR was compounded by the almost complete loss of its military research funding. With a dramatic reduction in salary levels and employment opportunities, TUSUR graduates, faculty and researchers *“needed to find new ways to use themselves”* and some started to establish IT-driven startups to supplement their income.

In 1999, at the height of this crisis, a new Rector was appointed to TUSUR with significant personal experience of startup creation as well as the regional opportunities and constraints for new business growth. The new Rector recognised the potential of technology-driven startups to support the university’s future economic interests, and, in 2001, led the decision for TUSUR to *“transform into an entrepreneurial university”*. A central component of this transformation was the establishment of a strategic informal partnership of mutual support and collaboration with university-affiliated startups. The resulting consortium of startup enterprises, referred to as ‘UNIC’, has played a pivotal role in the development both of the regional entrepreneurial ecosystem and of TUSUR’s E&I infrastructure. TUSUR’s entrepreneurial ambitions have shaped almost every strategic decision made by the university in the past decade. The E&I policies at TUSUR also reflect the original drivers for its transformation into an entrepreneurial university: to create a regional community of university-linked technology-driven startups that, in turn, will provide a major, stable source of research income and graduate employment for the university. In consequence, TUSUR offers high levels of support for startup creation by its staff, student and alumni populations, and, in most cases, *“gives the IP to the [faculty] inventor”*.

During the past 12 years, TUSUR has been an important pioneer in the establishment of university-based entrepreneurship in Russia, playing a central role in founding the country’s first (i) multi-institutional student business incubator, (ii) technology-driven economic zone, and (iii) system of widespread engineering project-based learning within the undergraduate curriculum. Much of the early success of the ecosystem rests on the commitment and vision of key members of the university’s senior management. It has also been underpinned by three additional factors: (i) the quality of the relationship established between the university and the UNIC companies, (ii) an evolving E&I university strategy that is informed by both international best practice and critical self-analysis, and (iii) the commitment and vision of the Tomsk Regional Administration. Given the very considerable barriers to entrepreneurship apparent both regionally and nationally, what has been achieved by TUSUR in the past decade is impressive. Although still at an early stage, a culture of entrepreneurial engagement is emerging amongst the student and younger faculty populations. Indeed, interview feedback suggested that a growing population of *“entrepreneurially-minded students”* was now being attracted to TUSUR for undergraduate study, which will further strengthen this ethos.

Arguably, however, the ultimate value of the university's entrepreneurial approach should be measured through the UNIC consortium of university-affiliated startups. The early indicators of the consortium's impact on both the region and the university are promising. The UNIC companies play a dominant role in the Tomsk ecosystem, accounting for one third of the residents of the Special Economic Zone. Overall, the UNIC companies are reported to account for *"80% of the revenue from science-intensive businesses in Tomsk"*. TUSUR can therefore arguably be described as having played a pivotal role in both establishing and populating what was described by an external observer as *"probably the best environment for high-tech startups in Russia"*. What is most impressive, however, is the level of investment that TUSUR has received from the UNIC consortium. By 2012, the university attracted an annual income of US\$14m from the UNIC companies, through the contracting of R&D services, infrastructure investment and the purchase of equipment for the university's laboratories, departments and research centres; a sum that represents a significant proportion of the university's annual research income.

Despite these clear strengths and achievements, key challenges still remain in the realisation of TUSUR's entrepreneurial ambitions. Many of these challenges are beyond the control of a single university; they are associated with the highly challenging regional and national environment for startup creation and growth. However, it was also noted that TUSUR startups, similar to others in the region, were highly dependent and focused on the local market, so the regional and national constraints have had a disproportionate impact on their inception rate and progress. Many TUSUR startups were seen to have struggled to make significant footholds in the international market. Interviewees indicated that the constraining factor appeared to be the relatively narrow skill base within the TUSUR startup teams. In particular, team members were characterised as holding *"great ideas and technical knowledge"*, but often lacking three critical capabilities; strong English language skills, sufficient management skills to develop *"sustainable business models"* and *"a clear understanding of the international market needs"*.

There is no doubting the considerable environmental barriers currently facing TUSUR startups. However, many interviewees viewed this period as an inevitable stage in the evolution of a new entrepreneurial ecosystem within a challenging national and regional environment, pointing, in particular, to the town's status as *"Russia's first startup hub"*. Interviewees noted that *"[TUSUR] were the first to do all of these things [in Russia], so they are the first to face all of the problems. They are having to design the solutions as they go"*. The university's rapid emergence as a key national driver of technology-driven entrepreneurship appears unlikely to wane anytime soon. There is an air of confidence amongst the university's senior management that TUSUR's E&I ambitions will be realised. With this *esprit de corps* has come a willingness to *"travel against the current"* and take unconventional approaches to nurture the entrepreneurial capacity across both the university and the region; an approach that has shaped their pioneering reputation. The university's intimate understanding of the regional and national startup environment also provides them with a capacity to anticipate, and adapt quickly to, emerging challenges and opportunities, a capacity not often associated with academic institutions. With continued commitment and strong leadership, TUSUR is well-placed to overcome regional and national barriers and see further growth in entrepreneurship and reputation over the coming years.

## 11. Summary of the University of Auckland evaluation<sup>10</sup>

The University of Auckland is the largest university in New Zealand, hosting one third of the country's top-ranked researchers. It is located in New Zealand's largest city, home to around one third of the country's four million inhabitants. Historically, the New Zealand economy has been strongly dependent on primary products, principally dairy, meat and wool. Recent decades, however, have brought national economic challenges, which some interviewees attributed to an *“overdependence on the dairy and agricultural industries”*. Many interviewees noted, in particular, New Zealand's slippage down the OECD rankings, from *“one of the richest countries in the world in the 1950s down to the bottom third of the OECD by the end of the 1990s”*. Nonetheless, New Zealand maintains a very high quality of life, with the country being ranked sixth out of 187 countries in the United Nations 2013 Human Development Index, which considers indicators of national health, education and living standards.

While New Zealand has a highly-educated population on which to draw, its entrepreneurial growth faces challenges. Two, in particular, were repeatedly raised by interviewees. The first concerns distance from the markets, a consequence of the country's size and geographical isolation; *“1200 miles in any direction from New Zealand, there is absolutely nothing”*. As a result, interviewees described the pressure placed on newly-formed businesses to identify and connect with international markets: *“firms in New Zealand internationalise earlier, but often at a point that they are still immature. So we have a significant failure rate... for those who want to grow internationally, the risk and challenge is massive”*. The second major constraint on New Zealand's entrepreneurial growth was identified as the low national investment in research and development (R&D). The total R&D expenditure in New Zealand represents 1.27% of GDP, little more than half of the OECD average of 2.38%. Much of the shortfall is accounted for by low private sector investment in R&D, largely stemming from the country's dearth of the larger-scale businesses that dominate research funding amongst OECD peer countries.

The University of Auckland's E&I infrastructure has grown over the past three decades, driven by two streams of activity: the first emerging in the late 1980s with the formalisation of the university's technology transfer and commercial research activities, and the second emerging in the early 2000s following a university-led drive to improve the national E&I capacity. Each development phase is discussed in turn below.

The **seeds of the university's entrepreneurial ecosystem** were sown in 1988, with the establishment of UniServices, the first university-based technology transfer function in Australasia. In response to the particular and acute barriers to technology transfer within a *“remote island nation”*, the university adopted a highly innovative, if not unique, approach to managing and funding its commercialisation activities. The UniServices approach brought together *“contract research and technology development in one organisation”*; a union of sufficient *“size and capability”* to offer a platform for *“accessing overseas markets”* and *“building effective partnerships with large multinational companies”* across the world. Amalgamating the university's corporate-funded research and technology transfer activities was also seen to offer other key benefits, such as creating *“synergies that lead to new inventions and ideas”* and facilitating a unified institutional approach to corporate engagement within a *“company culture which ... is able to devote itself wholly to its corporate partners”*. Paying an annual dividend to the university, UniServices operates autonomously, self-funding its operations through an overhead fee applied to all

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<sup>10</sup> The full case study for the University of Auckland is provided in Appendix D

its corporate research and consultancy contracts. This status allows the unit to “*make our own decisions and hire our own staff*” – UniServices currently employs over 700 researchers to support delivery of industry-funded research – but also allows it to strategically invest in university IP as well as programme to “*seek out new sources of corporate research*”. International observers of the UniServices approach consistently noted its regional presence and impact: “*what UniServices has achieved is impressive in itself, but when you consider the geography and the size of the university, it is phenomenal*”. UniServices has consistently doubled its revenues every seven years, an increasing proportion of which is sourced from international markets. By 2012, corporate research income reached NZ\$73m and commercialisation revenues were NZ\$13m, with the company accounting for 60% of all patenting activity across New Zealand universities.

**The second phase of the University of Auckland’s entrepreneurial development** emerged in the early 2000s against a backdrop of growing national concerns about New Zealand’s economic outlook and calls for the country to “*move from an agricultural base to a knowledge-based economy*”. New Zealand at that time, however, had a limited capacity to support E&I; “*there were virtually no serial entrepreneurs, no angel investors and a moribund Venture Capital industry*”. With a new Vice-Chancellor in post, the university took a strategic decision to play an explicit role in building this national capacity, on the basis that strengthening the university’s performance and reputation on a world stage would only be possible when positioned within a vibrant, innovative and growing economy. In 2001, in partnership with the Prime Minister of New Zealand, the university hosted the *Knowledge Wave Conference*, which sought to “*spark a national debate*” and establish an agenda for a New Zealand economy underpinned by “*knowledge-based creativity and innovation*”. This conference was noted by many interviewees as a turning point in the formation of the country’s E&I strategy, and one that put the University of Auckland at its heart. It also precipitated a strategic decision by the university’s Business School to focus its activities on “*building a generation of business-savvy STEM graduates*” and support the growth of institutional and regional entrepreneurial capacity. Central to this cultural change has been the ‘Spark’ initiative, established in 2003 and singled out by many interviewees as “*the beating heart of entrepreneurship at the university*”. Harnessing the “*pure passion and raw enthusiasm*” of the student population, Spark brings together a phased programme of entrepreneurship events, courses and competitions, drawing on 140 members of the local entrepreneurial community to mentor, judge and support its activities. Many interviewees noted the critical role that Spark has played in triggering a major, on-going cultural change at the university; a change that has “*bubbled up from the students*”.

A critical factor underpinning the success of the university’s E&I approach is the complementary balance of the two features described above. On one hand, UniServices creates a robust platform from which to access international markets to commercialise university IP and source new avenues of corporate research funding. On the other hand, the university Business School inspires and supports entrepreneurial talent emerging from both within and outside the university. Its activities have also served to demonstrate to the national business community that the university “*had a genuine commitment to improving New Zealand Inc*” and was not solely driven by institutional benefit; a feature which has proven critical to the catalysation of an inclusive and supportive regional community.

The university’s approach, however, was also seen to bring inherent tensions. Two issues emerged in particular. The first challenge relates to conflict between UniServices’ mandate – “*to create revenue for the university*” – and the expectations of the unit by the local entrepreneurial community – to support “*New Zealand Inc and growing home-grown startups*”. With an increasingly international portfolio and a current ratio of licences to startups at 30:1, some in the regional community expressed frustration that UniServices “*is not really anchored into the [regional] ecosystem*”, which, in turn, “*is not likely to benefit from*” the university’s research outputs and commercialisation activities because “*the money all flies offshore*”. A number of interviewees noted, however, that such tensions were inevitable for an ecosystem

that was distant from markets and in its early stages of growth: *“as New Zealand’s competencies in the ecosystem increase, so the work that is done on shore [by UniServices] will rise”*. The second challenge identified by interviewees relates to the *“tension at the interface”* between the university’s corporate-funded and publicly-funded research activities, which are managed by UniServices and the university Research Office respectively. A number of interviewees observed that the division presented particular challenges in *“having visibility over the full [research] funding lifecycle and understanding the potential for innovation in the future”*, thus potentially constraining the university’s ability to identify and invest in emerging research fields.

The university has built a robust model for establishing and growing an effective E&I ecosystem within a challenging environment, and one that offers an exciting blueprint for others across the world. Its design responds directly to the constraints of the environment, establishing a platform for international corporate engagement in response to the distance of the country from its key markets and establishing inclusive community-based E&I activities in response to the weak national entrepreneurial capacity. What has been achieved is impressive. However, the university is not complacent. It recognises that the approach requires constant recalibration and careful management. The university’s success is therefore testament to the quality and conviction of its leadership. This leadership, together with the complementary dynamic of the commercially-focused activities of UniServices and community-focused activities of the Business School, have established the University of Auckland as an emerging international centre of excellence in entrepreneurship and innovation.

# CONCLUSIONS AND RECOMMENDATIONS

## 12. Overview of study outcomes

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### 12.1. Key features of the global landscape for university-based E&I

The benchmarking study pointed to a major global trend towards strengthening entrepreneurial capabilities in universities across the world. Over 200 universities, representing every continent of the world, were identified by experts as demonstrating established or emerging leadership in entrepreneurship.

There was a high degree of consensus about which institutions had created and supported **the world's most successful technology innovation ecosystems**. Three universities in particular – MIT and Stanford University in the US and the University of Cambridge in the UK – were consistently cited as world leaders. The E&I strategies and activities developed by these three universities appear to have been a source of inspiration to institutions across the world striving to enhance their entrepreneurial capacity. During the course of the study, impact data and programme information were collected for 20 of the world's most highly-regarded entrepreneurial institutions: almost all had adopted or adapted E&I activities from at least one of these three universities. However, despite this common source of inspiration, many universities seeking to develop their E&I profile appeared to be working in isolation from each other, each struggling to build capacity within their own distinctive environments.

The study also highlighted the **growing strength and impact of the student entrepreneurial movement**, with evidence from both phases of the study suggesting that it had been responsible for some of the most innovative and engaging elements of emerging highly-regarded entrepreneurial ecosystems. Rather than simply emulating successful E&I activities 'off-the-shelf' from elsewhere in the world, student-led entrepreneurship activities are increasingly building active partnerships with the regional entrepreneurial community and developing solutions that respond to the challenges and opportunities in the local environment. In contrast to the apparent lack of E&I-based collaborations and cross-institutional support at a university level (as noted above), the student entrepreneurship movement benefits from an increasingly international and connected student network, enabling participants to learn from the *"spectacular successes and spectacular failures of others"*. It was clear that the study was conducted at a time of considerable change, when student-led entrepreneurship is *"bursting out of university campuses all over the world"*. The growth of the student entrepreneurship movement is fuelled by a number of factors, including an appreciation that there is *"no longer a job for life"* for new generations of graduates, the increasing prominence of entrepreneurial role models and the potential for rapidly establishing startups through web-based applications.

Interview feedback also highlighted **concerns about E&I performance metrics**. There is a strongly-held expert view that standard measures work against the university entrepreneurship that they are designed to incentivise and capture. Interviewees from the first phase of the study regarded commonly-used research commercialisation metrics (number of spin-offs, number of patents, licensing revenue, etc.) as unreliable indicators of a university's long-term capacity to support a vibrant ecosystem. Instead, many experts favoured metrics that captured institutional and cultural drivers for ecosystem growth, for example, indicators that measured the university's investment in an E&I agenda, levels of participation with entrepreneurship activities across university populations, and the extent of interaction between the university and the entrepreneurial/business community. Indeed, many experts went further in their criticism of current metrics, arguing that their widespread application had distorted university strategy in E&I and diverted attention from critical drivers of growth such as connectivity with the regional, national and international E&I community.

## 12.2. Key features of the emerging E&I leaders

Evidence from the expert interviews (Phase 1) and the case study evaluations (Phase 2) pointed to features shared by the ELG, despite differences with respect to their geography, culture and institutional profile. A number of these shared success factors are outlined below.

**Well-connected champions:** In many cases, the transition towards an E&I focus was propelled by the drive and ambition of two champions within the university; one who inspired and established the vision for change, and one who drove the growth of E&I activities within the institution. The formal role of these individuals varied widely, from a student leader to a university President. However, they shared a common conviction of the importance of entrepreneurship for the university and the region, as well as a set of personal connections with industry and the regional entrepreneurial community that would prove critical to the university's emergence as an entrepreneurial centre, particularly during the 'startup' phase of the institution's E&I development.

In many cases, the individual initially inspiring the E&I transition held a relatively short tenure at the institution. It was the sustained commitment of the second individual – who worked to build and institutionalise the university's entrepreneurial infrastructure – that was typically critical to embedding the E&I strategy and driving a continued focus on realising these ambitions. Indeed, interviewees consistently described a period of up to ten years where the university's E&I activities were “*almost completely dependent on the networks*” of this second individual, where “*if he left [the university], it would be very difficult for the rest of us to pick up the pieces*”. Beyond this ten-year threshold, many interviewees noted that universities were able to “*institutionalise what we are doing*” by spreading the responsibilities across a broader team.

**Public endorsement by senior management:** A distinctive feature of the ELG was their prominence in regional and national strategies for economic growth. These strategies recognised the importance of university-supported ecosystems as springboards for economic recovery and/or development, with the university senior management publicly promoting the importance of university engagement with entrepreneurship. It was an emphatic and sustained message that was heard and understood by the university populations (staff and student) and by the wider entrepreneurial community.

**Regional, national or government support:** A number of the established E&I universities which were highlighted during Phase 1 of the study had benefitted from significant external support for ecosystem development in the form of generous government subsidies and advantageous regional policies. In some cases, experts observed that these interventions allowed universities to present a highly successful façade that could mask an ineffective or very limited E&I contribution by the institutions themselves.

What distinguished the external support offered to the ELG was often its responsive and flexible nature, as well as its sustained presence. This was seen to be critical to the success of many institutions in the ELG, where E&I activities were often described as “*maverick*” in their design and “*explosive*” in their growth, making standard sources of funding hard to access. Interviewees from a number of ELG institutions spoke of a relationship of mutual trust and understanding with funding bodies which, in turn, “*bent a lot of their own rules to fund what we were doing*” and made commitments to continuity of support. Such flexibility allowed financial support to be targeted when and where it was needed, without constraining the direction or growth of the system, a critical feature during the university's 'startup phase' of its E&I growth. To support this responsive and facilitative approach, the funding agencies were empowered to identify and prioritise high-potential ecosystems and universities in their funding allocations. In addition to resourcing E&I activities and functions, many institutions in the



ELG have also used such funding to establish highly beneficial international strategic partnerships with established world-leading E&I universities, experiences that have often helped “*to open their eyes to the possibilities of commercialisation*”.

**Relationships of trust with the regional E&I community:** Many amongst the ELG are faced with the dual challenge of both connecting with and unifying the local entrepreneurial community. In many cases, the pre-existing entrepreneurial community was small and highly fragmented, and previous interactions between the university and this group were often marked by distrust and suspicion. For many in the ELG, “*student energy in entrepreneurship*” was seen to play a critical role in brokering these relationships and energising the local entrepreneurial community, often acting as a conduit between this community and the university itself. Underpinning the interface role of student entrepreneurs is the perception that the student community is “*neutral ground*”, offering a clarity and simplicity of agenda that all parties can relate to. They provide a focal point through which the university and its local entrepreneurial community can come together to “*support the next generation of entrepreneurs*” without “*any suspicion that anyone is coming to this with an ulterior motive*”. As one interviewee observed, “*it stops being about money and starts being about creating something together*”.

**Mobilisation and drive of the student entrepreneurial movement:** At a number of the universities in the ELG, in addition to the community-building role with regional E&I practitioners (as described above), the student population is often responsible for creating and delivering many of the university’s most innovative extra-curricular entrepreneurial support activities and events. The university’s capacity to generate entrepreneurial success is maximised when this student body is informed, mobilised and empowered. Amongst the ELG, these features are often associated with four factors: (i) an existing entrepreneurial experience and networks amongst the student movement leadership, (ii) a direct line of communication between this group and a highly-supportive university senior management, (iii) dedicated low-level funding to support both on-going and new activities, and (iv) a strong sense of dissatisfaction with the *status quo* leading to a shared common purpose amongst the student body.

Interviewees at many institutions in the ELG noted, in particular, the vision, charisma and management quality of the initial leader/s of the university student entrepreneurship movement. These individuals were often seen to set a standard for the ambition and professionalism of E&I activities that was subsequently maintained by successive student leaders, and were repeatedly described as “*the type of students who come along once in a generation*”. In some cases, the drive and vision of the student entrepreneurial movement has played a critical role in triggering the university-wide prioritisation of E&I, as well as shaping its approach to entrepreneurship.

**Creating a market for university entrepreneurship:** Often with limited existing E&I strengths in their immediate environment, an important priority for many in the ELG was the establishment of a market for the university’s innovative output, at a local, regional and international level. As the case studies make clear, a variety of mechanisms were employed to achieve this goal, such as: (i) creating mutually-beneficial partnership agreements with alumni entrepreneurs, (ii) establishing a dedicated business-facing agency to secure and develop international industry partnerships, or (iii) offering open-access support for entrepreneurial development and startup creation regardless of university affiliation and nationality. Shaped by the regional environment and culture, the content of these strategies for creating new E&I opportunities and partnerships outside the university varied considerably and this adaptability appears to be integral to their success.

### 12.3. Models of E&I development amongst the ELGs

Taking evidence from Phases 1 and 2 of the study together, it is evident that universities with a growing E&I reputation tend to conform to one of two development models.

These models are strongly linked to the drivers and triggers for the university's original adoption of an E&I agenda and can be characterised as:

- **Model A: 'bottom-up' and community-led, catalysed by students, alumni and entrepreneurs in the regional economy, with a 'loose IP control'.** Often responding to economic and societal challenges, E&I development is triggered by a desire to stimulate regional/national economic growth, and thereby create graduate jobs, research opportunities and broader avenues for university support through the creation of a vibrant localised entrepreneurial ecosystem. Typically driven by the university grassroots, students and alumni, a dynamic and inclusive ecosystem is created through strong partnerships of trust between the regional entrepreneurial community and the university. The investment is focused on regional rather than institutional capacity; universities often downplay the importance of IP ownership and startup affiliation, regarding these as secondary to the overarching goal of developing the broader ecosystem. A rapidly growing set of innovative E&I activities often brings high levels of engagement with the entrepreneurial agenda. However, with many activities operating outside the university itself, the model can face difficulties when the university seeks to regulate and institutionalise its entrepreneurship profile. As this suggests, a university can also struggle to manage the organic growth of the E&I capacity and to measure its contribution to the university's standing and impact.
- **Model B: 'top-down' and university-led, working through established university structures, with a 'tight IP control'.** This model is typically triggered by the desire to realise income from university research, with the E&I agenda driven by and focused on a strong and ambitious technology transfer office (TTO) (or equivalent). Often building on established university research strengths, this model offers a robust and fully institutionalised approach. However, its primary focus on university-owned IP often leaves the student and alumni communities marginalised, and relationships with international strategic R&D partners can be prioritised over those with the regional entrepreneurial community. In the years that follow the establishment of such an E&I model, many universities appear to subsequently establish student-led entrepreneurship activities outside and separate from the university's TTO (or equivalent), which actively connect with the regional community. These are seen as a counterweight, a secondary mechanism that will nurture a broader E&I culture within and outside the university.

It should be noted that the study focused specifically on the group of emerging leaders in university E&I that were identified by the Phase 1 experts to have played an active positive role in the establishment and growth of the regional entrepreneurial ecosystem. It could be argued, therefore that a third development model is also likely to exist for universities whose E&I transformation was seen to be driven by existing national/regional entrepreneurial strength or strategic government investment. Such cases, however, were not the target of this study.

Many in the ELG appeared to show a clear alignment with one of the two models (Model A or Model B), a factor that strongly influenced the resulting E&I priorities and implementation process as well as barriers faced by the university. Key features of the two models are outlined in Table 1. For each, the table summarises (i) the triggers for the university's original E&I engagement, (ii) the function or group which drove the initial E&I transformation, (iii) the key distinguishing features of the early university-based ecosystem, (iv) the E&I performance metrics prioritised within the university, and (v) the key challenges associated with the ecosystem model.

	Model A	Model B
Initially triggered by...	Regional/national economic constraints, leading to a desire to position the university at the centre of a programme of regional capacity development, job creation and, ultimately, economic growth.	A desire to “realise income from university research” and increase university revenues.
Initial E&I drive often led by...	A grassroots movement, often driven by students and alumni in partnership with the regional entrepreneurial community.	A strong and successful technology transfer office (TTO) (or equivalent) typically with a clear preference for licences over startups.
Strategic priorities	The development of the regional entrepreneurial ecosystem, typically focused on technology-based startups, regardless of university affiliation or IP ownership.	To create national and international impact and revenue from the institution’s translational research output. Tight control is exerted over university-owned IP, with a primary focus on inventive research output.
Key features of the emerging ecosystem	Entrepreneurial activities are highly integrated into the regional entrepreneurship community, often acting as a catalyst to bring this community together. The entrepreneurial activities often take root at speed and appear to be associated with significant levels of engagement, trust and collegiality both outside and within the university. A diverse range of E&I activities is developed, often both innovative and led by students or the E&I community, ranging from low-entry networking opportunities, to E&I development courses/experiences, to one-to-one startup support. This model appears to be more strongly associated with external, often government-linked, funding to support E&I activities.	The university often has established research strengths and growing capabilities in multi-disciplinary applied research with an explicit emphasis on societal and industry benefit. With national research funding increasingly linked to ‘impact’, such translational research activities are the focus of increasing attention. Almost all E&I activity is associated with the TTO (or equivalent) and the approach developed offers a stable and robust set of E&I processes which provides a strong platform for the university to access international markets. These processes are well-understood and disseminated within the university and are not dependent on the priorities of individual university leaders or “the ups and downs of university life”.
E&I performance metrics employed	Anticipated long-term success metrics include regional employment opportunities, graduate E&I skill base and employability, growth in regional startups and (ultimately) regional economic growth. The universities, however, find short-term success metrics more difficult to identify or measure.	Institutional E&I success metrics are typically focused on licensing revenue and industry-funded research. TTOs will also closely monitor numbers of invention disclosures, patents, startups and licences.
Challenges associated with the ecosystem model	Challenges focus on the extent to which the E&I activities are embedded into the institutional fabric rather than being dependent on the drive and networks of a few charismatic individuals. In consequence, many such universities have invested time and resources in establishing parallel E&I activities within the university itself, to complement the student- or community-led activities. The organic nature of the growth of this E&I model also makes its progress difficult to predict or manage.	The university, believing E&I to be an established strength of the institution, often does not see the need to develop additional entrepreneurial capabilities outside those supported by the TTO (or equivalent). As a result, the university’s E&I policies become “synonymous” with those of the TTO, leading to a culture where “only university-protected IP is seen as worthwhile”. Such a model risks marginalising student- and alumni-driven entrepreneurship, and integration with the regional entrepreneurial community is often very limited.

**Table 1. Overview of the two development models associated with the initial establishment of an E&I agenda amongst the ELG.**

Despite these differences in approach – one driven from the ‘bottom-up’ and one taking a ‘top-down’ strategy – both models share a common barrier to long-term success, namely the very limited levels of engagement with entrepreneurship by academic departments. Indeed, both models require limited faculty engagement for their growth and operation; almost all E&I activities are offered by student/community groups (Model A) or university support functions (Model B). As such, they operate in parallel with, rather than being integrated into, the core university functions. In consequence, many institutions in the ELG identified faculty culture as the major barrier to their further growth as entrepreneurial centres.

How a cultural change might be achieved, and, indeed, whether it is appropriate to “*distract*” faculty from their “*core duties of teaching and research*” is the subject of major debate within these institutions. As of early 2014, most institutions had taken few explicit steps to foster a stronger E&I culture within departments. So, for example, a university’s entrepreneurial ambitions and profile are rarely reflected in the curriculum; in large part, the educational content and delivery remains fairly traditional. Similarly, there is little explicit encouragement to consider and harness commercialisation opportunities in the early stages of research; commercialisation is almost always seen as a beneficial by-product for a very small proportion of research rather than a mainstream driver for it. In addition, despite explicit senior management endorsement and often a high visibility of E&I on campus, university promotions procedures and budgeting priorities typically remain unchanged. Indeed, amongst many institutions in the ELG, there has been a keen appreciation of the challenges of moving E&I from the margins – the TTO or E&I support functions – to the centre of the university – the research and teaching functions.

Such issues have been the subject of considerable debate and “*soul searching*” by senior university management amongst the ELG universities; particular thought has been given to the question of whether entrepreneurship should be written into the university’s mission. In this context, many university senior managers acknowledged the potential conflict between research excellence, as measured by international university rankings, and entrepreneurial ambitions. Such discussions are on-going in many of the universities considered in this study.

## 13. Concluding comments and recommendations

### 13.1. Conclusions

This study has turned a spotlight on some of the world’s most highly-regarded university-based entrepreneurial ecosystems. Its aim has been to highlight key strategies and features associated with well-regarded university E&I transformations within more challenging environments, as well as the barriers and challenges faced by the ELG, in order to provide inspiration and support to other universities wishing to make similar changes.

The study has pointed to a number of factors that support the development of university E&I capabilities and ecosystem growth. These components centre around five groups or functions that play a critical role in nurturing and growing this capacity: university senior management, university departments, university-led E&I functions, student-led entrepreneurship activities and the external E&I community. Structured within these five groups, Figure 12 illustrates the distinguishing building blocks of an effective university E&I approach, as implied by the study findings.

Evidence from the ELG suggests that synergies between the features highlighted in Figure 12 provide the foundations for the establishment of institutional entrepreneurial cultures and capabilities. The combination and emphasis of each of these features varies between the two models of university

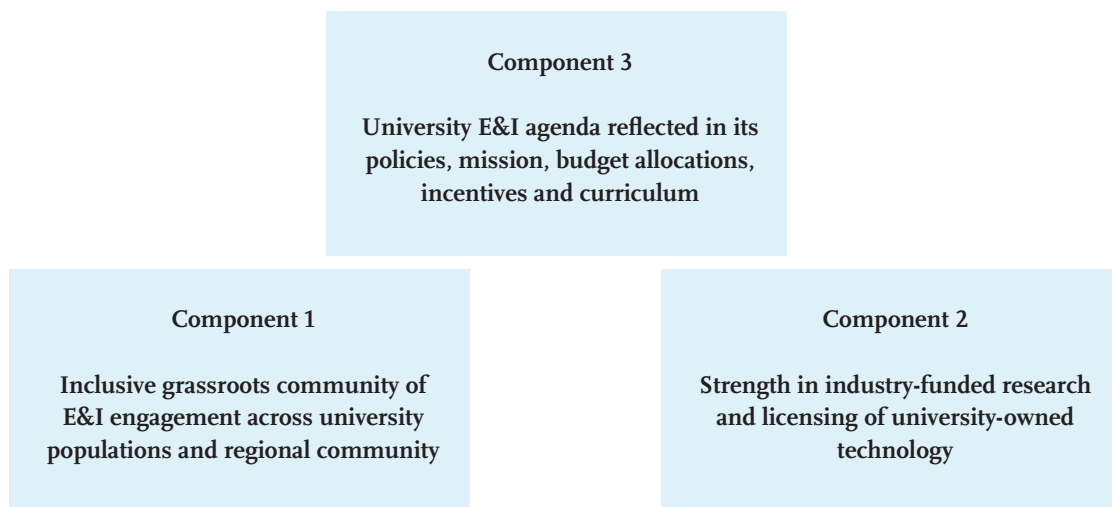
1. <b>University senior management:</b> Strong university leadership and governance, actively promoting a clear and prominent E&I agenda that is responsive to the regional and national entrepreneurial environment.
2. <b>University departments:</b> An academic culture that acknowledges, supports and rewards E&I enquiry within a cross-disciplinary context, helping to nurture influential disciplinary-based role models, curricular and co-curricular activities, and champions for institutional change.
3. <b>University-led E&amp;I activity:</b> Distributed responsibility for E&I delivery across multiple university agencies, with a range of support services and participation routes for both students and staff throughout each stage of their personal entrepreneurial growth.
4. <b>Student-led E&amp;I activity:</b> An empowered, cohesive, inventive, bold and well-connected student-led entrepreneurial community, benefitting from sustained low-level funding, seasoned entrepreneurial mentors and direct connections to university senior management.
5. <b>External E&amp;I community:</b> Robust relationships built on trust and mutual benefit between the university and the regional/national E&I community, with a platform for these individuals to play a visible and influential role in university life.

**Figure 12. Distinguishing building blocks of university E&I strength.**

entrepreneurial growth amongst the ELG – ‘top-down’ and ‘bottom-up’. The challenges faced by the two models, however, are shared; they both struggle with two common barriers to change. The two challenges – (i) a disconnect between grassroots, community-driven E&I and formal university channels for research commercialisation, and (ii) the integration of E&I into the university’s mission, policies and incentive systems – are outlined below.

If not addressed, these two challenges have the potential to constrain the growth and institutionalisation of E&I within this group of universities. However, universities can exert considerable traction on both challenges; they are able to make significant progress at the institutional level in each domain without wider changes in the national or regional environment for higher education or E&I. The **first challenge** relates to the disconnect between the two key mechanisms that appear to be driving entrepreneurial growth:

- the grass-roots community-led effort to build E&I engagement and strengthen the regional entrepreneurial skills base, labelled Component 1 in Figure 13;
- the university-led effort to drive corporate engagement and commercialise university-owned innovations, labelled Component 2 in Figure 13.



**Figure 13. Three critical components in the establishment of an entrepreneurial university.**

Evidence from the study suggests that universities in the ELG tend to establish their E&I focus through one of these routes, leaving it imbalanced during its early development. In addition, where, and if, the second domain is added, there is often a considerable tension at their interface and the two domains often operate in relative independence from one another.

For example, a faculty member interested in the commercial potential of their field of research is rarely encouraged to interact informally with relevant experts from the regional ecosystem. Similarly, participants in grassroots E&I activities are rarely given the opportunity to learn from university research commercialisation or benefit from the national and international networks accessed through the TTO office. In other words, the division between university-owned IP and non-university IP casts a long shadow. This division is further reinforced by E&I performance metrics currently employed by most universities that focus predominantly on the exploitation of university-owned IP.

The benchmarking study indicates that an entrepreneurial university is one that supports and integrates both these domains, with the performance of an effective and vibrant ecosystem being greater than the sum of these parts. At an institutional level, integrating these two domains comes down to strong leadership and governance structures that facilitate E&I. Beyond the university, there is an important role to be played by governments at national and international level in actively promoting the economic contribution of universities and in supporting the development and application of appropriate metrics that reflect both domains of an entrepreneurial university.

The **second challenge** is perhaps more deep-rooted and relates to the issue of embedding E&I into the vision and mission of a university, indicated as Component 3 in Figure 13. While not inherently in conflict, entrepreneurship at many universities in the ELG has yet to be aligned with the core university functions of teaching and research. Despite vocal commitment to the E&I agenda by university leadership and a suite of high-profile and engaging entrepreneurship activities offered by various support functions, interviewees frequently reported that “*entrepreneurship is virtually invisible*” in university departments. Instead, “*the [university’s] entrepreneurial outlook has not seeped into the academics’ priorities or had an effect on the curriculum*”. For many, “*the incentives built into the university*” were the root causes of the problem, which, in almost every case, remained “*the same as any research university*”, and had not been adapted to reflect the university’s transition to an entrepreneurial institution.

Although it will clearly take many years for an entrepreneurial culture to take root in academic departments, interviewees consistently identified the incentive structures around which departments were organised as “*stagnating*” the university’s entrepreneurial growth. In the globalised market in which universities operate, research income and research rankings are the metrics that count, goals seen by some to “*directly conflict*” with an entrepreneurial agenda. Indeed, senior managers at many of the ELG universities spoke of how pressures to improve the university’s research performance had grown in parallel with the university’s developing entrepreneurial ambitions – and the tensions between the two were “*considerable*”. In consequence, most have not “*taken the risk*” of implementing formal mechanisms to incentivise and celebrate entrepreneurship within the university, such as changes to promotions procedures, budgetary allocations or curriculum design, for fear of compromising their research performance and “*slipping down the league tables*”. Some interviewees suggested that many of the established leading entrepreneurial universities, such as Stanford University or MIT, had put the foundations in place at a time when the risk and opportunity costs of investing in ecosystem growth and university-led E&I activity were seen to be significantly lower than they are today. Even amongst these institutions, however, many interviewees reported that the diffusion of an entrepreneurial faculty culture, beyond well-recognised champions, remained “*a significant challenge*”.

As this suggests, if university-based entrepreneurial growth is a priority, university performance metrics need to be revised to reflect this. Identifying appropriate institutional E&I metrics is clearly challenging; they need to both catalogue E&I activity and incentivise activities that will generate a future return on investment (ROI) for the institution, both with respect to income and reputation (e.g. via the international rankings). Widely accepted measures of university E&I (research-related invention disclosures, patents, number of spin-offs, licensing revenue etc.) are relatively easy to capture. However, as this benchmarking study has highlighted, such established metrics only reflect one dimension of institutional E&I capacity – typically the immediate output from its TTO and corporate research functions (represented by Component 2 in Figure 13). Metrics that capture the university's institutionalisation of and commitment to E&I (Component 3) as well as its E&I culture, connectivity and influence on the regional and national entrepreneurial community (Component 1) are rarely considered. However, the benchmarking study suggests that it is these wider infrastructural features that are driving E&I capacity in the ELG and are likely to be vital to a university's long-term capacity to create and support E&I. As the experts consulted in Phase 1 made clear, additional metrics are required to shift the characterisation of a 'successful entrepreneurial university' away from those who have "got lucky" with one or two successful research commercialisation "blockbusters", and towards those institutions with an E&I commitment, culture and capacity that will enable sustained regional and national entrepreneurial growth.

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### 13.2. Entrepreneurial university checklist

Taken together, the study findings summarised in Section 13.1 – the distinguishing building blocks for success amongst the ELG (Figure 12) and the on-going challenges often faced by these institutions – provide a checklist for institutions wishing to develop their entrepreneurial capabilities. Figure 14 presents this checklist. It does not represent an exhaustive list of the components of an effective entrepreneurial university, a task beyond the remit and resources of this benchmarking study.<sup>11</sup> Instead, the checklist highlights features that mark out potential E&I leaders of the future from their contemporaries and, additionally, can be directly influenced by an institution.<sup>12</sup> The emphasis of each factor within the five mutually-supportive components in Figure 14 will vary between institutions, but all are associated with the ELG universities, blending the success factors and challenges faced by this group.

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<sup>11</sup> For a broader, system wide assessment, see, for example, see the OCED *Guiding Framework for Entrepreneurial Universities*, available at <http://www.oecd.org/site/cfecpr/guiding-framework.htm>

<sup>12</sup> It should be noted that the checklist does not provide a template for priorities and strategies associated with effective TTOs. As the case studies make clear, such strategies vary by institutional and regional context as well as the university drivers for its E&I transformation.

<p><b>1. Leadership and institutional governance</b></p> <p>Clear, well-articulated and unified university E&amp;I strategy, which brings together priorities, activities and outputs related to both university-owned IP and non university-owned IP</p> <p>Visibility of E&amp;I in the university mission statement, with the vision vocally and publicly endorsed by senior university management and governing body of the institution</p> <p>Clear performance metrics for university E&amp;I that incorporate institutional E&amp;I culture, connectivity and engagement as well as commercialisation and industry-funded research output</p> <p>An approach that is responsive to changing institutional conditions and opportunities for E&amp;I, based on a knowledge of the external E&amp;I environment, on-going university E&amp;I impact assessments and an awareness of international research and progress in the field</p> <p>Provision of flexible, responsive and on-going funding streams to support E&amp;I activities, resourced from internal budgets and/or brokered from agencies external to the university</p>
<p><b>2. Academic cultures and careers</b></p> <p>Visibility of E&amp;I in departmental and faculty activities, workload models, role allocations and performance targets</p> <p>Recognition of E&amp;I impact, experience and connectivity in the recruitment and promotion of faculty, researchers and teachers; a fact publicly promoted and endorsed by senior academic staff</p> <p>Visibility of faculty role models and champions in E&amp;I, celebrating both their successes and failures</p> <p>Mechanisms to promote research collaboration, enquiry driven by end-user need and multi-disciplinary E&amp;I across and beyond the university</p>
<p><b>3. University-led E&amp;I activity</b></p> <p>Distributed responsibility for delivery of the university E&amp;I agenda, across several autonomous agencies, led by individuals with networks and experience within the E&amp;I community</p> <p>Range of university-led E&amp;I activities, which can be accessed by staff and students via multiple routes, supporting each stage of an individual's entrepreneurial development, from early awareness-raising to accessing financing for commercialisation</p> <p>Inclusion of E&amp;I in the curriculum, exposing students to entrepreneurial ideas, projects, role models and opportunities from within their field of study</p> <p>Formal E&amp;I training for university faculty and researchers as part of their continuing professional development</p> <p>Dedicated mentorship for student and staff startups, with particular focus on skill-building and the creation of well-balanced startup teams with insight into market need and access</p>
<p><b>4. Student-led and grassroots E&amp;I activity</b></p> <p>Empowered, cohesive and bold student-led entrepreneurship activity that is:</p> <ul style="list-style-type: none"> <li>• well-connected to and working in partnership with the regional E&amp;I community, acting as a conduit between this community and the university, where necessary</li> <li>• informed and well-connected to the national/international student entrepreneurship community</li> <li>• autonomous in its direction and focus</li> <li>• supported by a highly-supportive point of contact within university senior management</li> <li>• led by students with personal experience of and networks in entrepreneurship</li> <li>• fresh and innovative in its thinking, supporting renewal and responsive to changing regional conditions, institutional environment and student needs</li> </ul>
<p><b>5. Connectivity with and support for the regional, national and international E&amp;I community</b></p> <p>Partnerships based on trust and mutual benefit with government, industry, alumni entrepreneurs and the regional/national E&amp;I community, with a common understanding of the university's regional E&amp;I role</p> <p>Connectivity with the international academic E&amp;I community, with strategic alliances, where appropriate, with established internationally-leading E&amp;I universities</p> <p>Range of mechanisms for members of the regional/national E&amp;I community to support university-based E&amp;I talent and ideas, allowing these individuals to play a visible and influential role in university life</p> <p>Range of mechanisms – both within and beyond disciplinary departments – by which students, staff and alumni can access, network and collaborate with the regional, national and international E&amp;I community</p>

**Figure 14. Checklist of the distinctive features of an effective entrepreneurial university that can be directly influenced by the institution, as identified during the benchmarking study.**





# APPENDICES

## APPENDIX A

### AALTO UNIVERSITY CASE STUDY

## A.1 Ecosystem context

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### A.1.1 The university: key features

Aalto University was established in 2010 following the merger of the Helsinki University of Technology (TKK), the Helsinki School of Economics (HSE) and the University of Art and Design Helsinki (TaiK). The university officially opened its doors on 1st January 2010 and is now home to around 18000 undergraduate students, 1400 graduate students and 350 academic faculty. The proportion of non-Finnish faculty currently stands at 16% and is slowly increasing. Although the proportion of overseas students at the undergraduate level is relatively low (3%), overseas numbers have increased significantly in the masters and doctoral student populations in recent years, to 21% and 18% of these cohorts respectively. In 2012, Aalto University attracted a sponsored research budget of US\$151m of which US\$28m was sourced from industry. The university is currently operating on three separate campuses, which represent the original locations of the merged institutions. From 2013, the university buildings will gradually be relocated to the Otaniemi campus, the original home of the largest of the three Universities, TKK, as well as an existing area of major R&D activity.

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### A.1.2 The regional context

Aalto University is located in Espoo, Finland's second largest city and home to half a million inhabitants. Established 40 years ago, the city has seen a four-fold increase in its population. Around one half of the R&D activities in Finland are undertaken in the 4km<sup>2</sup> Otaniemi region of Espoo. In addition to Aalto University, Otaniemi is home to more than 25 other research centres and higher education institutions, including VTT Research, Mikes Metrology, CSC Supercomputing Center, Laurea University of Applied Science, HIIT Helsinki Institute of Information Technology and the EIT ICT Lab. This concentration of R&D activity is built on decades of investment by the Finnish government in the national innovation infrastructure; as one interviewee put it, the Aalto University ecosystem has "*inherited great traditions from other established ecosystems in Finland*" such as Technopolis in Oulu, Northern Finland. Otaniemi is an ecosystem that attracts and is supported by a young and educated population: its community of 32000 is divided roughly equally between technology professionals and students. As such, Otaniemi's population is young, with 58% of residents aged 15-24.

Otaniemi is reported to be "*Northern Europe's largest high-tech hub, as measured by the number of companies and R&D centres located within its vicinity*", where around 40-70 new startups are established each year.<sup>13</sup> A high proportion of these startups – around 70% – are in ICT, primarily business-to-business software, consumer internet services, mobile health technologies and gaming. An incubator was established in Otaniemi in 1986, operating first as a traditional incubator and then becoming a 'virtual incubator' in 2006.<sup>14</sup> In the wake of redundancies at Nokia, the multinational company launched the Bridge Program in 2011 to fund new startup business ideas from former employees; 400 have been funded to date. A considerable number of these new ventures are located in the Otaniemi area.

Looking at the national landscape, Finland is a small country with a population of 5.6 million. The national population is highly educated, with 42% of Finns aged 20-29 year-olds being students,<sup>15</sup> the

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<sup>13</sup> Otaniemi.fi, [www.otaniemi.fi](http://www.otaniemi.fi)

<sup>14</sup> Spinno, [www.spinno.fi](http://www.spinno.fi)

<sup>15</sup> OECD (2012). *Education at a Glance 2012: Highlights*. OECD Publishing, [http://dx.doi.org/10.1787/eag\\_highlights-2012-en](http://dx.doi.org/10.1787/eag_highlights-2012-en)

highest proportion in the OECD. Finnish students are also more likely than their OECD counterparts to study engineering, manufacturing and construction, with 25% of new entrants to tertiary education selecting these fields. The student population in Finland is relatively old, with the average student entering higher education at 21.6 years of age and studying for an average of 6.3 years.<sup>16</sup> Less than 0.5% of Finnish students are from outside of the country.

The country as a whole is distinguished by its highly-skilled workforce and commitment to R&D; government investment in R&D is close to 4% of GDP and the proportion of researchers in the labour force is the highest in the OECD. Much of the R&D activity is concentrated within a small number of multinational companies; Nokia alone accounts for a half of the country's R&D activity. Indeed the recent Global Competitiveness Report<sup>17</sup> ranked Finland as the leading economy for the “*availability of scientists and engineers*”. The same report also ranks Finland amongst the top five countries in the world for “*university-industry collaboration in R&D*”, reflecting its long tradition of industry-informed research within higher education. Technology-based high-growth entrepreneurship has been at the heart of Finnish government strategy since the economic recession of the early 1990s. A key funding mechanism for this strategy has been the Finnish Funding Agency for Technology and Innovation<sup>18</sup> (Tekes), which invests around €600m per annum across a wide range of innovation and R&D activities.

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### A.1.3 Barriers to the development of an entrepreneurial ecosystem

Finland has well-recognised strengths in technology-driven R&D as well as long-term government investment in the innovation infrastructure, as discussed in Section A.1.2. Nonetheless, as the case study interviewees acknowledged, the national entrepreneurial output has remained relatively poor. The interviewees identified a range of barriers to the development of an entrepreneurial ecosystem in Finland generally, and around Aalto University specifically. These can be grouped under four broad headings, as outlined below.

- **A national culture not supportive of risk-taking and entrepreneurship:** While noting the university's propitious location in the R&D-rich hinterland of Otaniemi, many interviewees viewed the broader national culture as a barrier to innovation and enterprise. Finland was described as “*a systems-driven country*”, where, “*we excel in creating big companies like Nokia... the culture is geared to producing graduates to work in these disproportionately large companies*”. National attitudes to entrepreneurship prior to 2008 were seen as hostile; as one regional investor observed, “*entrepreneurs were associated with criminals – you must be doing something illegal. If you were unsuccessful, then you were definitely a crook. If you became bankrupt, then you were done*”.
- **Very limited E&I traditions within the three universities which formed Aalto:** As with many universities in Finland, the three merging institutions had “*almost no tradition in entrepreneurialism*”. The “*close ties between big companies – like Nokia and Siemens – and university departments*” meant that the university curricula were “*super concentrated on how to work for big companies*” and students, “*all just wanted to work in the public sector or big business*”. The one exception was the relatively small Department of Industrial Engineering and Strategy at TKK,

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<sup>16</sup> Orr, Dominic, and Klaus Schnitzer. *Social and Economic Conditions of Student Life in Europe: Synopsis of Indicators; Final Report. Eurostudent III 2005-2008; a Joint International Project Co-ordinated by the Higher Education Information System (HIS), Germany.* W. Bertelsmann Verlag, 2008.

<sup>17</sup> Schwab, K. (2012). *The Global Competitiveness Report 2012-2013.* World Economic Forum. Retrieved from <http://reports.weforum.org/global-competitiveness-report-2012-2013/#>

<sup>18</sup> Finnish Funding Agency for Technology and Innovation, <http://www.tekes.fi/en/community/Home/351/Home/473/>

a department seen as an “outlier” which, for some, only served to highlight how little the new university had by way of “hands-on, technology-driven entrepreneurship”.

- **A limited focus on the market for and application of technology:** Many interviewees described how “Finland is full of people with fantastic technology knowledge, but we are no good at developing technology for people”. Many told stories about previous generations of Finnish entrepreneurs who travelled to Silicon Valley and “waved their clever technology at the investors with no idea about how it would really be used and were astonished that nobody wanted it. We are just not trained to think about the market, and nobody does”. As one interviewee commented, “Nokia developed, technologically, the most advanced phone in the world, but no one could use them. We had good engineers but no business skills”.
- **A lack of talent, fresh ideas and venture capital:** A very small proportion of Finland’s science and technology workforce, around 1.5%, are non-national. In a country of less than six million, this means that Finland struggles to achieve “the critical mass of new ideas and new people to get the investors interested”. In addition, outside key sectors such as ICT, there was seen to be “no venue where all serial entrepreneurs could come together”, to build and strengthen the regional community and attract venture capital. Startups therefore found themselves starved of funds, particularly early stage venture capital. It is perhaps not surprising that venture capital investment in Finland is 18% below the OECD average. As one entrepreneur commented, “Startups in Finland had two big collapses, in 1991 and in 2011. After that, there were almost no VCs left in the country and very little basis for securing funds... The amount of money is much lower [than in other international entrepreneurial hubs] and this is a major weakness”.

In summary, while the new university benefited from the existing concentration of R&D capacity in Otaniemi and the established departmental links with major Finnish companies, it faced formidable cultural and structural barriers in developing a vibrant ecosystem. The next Section describes how, despite these barriers, an entrepreneurial ecosystem at Aalto has emerged.

## A.2 Historical development of E&I at the university

### A.2.1 Foundations of the Aalto University ecosystem

As noted above, the area that now represents the immediate Aalto University ecosystem was one that had benefited from many decades of R&D investment and a regional commitment to nurturing a startup culture. However, over the last five years, the ecosystem has been supported directly by a serendipitous combination of factors. The government-led creation of a new national university with a mission to foster world-class E&I coincided with the emergence of an entrepreneurial student-led movement. Both factors appear to be critical to the early development of the ecosystem and are considered in turn.

During the early 2000s, those leading Finland’s universities had become increasingly vocal in their calls for greater autonomy, to move away from a model where “university budgets were just state budgets and university presidents were just civil servants”. At the same time, Finnish industrialists were expressing concern that the national higher education system and, in consequence, the country’s graduates, were not globally competitive. As a result, the government instituted wide-ranging changes in the Finnish university system, including combining the country’s 20 specialist universities into 14 larger institutions.

The merger of the three universities that became Aalto University was one of the major outcomes of this process. Designed to be the flagship national university, it embodied important elements

of a new approach to Finnish higher education. It was explicitly to be “*the innovation university*” with its combination of engineering, business and design seen as “*the perfect recipe for technology commercialisation*”. The government agreed to back industrial support for the new university, guaranteeing industrial sponsors that, “*for every Euro you commit, we will back it with €2.5*”. The €200m target for industry funding was raised shortly before the financial crisis in 2008; a target matched by a further €500m from the government. The total investment of €700m plus the real estate made available for the university site was acknowledged to be, “*a massive investment for a country of this size*”. The board of the new university was also to be exclusively external.

Expectations for the new institution were high amongst staff, students and the wider community – “*Everyone was waiting to see what would happen. Would it really be a place for entrepreneurship?*”. The challenges facing Nokia added to these expectations: “*There was a growing public debate about whether the country should be so dependent on the success of one company...but people said, if we can't work at Nokia, where are we going to work? Who will start the other companies that will continue?*”.

The interviewees were clear that it was students who were the first to realise the potential of the ‘innovation university’. There was agreement too that the student community adopted a distinctive model of grassroots entrepreneurship, a model explicitly designed as a protest against what was perceived to be the three universities’ overriding focus on “*catering to big business*”. As one interviewee observed, “*the customers of the university were the first people to ‘get it’. The change was very dramatic in a short period of time*”. This dramatic change was facilitated by the appointment of the new President of Aalto University in April 2009, nine months before the university was officially launched. She noted that, “*almost my first day at work as President, the students presented their ideas to me*” about developing student-led entrepreneurship at the new university. In the months that followed, the leaders of the emerging student group spent time with the new President discussing their vision and lobbying for support. An understanding of mutual respect and trust was built between students and the university’s senior managers, which helped to align the university’s innovation identity with regional high-growth technology-based startups rather than, “*ideas of innovation that take place within big companies*”. While seen as integral to the success of the Aalto ecosystem, interviewees acknowledged that such access to senior management would be unlikely in an established institution, particularly for a student group whose membership was still relatively small.

The creation of a new university played a practical role, too, in supporting student entrepreneurship. The Otaniemi campus site, which previously housed the Helsinki University of Technology, was to be expanded to accommodate the two additional universities. During the period of transition, there had been significant “*spare capacity*” on the campus which allowed “*new ideas and groups to set themselves up very quickly without much negotiation*”. In one example, the student group took up residence, without formal approval, in an old campus warehouse, which later became home to two key student-led activities: the Aalto Entrepreneurship Society (AaltoES)<sup>19</sup> and Startup Sauna.<sup>20</sup> By acquiring this space, the group, “*suddenly demonstrated their presence in square metres on campus*”. It also allowed them to capitalise very quickly on the momentum of the growing entrepreneurship movement and create a space to host and welcome this community.

As reflected in their “*occupation*” of university buildings, the emerging student movement was overtly counterculture, with a guiding philosophy to “*ask for forgiveness rather than seek permission*”. Its formation was seeded when a small group of Masters students from the Helsinki School of Economics

<sup>19</sup> AaltoES, <http://aaltoes.com>

<sup>20</sup> Startup Sauna, <http://startupsauna.com>

(which later became the School of Economics within Aalto) visited the United States to study the student entrepreneurship societies. The experience left them deeply frustrated with the lack of entrepreneurial activity at their home university and the perceived prevailing culture that “universities were just a production line to cater for the big companies”. As one of the founding members commented, “We were angry. We wanted something different, something co-international, something technology-driven and something really ambitious. We were like a startup”. This rebellious determination to create something new was recognised by the university senior management at an early stage: “We happened to have active students who feared nothing – they were interested in doing rather than talking, talking, talking”. Drawing on their experiences in the US, the early student leaders also recognised that, while representing a significant concentration of E&I capacity for Finland, the entrepreneurial capacity of the Aalto region was insufficient to create a startup community that would attract international investment. From its foundations, therefore, the student-led movement developed a strategy which looked well beyond the university, seeking to establish Finland as, “the startup hub of Europe and Russia by 2017”. Within a month of their return, in December 2008, AaltoES hosted its first startup event in which 200 students, entrepreneurs and investors participated.

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## A.2.2 Time-line for the ecosystem development (October 2008 to date)

Following the formation of the roots of the entrepreneurial ecosystem (see Section A.2.1), there have been four key stages in its growth to date, as outlined below. The evolution of the central components of the university’s E&I system is illustrated in Figure 15, beginning in late 2008, when the momentum for change began, and running to the time of writing (July 2013).

- 1. Identity development of the grassroots student entrepreneurship movement (Oct 2008-Oct 2009):** AaltoES was formed in late 2009, with support from the recently-established Aalto Design Factory. Within weeks, the student society held its first public event and was engaging with the local startup community and the senior management of the new university. In early 2009, AaltoES started to look more closely at its goals and approach. They sought advice from regional serial entrepreneurs and identified three key barriers to the establishment of startups within the Helsinki region; the low engagement with entrepreneurship in the Finnish culture, the lack of startup “know-how” and the lack of international ambition for startup businesses. AaltoES developed a strategy which looked well beyond the university, focusing on high-growth entrepreneurship across Russia and Northern Europe. In March 2009, AaltoES secured the Aalto University President as an advisor to their activities. At this point, AaltoES was operating on a relatively small budget of €35k per year, provided by the university.
- 2. The rapid growth of student-led entrepreneurship activities (Oct 2009-Dec 2010):** Following visits and meetings with AaltoES from late 2009, the Stanford Technology Ventures Program<sup>21</sup> (STVP) signed a partnership agreement with Aalto University in late 2010, to support the development of their entrepreneurial capacity. These discussions also catalysed the formation of the Aalto Centre for Entrepreneurship (ACE),<sup>22</sup> in May 2010. From this point, the student society significantly expanded the scope and scale of its activities. In 2010 alone, these included the establishment of an accelerator programme and a startup internship, together with over 50 events, such as the *International Day for Failure*<sup>23</sup> on 13th October 2010, to embrace and learn from failure as an important part of the entrepreneurial process. By mid-2010 AaltoES had received €500k in funding and had a membership of 5000.

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<sup>21</sup> Stanford Technology Ventures Program, <http://stvp.stanford.edu>

<sup>22</sup> Stanford Technology Ventures Program, <http://stvp.stanford.edu>

<sup>23</sup> International Day for Failure, <http://dayforfailure.com>

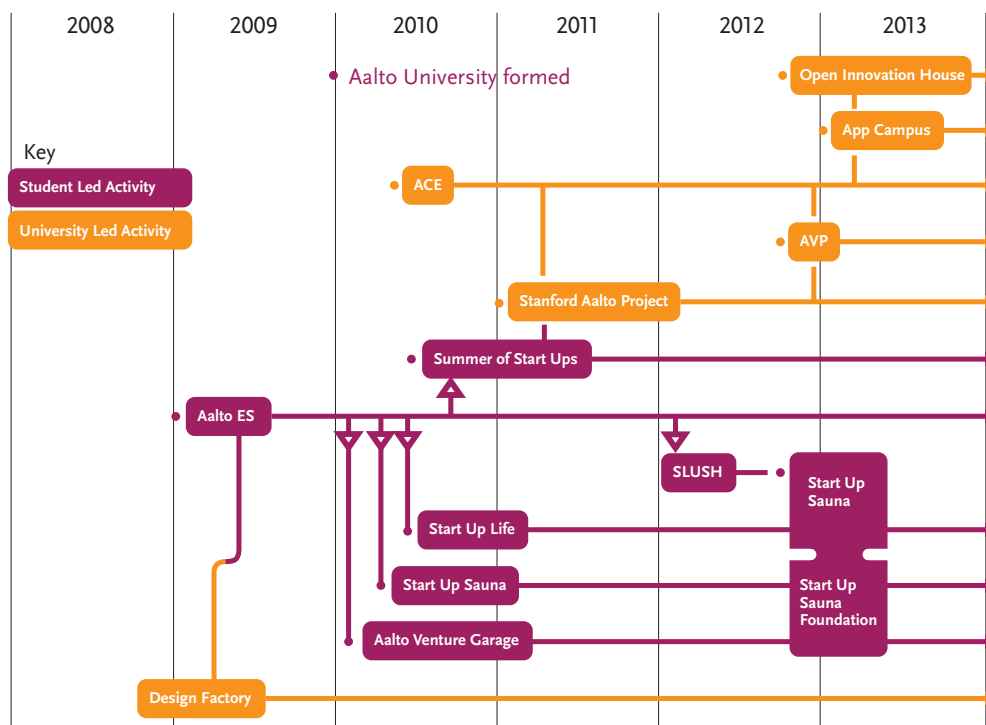


Figure 15. Timeline for the development of the university E&I components, 2008–2013, showing student-led activities in purple and university-led activities in orange.

3. **Growing external profile and engagement with student-led activities (Jan 2011-present):** By early 2011, the student-led activities were attracting increasing external and media attention. For example in February 2011, AaltoES organised and hosted a week-long visit from Steve Blank,<sup>24</sup> incorporating a range of events and activities. The growing national and international media interest in the Aalto ecosystem has also been supported by impressive success stories from previous generations of graduates, particularly from the ICT sector. In early 2012, AaltoES took over the management of a national startup conference (SLUSH),<sup>25</sup> and quickly transformed this into a major regional event, drawing participants from across Northern Europe and Russia. In late 2012, many of the established startup activities organised by AaltoES were formally separated from the society and brought together under a new independent organisation called the *Startup Sauna Foundation*.

4. **The development of an E&I support infrastructure within the university (late 2012-present):** Following the establishment of ACE and the Stanford University STVP partnership, the university-led entrepreneurship activities have developed more rapidly from late 2012 on. An increasing number of university faculty have started to engage with both startup activities and E&I support activities. As part of the STVP partnership, the Aalto Ventures Program (AVP)<sup>26</sup> was established in 2012, which soon offered a suite of entrepreneurship courses to students across campus. Activity is underway to develop an entrepreneurship research portfolio under the AVP, and, in 2013, two Growth Entrepreneurship Professorships were appointed within the School of Science. Reflecting the student-led movement, university-based E&I activities have focused on the regional high-growth entrepreneurial capacity and environment. For example, in 2013, the university established AppCampus,<sup>29</sup> a mobile application accelerator open to applicants from across the world.

<sup>24</sup> Steve Blank week, <http://steveblank.fi>

<sup>25</sup> SLUSH conference, <http://www.slush.fi>

<sup>26</sup> Aalto Venture Program, <http://avp.aalto.fi/en/>

<sup>29</sup> AppCampus, <http://www.appcampus.fi>



## A.3 University approach to entrepreneurship

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### A.3.1 University E&I strategy and IP policy

**University E&I strategy:** As noted in Section A.2, the university's senior management has been a vocal supporter of the entrepreneurship movement at Aalto from the earliest stages of its formation. It has done so without an explicit university policy on entrepreneurship. Nonetheless, interviewees agreed that the philosophy underpinning the university's support for E&I is clear. It is one that actively nurtures the regional entrepreneurial ecosystem – “*trying to build the ecosystem around the university rather than inside the university*” by supporting startup activity regardless of whether it is directly affiliated or credited to the university. As this suggests, income generation for the university has been, and remains, secondary to capacity building. The university is therefore focused more on supporting regional startups than securing IP and return on investment. The partnership secured with the STVP<sup>21</sup> also represents an important element of their E&I approach, through seeking to enact a cultural change within the university by forming networks and collaborations outside the institution.

This facilitative approach also underpins the strategy of the university-based technology transfer office Aalto Entrepreneurship Centre (ACE). It works to identify and support spin-offs with the potential to grow into new business around Aalto. Licensing is therefore given low priority. ACE focuses on long-term support and is highly selective about the startup ideas taken forward, with patents only issued where “*we see the real business potential*”. This relatively tight filter for providing startup support is reflected in ACE's financial support model. Of the 300 invention disclosures received annually, around 250 are provided with €5k *evaluation grants*. Of this group, the 50 demonstrating the highest potential are provided with a €50k *concept development* grant. Finally, around ten projects are provided with a *validation* grant of up to €300k to, “*secure market validation for the commercialisation project*”. In line with Finnish policy, faculty-generated IP at Aalto is owned by the university. However, where ACE does not take a project forward (which is the case for 95% of invention disclosures), the IP rights are given back to the inventor. In the case of industrially-funded research, IP is owned by the university until the project completion, at which point it is assigned to the sponsoring company.

In addition to its focus on regional startups in favour of licences and limited patenting, ACE can be distinguished from conventional university technology transfer functions in a number of other ways. These distinguishing features reflect its overarching goal of improving and populating the regional startup environment. For example, ACE offers an identical service to university staff and student entrepreneurs. In addition, it provides extended support for startups emerging from the university, for example by taking startup companies through the first funding round so that, “*when we let them go, they are fully funded. We take them to the VCs, help them with their pitch*”.

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### A.3.2 University E&I infrastructure

The Aalto ecosystem architecture comprises three key elements, as outlined below. Further details of the university-based E&I components are given in Table 2.

1. **The student-led activities:** These cluster around two organisations. The first is AaltoES,<sup>19</sup> a student-led society which is highly experimental and organises a wide range of activities and events each year, such as ‘Aalto on Tracks’, which took a group of 100 budding young entrepreneurs from the Aalto community on “*an entrepreneurial journey*” from Helsinki to Shanghai on a private train. AaltoES is wholly student-run and its board and leadership change each year. The second element, Startup Sauna Foundation,<sup>20</sup> takes successful activities from AaltoES and embeds them in a stable structure

and funding stream. It consists of an internship programme (Startup Life)<sup>27</sup> placing students in high-growth startups in Helsinki and Silicon Valley, an accelerator programme (Startup Sauna)<sup>28</sup> for early stage startups in Russia and Northern Europe, and the annual SLUSH<sup>25</sup> conference, which is now the largest startup event in Northern Europe. The Startup Sauna Foundation is an independently-funded organisation managed by a board of serial entrepreneurs.

2. **The university-led activities:** Since Aalto University was established in 2010, the number of university-led E&I activities has increased significantly. All are managed by or have a strong affiliation with the ACE.<sup>22</sup> Most E&I activities within Aalto University reside outside the formal departmental structure, in support functions or industry-supported facilities, with a strong focus on developing regional startup capacity. One recent example is AppCampus,<sup>29</sup> a mobile application accelerator programme funded by Nokia and Microsoft. The university offers a suite of entrepreneurship courses to its undergraduate and postgraduate populations, through the Design Factory<sup>30</sup> and the AVP.<sup>26</sup>
3. **External community:** In addition to its long-standing research and innovation partnerships with key multinational companies such as Nokia, the primary external players supporting the Aalto ecosystem can be considered in two components. The first comprises the community of ecosystem practitioners, principally serial entrepreneurs, government funding agencies and investors, who are located (or were formerly located) within the Helsinki area. In addition to active participation in community events and activities, this group have played a critical role as advisors, mentors and coaches to many of the E&I activities within and affiliated to the university. The second component is Aalto's international university partnerships, primarily its collaboration with the STVP.<sup>21</sup> This three-year partnership, established in 2011, facilitates student and faculty exchanges between Aalto and Stanford University and provides support for the growth of E&I activities within the university. Aalto University has also established a number of other international university partnerships to support and inform the development of other entrepreneurial ecosystems, such as with *Kaunas University of Technology* in Lithuania, as well as helping to seed student entrepreneurship societies at other Finnish universities.

Figure 16 focuses on the first two elements and indicates where these activities (shown in brown) reside in relation to the university structure (shown in purple). Figure 17 indicates the role these activities play in supporting an individual's entrepreneurial journey, from their initial introduction to entrepreneurship through to the financing of a new venture. As can be seen from Figure 17, the majority of events and support activities offered are openly available, regardless of nationality or university affiliation.

<sup>27</sup> Startup Sauna internship program: Startup Life, <http://startupsauna.com/internship/>

<sup>28</sup> Startup sauna accelerator programme, <http://startupsauna.com/program/>

<sup>29</sup> AppCampus, <http://www.appcampus.fi>

<sup>30</sup> Aalto Design Factory, <http://www.aaltodesignfactory.fi>

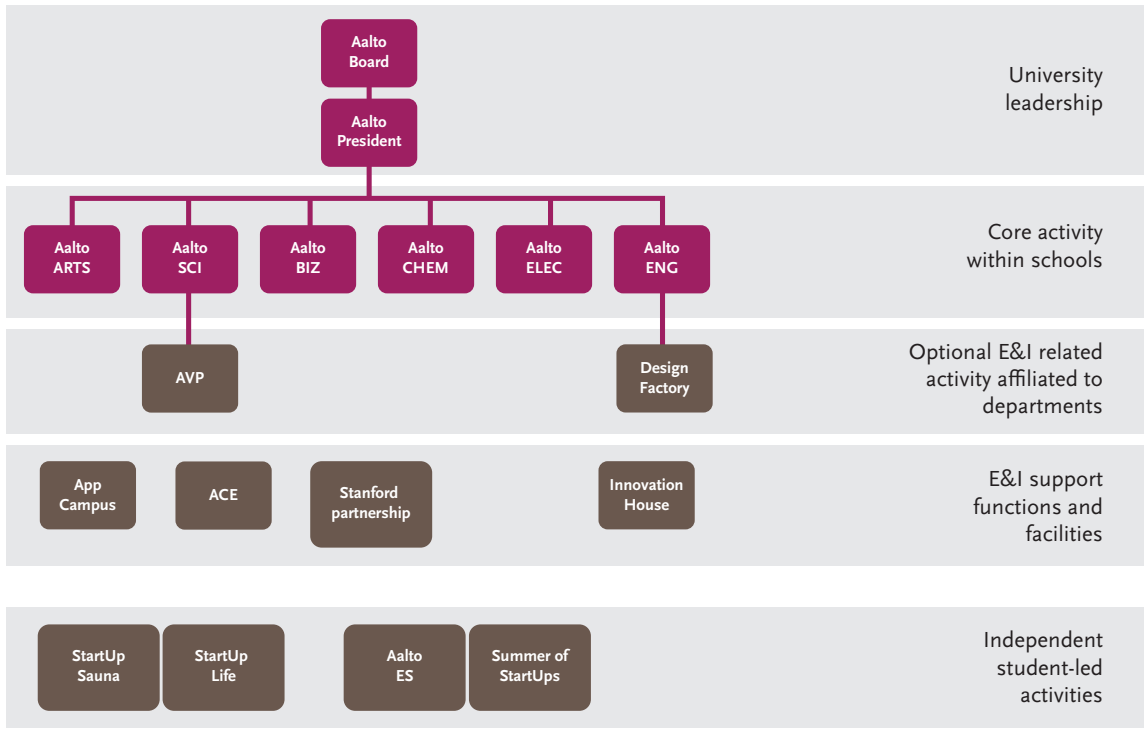


Figure 16. Architecture of Aalto University E&I components (university structure shown in purple, E&I support and education activities in brown).

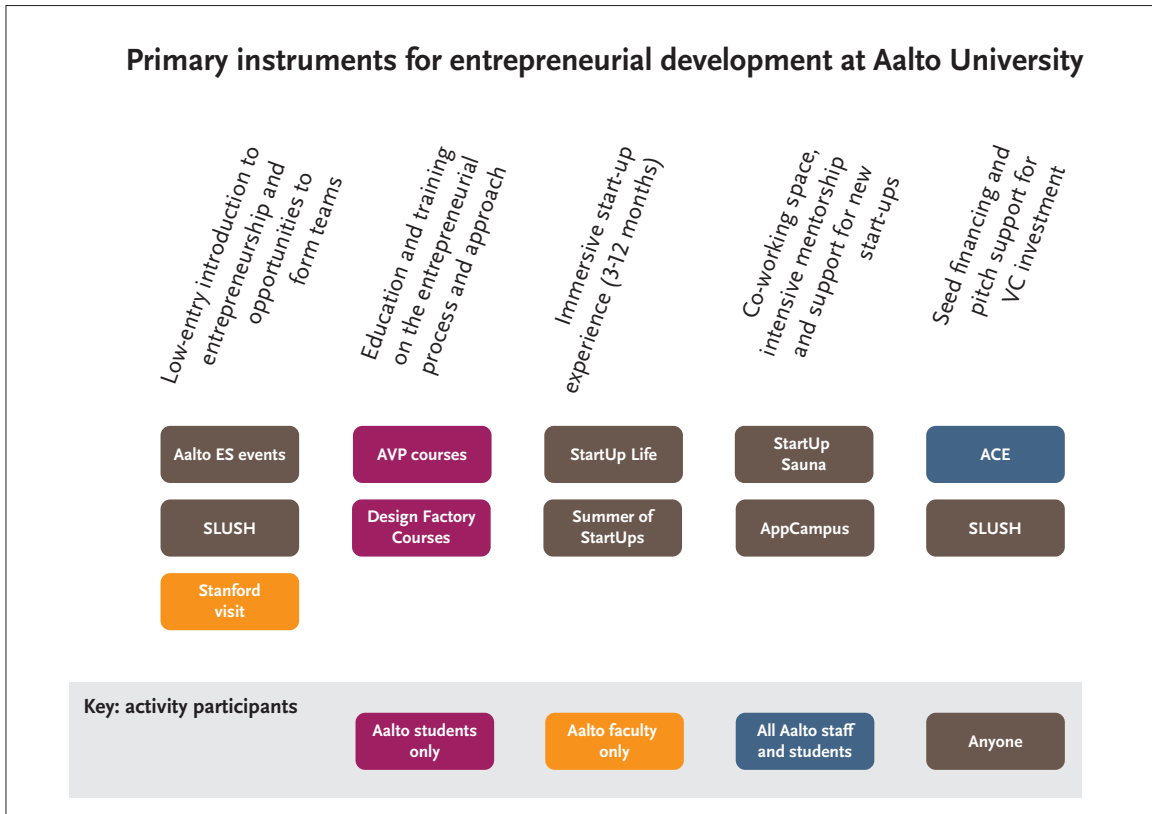


Figure 17. The E&I support activities at Aalto along the startup pipeline, from initial engagement with the idea of entrepreneurship to funding a new startup company.

### Open-access centre providing entrepreneurship support and advice

Aalto Centre for Entrepreneurship (ACE)	Established in 2010, ACE supports and coordinates all student and staff E&I activities within Aalto University (excluding the student-led activities, AaltoES and Startup Sauna). With a team of 14, it brings together four key functions: (i) a <b>technology transfer function</b> , with a “tight filter”, focusing its resources on high-potential startups emerging from Aalto’s staff and student communities, (ii) <b>startup services</b> , to “take the startups through their first funding round, so that when we let them go, they are fully funded”, (iii) <b>strategic industry partnerships</b> , with companies such as PWC, to improve “the understanding of market needs for Aalto-based innovations”, and (iv) support for and oversight of <b>other E&amp;I activities</b> “that don’t have a natural home”, such as AppCampus and Aalto Ventures Program (see below).
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### Entrepreneurship courses offered to students in engineering and technology disciplines

Aalto Ventures Program (AVP) (optional courses)	Established in 2012, Aalto Ventures Program offers a suite of courses to undergraduate and postgraduate students across campus tailored for the development of entrepreneurial skills and attitudes. It was developed as part of the Aalto University partnership with the Stanford Technology Ventures Program (STVP). Of the 20 AVP courses currently available, a number are co-taught by faculty from Stanford University via remote link. Such courses include <i>Changemakers</i> , <i>Entrepreneurial Leadership</i> and <i>New Venture Formation</i> . More than 350 students from across Aalto University participated in one or more of the AVP courses offered this year. Students are also able to study for an entrepreneurship minor through the AVP.
Design Factory (optional courses)	The Design Factory offers a number of hands-on courses with a focus on innovation, available to undergraduate and postgraduate students across campus. An example includes the interdisciplinary <i>Product Development Project</i> , where students develop a product from initial ideas through to the creation of a prototype, with a clear focus on its commercial potential.

### Student entrepreneurship clubs and societies

AaltoES	Established in 2009, AaltoES is a not-for-profit student-run society which describes itself as “the largest and most active student-run entrepreneurship society in Europe”. Although AaltoES operates independently of Aalto University, many of its 5000 members are undergraduate or postgraduate students at Aalto or other Helsinki-based universities. The society, “creates high-tech, high-growth, scalable entrepreneurship and builds a leading startup ecosystem in Finland and Northern Europe”. Although operating in close collaboration and being housed in the same building, AaltoES recently separated from the Startup Sauna to allow the society to continue to adapt and create new ways to support and nurture the entrepreneurial ecosystem. To support this “startup spirit of invention” and “not caring what people have done before” the (wholly student) leadership and board of AaltoES is replaced annually. The society organizes around 50 events each year, such as <i>Aalto on Rails</i> and <i>National Day of Failure</i> , and attracts around 10,000 participants annually. AaltoES also organises the Summer of Startups, a two-month programme to support “first-time startups” emerging from the populations of students or researchers.
Startup Sauna	Founded in 2010, Startup Sauna is a student-led not-for-profit supporting regional entrepreneurship. Although based on campus, it no longer has an official affiliation with Aalto University since its separation from AaltoES in early 2013. The Startup Sauna Foundation is managed by a board of serial entrepreneurs, which is renewed every three years. It focuses on the growth of regional high-growth startups and comprises three key elements: <ul style="list-style-type: none"> <li>• <b>The Startup Sauna accelerator programme:</b> a bi-annual seed accelerator for startups in Northern Europe and Russia. It comprises (i) one-day ‘warm-up’ coaching sessions, held across in 10-20 locations across Northern Europe and Russia, (ii) a six-week residential accelerator programme for around 40-60 teams per year, as selected during the warm-up sessions. The teams with the highest potential are given the opportunity to visit Silicon Valley to meet with investors.</li> <li>• <b>Startup Life:</b> a 3-12 month internship within an established startup in Silicon Valley or Helsinki, open to students, postgraduates or researchers from any university. Its aim is to “get students out of the university, out of Finland to see what is possible and how startups really work”.</li> <li>• <b>SLUSH conference:</b> Startup Sauna assumed management of the SLUSH conference in 2011, which “brings together the early-stage startup ecosystem in the region to meet top-tier venture capitalists and media from around the world”. Three and a half thousand people attended the 2013 SLUSH conference including 1000 startups.</li> </ul> <p>The 2013 operational cost for the first two elements above is approximately US\$650k in total, which is financed by key Finnish E&amp;I funding agencies (Teknologiateollisuus, Sitra and Tekes) and other private investors and donors. Early financing for the operation was covered by Aalto University and Tekes. The operational costs of SLUSH (approximately US\$1m) are covered by ticket sales.</p>

### University accelerator/incubator

Startup Sauna	(see Startup Sauna accelerator above)
App Campus	Established in 2013, AppCampus is a mobile application accelerator programme offering a one-month residential experience to two cohorts per year, each of around 100 participants. The accelerator is funded by Nokia and Microsoft, who each contributed US\$6m over a period of three years. In-kind support of US\$3m is provided by Aalto University. AppCampus is open to all applicants, regardless of affiliation, and received 1200 applicants from 92 countries in its most recent call. Only a small minority of the teams accepted onto the accelerator programme are affiliated to the Aalto University and no IP, revenue share or equity are taken from any participant.

### Other

Open Innovation House	The Open Innovation House was established within the Aalto University campus in early 2013 and offers, “a base and meeting venue for open innovation and collaboration creation”. It hosts a number of research centres working primarily in the IT sector (such as the Nokia Research Centre and the European Innovation and Technology IET Labs) space for new startup enterprises as well as a range of other E&I activities, such as AppCampus.
Design Factory	Established in October 2008, the Design Factory was the first physical entity of the new Aalto University. Modeled on the d.school at Stanford University, this centre brings the disciplines of engineering, design and business together to “develop and cultivate the passion-based, student-centric learning culture”.
STVP Partnership	Established in 2010, initially as a three-year agreement, the university’s collaboration with the Stanford Technology Ventures Partnership (STVP) aims to infuse, “the culture of Silicon Valley” into Aalto University. The key elements of the programme involve: (i) visits from key Stanford University faculty with expertise in entrepreneurship, (ii) the hosting of week-long visits of Aalto University students, and senior university management to Stanford University and Silicon Valley, (iii) a platform to host Aalto startups in Silicon Valley, (iv) guidance for new Aalto research tracks in entrepreneurship, and (v) support in the design and delivery of the Aalto Ventures Program, including the co-teaching of key undergraduate modules. The majority of the funding that supports the STVP partnership is provided by Tekes.

Table 2. Key E&I components at Aalto University.

## A.4 Achievements and impact

Some early performance indicators of the Aalto University ecosystem are available. Following the establishment of AaltoES and ACE in 2009 and 2010 respectively, an increasing number of startups have entered the market. For example, around ten startups per year are emerging from ACE, of which approximately half are student-led. In addition, around 90 companies have graduated from the Startup Sauna since 2010, which have, to date, attracted around US\$25m in funding. However, it is less than five years since the emergence of a community of entrepreneurial students and only three years since Aalto University was established. As was widely acknowledged by interviewees, the Aalto ecosystem is at an early stage of development. As one local entrepreneur put it, *“the fruits are not yet ripe for picking”*. It is therefore too early to apply *“more meaningful”* metrics of long-term E&I performance such as trends in growth rate in ecosystem employment, or the survival rate of the companies formed.

However, as one Silicon Valley-based entrepreneur commented, the trajectory of the ecosystem *“looks promising”*. Other interviewees concurred, pointing to a number of ‘soft’ indicators that suggested a vibrant ecosystem was emerging. These focused on (i) evidence of a major cultural shift in young people’s attitudes to entrepreneurship, (ii) high levels of engagement in startup opportunities, and (iii) evidence of increasing levels of inward investment. Each of these issues is discussed below.

Almost every interviewee noted the speed and scale of **change in young people’s attitudes**, which, for many, was directly attributable to the emergence of the Aalto University ecosystem: *“There has been a revolution in attitudes in young people towards entrepreneurship. Before, perhaps 2% might have been interested. Now it is 20-30%. People don’t want to get a safe job now. Much of this is down to the students [at Aalto]”*. Another interviewee commented, *“Attitudes to entrepreneurship in Finland are changing. Aalto ES have pushed through a new way of thinking. Finland is a small country and much of the economy is concentrated in Helsinki, so this one student organisation can be very influential”*. Many interviewees had had decades of experience with startups in Finland and had watched the cyclical rises and falls in engagement in entrepreneurship. All were clear that the current period was different: *“Aalto has generated excitement at the student level that has not died away. Previous waves like this died away quite quickly”*. Another Helsinki-based investor commented that, *“it is the most significant phenomenon of my career that I have seen, because the change is so sudden. Five years ago, if you were a top student and had all the options in the world, entrepreneurship and startups were at the bottom of the list. If you said ‘I want to start up a business’, the reaction would have been ‘what, you can’t find a job?’ All of a sudden, amongst these students, entrepreneurship has become a desired career path. Successful entrepreneurs in Finland have become like rock stars. Entrepreneurship became a cool thing”*. Most, although not all, interviewees also commented that this cultural transformation, driven by AaltoES, had influenced attitudes across the country.

Almost every interviewee also spoke about the **high level of engagement in the entrepreneurship activities** sponsored by Aalto; what one stakeholder described as *“the phenomenal levels of participation”*. For example, among the university’s undergraduate and postgraduate population, it is estimated that one in six are members of AaltoES, with a considerably larger proportion of the university student population participating in one or more of the 50 AaltoES events each year. In addition, many interviewees commented that a very high proportion of the serial entrepreneurs operating within the ecosystem are engaged in some capacity with Aalto University, for example, as a coach, advisor or participant in AaltoES activities. The ecosystem is also attracting increasing external interest. For example, the SLUSH<sup>25</sup> conference in 2010 was attended by an exclusively local audience of around 300-500, with 20-40 local startups represented and almost no media coverage. In contrast, SLUSH attendance in 2013 stood at 5000, with 1000 startups, of which 70% were non-Finnish, and 100 foreign venture capital funds; it was also reported to be the third largest startup conference in Europe. The 2013 SLUSH event also generated 200-300 articles in the international media.

In all, it is estimated that there were over 40,000 participants at the various startup events and activities at Aalto University in the previous 12 months to July 2013.

There is also evidence of **inward investment** in the Aalto ecosystem. According to Ari Huczkowski, the CEO of Otaniemi Marketing Ltd, *“in the first quarter of 2013, Finland attracted the third highest investment money in Europe, behind only France and the UK. More than 90% of that money was invested within 15 minutes from Otaniemi campus”*. In addition, he added that, *“the most recent Red Herring 100 Europe winners list had 12 Finnish companies on it. Nine of those are either right inside the Otaniemi campus – or within 15 minutes of it”*. Indeed, three of the five fastest-growing Finnish companies in 2012 came out of Aalto University.

While indicative of future performance, it must be acknowledged that the Aalto ecosystem is still in its infancy. Its long-term capacity to nurture successful startups and to contribute to the wider Finnish economy has therefore yet to be demonstrated.

## A.5 Success factors

Many of the world’s leading entrepreneurial universities were formed from the convergence of two factors: (i) being, *“in the right place at the right time”*, and (ii) the implementation of a strategy, that, consciously or unconsciously, supported entrepreneurial behaviours and attitudes amongst its population. Aalto University is no exception.

Two broad sets of factors have contributed to the successful development of the Aalto ecosystem to date. The first relates to its propitious circumstances and the second to the approach taken by the student and university leaders.

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### A.5.1 Success factors relating to environment and circumstances

It was clear from the interviews that three contextual factors were critical to the development of the Aalto ecosystem. These are noted briefly in turn.

**1. The stimulus of a new university:** Many interviewees described the university merger as a *“triggering event”*; one which *“caused collisions”* as the different universities were brought together with the aim of fostering cross-disciplinary innovation. There was a strongly-expressed view that, *“without the merger, the original three [universities] would have continued as they were for hundred years”*.

Aalto University was explicitly designed to break with the Finnish traditional model both in its greater autonomy and its focus on innovation for the good of the wider society. Together, the new model, *“made us open up to new ideas – even radical ideas – of how to do things differently”*. The significant endowment capital received by the new university also allowed it *“to invest in new ideas – be it the student entrepreneurship society or in new tenure track slots – without asking permission from anyone”*. Further information of the impact of the merger on helping to nurture the ecosystem development is provided in Section A.2.1.

**2. An improved national environment for entrepreneurship:** The entrepreneurial environment in Finland changed significantly during the period of Aalto University’s design and establishment.

Firstly, Aalto was able to benefit from ongoing support from the national government for innovation and entrepreneurship. Through its public innovation policy, *“the government saw changing the culture as one of the key factors in future growth”*. Tekes, in particular, plays a key role in supporting the country’s E&I infrastructure. As one interviewee commented, *“in Finland, there is almost no private funding, Tekes*

plays a very big role. Without it, most of us would be nowhere”; in a similar vein, another observed “student passion can achieve a lot in a year, but only if the money is there. Tekes bent a lot of their own rules to fund what we were doing”. There was a clear consensus that “nothing could have happened at Aalto without Tekes funding”, with the agency investing directly or indirectly in almost every successful component of the university’s ecosystem.

Secondly, the establishment of Aalto University occurred during a period of major economic upheaval in Finland. Many interviewees noted that the change in Nokia’s fortunes, “opened up a space for Finns to think differently about startups”. As one local serial entrepreneur commented, “the macro environment had changed. Nokia going down had a huge benefit for existing startups as well as new startups. Much of the success in the gaming industry is down to Nokia going down. Nokia was keeping companies alive by subcontracting or licensing. But these companies were constrained to the Nokia ecosystem. Once Nokia went down, they have broken out and this has been the key to getting competency in the culture. In Finland, we hate failure, but this big failure has created its own success”.

Thirdly and related to both factors above, the national media began to tell a “different story” about entrepreneurship, and one that positioned it as, “a new economic basis beyond Nokia”. Prior to 2011, the Finnish media paid little attention to home-grown startups, after “getting their fingers burnt in the mid 1990s” and, like much of Finnish society, viewed “startups as a bubble ready to burst”. After 2011, however, the Finnish media were able, “to tell a different story about startups. This one was about student energy and activism. They first started talking about the AaltoES phenomenon. Then they talked about the people behind the phenomenon. Finally, now, they are talking about the companies themselves which is what the real stories need to be about”. Much of the recent coverage revolves around two major success stories from an earlier generation of Aalto entrepreneurs: Rovio, the makers of *Angry Birds*, and *Supercell*, reported to be the fastest growing games company in history.

**3. A long-standing Finnish culture of student activism and community activity:** Many interviewees commented that a successful student-led entrepreneurship movement, “could only have ever happened in Finland”. It was seen as having been built upon “hundreds of years of history” of student activism within the country. A high proportion of the Finnish population attends university, and each student is given a “government stipend” for around seven years of study. The student population is therefore large, relatively mature in years and does not necessarily rely on part-time employment to supplement income. A culture of student activism has emerged, and Finnish student unions have been major players in business developments, such as the first commercial TV station in Finland. Indeed, the amalgamated students’ unions from the three merging schools brought together assets of around €200m when Aalto Student Union was formed. The unions in turn support student societies – there are around 250 student societies in the Otaniemi region alone – which, “are usually pretty rebellious and quite counterculture, but they often do amazing things”.

In addition to the culture of student activism, there is a long Finnish tradition of *talkoot* – a voluntary collective effort for the benefit of the community. As one interviewee explained, “it is a very Finnish thing. We live in a harsh climate. In our past, no one would have survived if we did not work together. Individuals do not survive. People work together, not for profit, to survive.” Many interviewees saw the entrepreneurship movement at Aalto University as an expression of Finnish *talkoot* culture, a collaboration between students, serial entrepreneurs and the university for the benefit of both themselves and the wider regional community. As one interviewee noted, “there were over 150 people who each put in hundreds of hours to work in this thing, for free. They knew that this would probably benefit them, but they were also thinking about what we could all create, together”. Mutual respect and trust were highlighted by almost every interviewee, regardless of their background, as the values underpinning much of the development of the Aalto ecosystem.

## A.5.2 Success factors relating to leadership and harnessing talents

Along with a supportive environment, the interviews pointed to the quality of E&I strategy and leadership as a significant factor in the success of the Aalto ecosystem to date.

**1. An egalitarian grassroots movement led by uniquely talented individuals:** What is probably most impressive about the Aalto story is that the early entrepreneurship movement was almost entirely student-driven; the vision and vibrancy of which was described by external observers as, *“unlike anything I have seen anywhere in the world”*. Almost every successful component of the emerging university entrepreneurial ecosystem is managed by, or has its seeds in, the student movement. Although both the local startup community and the university have been critical players in the transformation, there is no doubt that it was driven by the students.

A key factor has been the quality of its leadership; in particular that of the movement founder who was described by many as *“uniquely talented”*. This leader also brought prior startup experience and connections into the local startup community which were to be the foundations of the entrepreneurial network nurtured by AaltoES. Successive leaders were similarly seen as having, *“a unique ability to recognise and bring in the right talent”*. Whereas many student entrepreneurship societies rely on adopting a successful model from elsewhere, such as the MIT 100k competition, AaltoES drew on the world’s best models to develop bespoke structures and activities that worked for the Helsinki environment. From its foundation, AaltoES created an inclusive, egalitarian culture, which, *“allowed people to take whatever responsibility they wanted and supported all of the ideas that were coming out”*. Although this approach resulted in as many failures as successes in the early days, the atmosphere created was one of passion, cooperation and creativity. The separation of AaltoES from Startup Sauna in early 2013 marked an important division between the more maverick, risk-taking element of the movement and the established activities that required a longer-term agenda and on-going support.

**2. Engagement and strengthening of the local startup community:** The startup scene in the Helsinki area was described as *“fragmented”* prior to 2008, where *“the community was nothing more than a few individual contacts”*. While entrepreneurs, many of whom had graduated from TKK in the late 1990s and early 2000s, were starting to see some success, there was no organisation to bring these individuals together.

This organisational structure was provided by the student movement. When approached by the student leaders in early 2009, local entrepreneurs and investors were quick to come on board. Interviewees from across the ecosystem all gave the same response when asked about why they engaged with the students; *“of course I wanted to help with this. I said yes because they asked...Entrepreneurs are like bikers on the road. We help each other because no one else will”*. A high proportion of those who became actively involved in supporting the student movement had experience working in Silicon Valley, and *“understood the responsibility and power of the community. We have all been helped, all the way along the line, and we are here to help others”*. These individuals also recognised *“the quality of the leadership”* of the student movement that *“only comes around once in a generation”* and catalysed the community through *“sheer force of will”*. A group of mentors, coaches and advisors was quickly formed, attracting wider groups to become involved in the Startup Sauna and AaltoES events.

The community created has been a cornerstone of the Aalto university ecosystem, bringing authenticity, expert guidance and inspiration to the movement. The quality and extent of the relationships formed between the entrepreneurial community and the university/student E&I activities is rarely seen outside the US.



**3. Leadership by Aalto University senior management:** Aalto senior management has followed a clear strategy to “*support but not direct*” entrepreneurial activities within and outside the university. This has allowed the student-led movement, and its integration with the local entrepreneurial community, to develop organically while, at the same time, offering it strong support. As the university President commented, “*you should never underestimate the power of creative individuals and you should never push them into one mould*”. The goal, as she made clear, was to establish a relationship with the student leaders built on trust and mutual respect.

The university senior management provided public and vocal support for the students’ vision: to nurture the regional high-growth technology-driven ecosystem for which Aalto University was the hub. As such, the university “*supported the students with anything they wanted to do, as long as it was consistent with our goals*”. While “*allowing the students to make mistakes*”, the university played an important role in resolving the issues faced by this rapidly-growing and highly experimental movement. As one former participant of AaltoES noted, “*they got us out of a lot of scrapes... some of them, we didn’t even see coming. But it did not change their attitude to what we were trying to do. The support was always there*”. The governance structure and endowment of the new university also allowed it to “*invest without asking the permission of anyone*”. It was thus in a position to adapt to the organic growth of the student-led movement and provide support where and when it was needed.

This approach also extended within the university. ACE was able to, “*incubate some interesting ideas. The ones that worked could then be embedded elsewhere*”. The individual originally appointed to direct ACE brought a strong background in the Finnish high-tech environment and a wide network in the regional, national and international startup communities. In a similar manner to the founder of the student-led movement, this individual has played a key role in establishing and nurturing the university’s relationships with the startup community.

## A.6 On-going issues and challenges

The two components of the Aalto University entrepreneurial ecosystem are challenged by relatively distinct issues; the problems faced by the student movement are different from those faced by the university itself. The barriers faced by each ecosystem component are therefore outlined separately in Section A.6.1 and A.6.2 below.

### A.6.1 Issues and barriers associated with the student-led movement

The student-led movement has been phenomenally successful and rapid in its progress, features that were highlighted by all the 30 interviewees in this study. However, some of those from outside the student body also expressed concerns that, without careful management, an equally rapid decline in engagement may also be possible if the “*current trend for entrepreneurship*” amongst Finnish youth did not continue. As one commented, “*I am not sure anyone knows the secret sauce of what makes this work – what if it is just a trend for a certain period of time and then the students drift back to McKinsey or Nokia? I am not sure we would know what to do to stop it*”. Interestingly, the interviewees from the student movement were much more sanguine, upbeat and expressed confidence in the annual influx of new leaders of AaltoES as a mechanism to maintain the energy and vibrancy of the movement. They regarded fluctuations in the strength and impact of the student movement as an inevitable element of the growth of the ecosystem as a whole: “*the culture is that we do not think like the old guys [leading AaltoES in previous years]. We re-start each year..., but I know that all of this will go in cycles. Like Stanford, we will have strong cycles and weak cycles. I do not mind this. It is the community that matters. If AaltoES starts to go into the background, this is okay, as long as the [startup] scene is strong*”.

However, it is clear there are some challenges facing the student-led movement as it continues to grow and seed a sustainable ecosystem, as summarised below.

- **Ensuring that the integrity of the community and activities do not become diluted by “hangers on”:**  
 A feature that distinguishes AaltoES and Startup Sauna events from their international counterparts is a strong value base of trust and good will. The bedrock of the ecosystem, this culture is based on the community attracted to these events, namely potential entrepreneurs, practicing entrepreneurs and other ecosystem professionals. Together, they create, *“a buzz in the room full of amazing, friendly people to learn from and who could actually help us to make our own startup”*. Having created a strong brand which has enjoyed significant attention from national government and international media, it is clear that the proportion of individuals commonly described as *“hangers on”* at these events – media, government, service providers– has significantly increased in the past one to two years. Unless a critical mass of ‘startup practitioners’ can be maintained at these events, some interviewees expressed concern that this group will no longer see the value in attending and thereby actively participating in the university-based startup community. In addition, AaltoES only retains limited institutional memory; with their annual leadership turnover, such a gradual shift in attendee profiles may not be sufficiently visible for remedial action to be taken.
- **Translating the high levels of engagement into success stories about “stable, successful startups”:**  
 Many interviewees spoke about the necessity for the ecosystem to create success stories before its potential could be realised – *“Startups that go through the roof affect attitudes. Without it, I’m afraid this phenomenon will just fade out.... VCs and angel investors come where the success stories are”*. During its first four years, the student movement has demonstrated significant success in building engagement, community and skills in entrepreneurship. Anecdotal evidence from interviewees suggests that this has both changed public attitudes to entrepreneurship and significantly increased the number of graduates seeking employment in startup businesses. Despite an encouraging number of startups emerging from the student-led movement, however, no visible success stories have yet been created. For some, the issue may be connected with the historical focus within AaltoES on, *“business skills rather than the engineers with the technical ideas”*. Others, however, particularly startup practitioners outside the university, had fewer concerns: *“This is a long-term game. Companies take time to build. We are in a good place. We need to wait to see the results”*.
- **Demonstrating the breadth of the ecosystem, outside the gaming industry:** Externally, much of the success at Aalto is associated with the gaming industry, with the two most prominent success stories, from a previous generation of entrepreneurs, being *Rovio* and *Supercell*. This image does not reflect the true breadth of the university ecosystem; although gaming accounts for a significant, and highly visible, component of university startup activity, *“a number of other companies are coming out of the university that are less hyped, [in sectors] such as in cleantech and materials”*. Across the university, opinions are split as to whether the public association between the Aalto ecosystem and the gaming industry poses a threat. For some, this reputation imposes a potential constraint on the ecosystem: *“an immense amount of PR is going into quick and easy software startups that don’t reflect the expertise of Aalto”*. Indeed, some interviewees even suggested that the *“focus on the students and the gaming industry”* has disengaged university faculty from the entrepreneurship agenda: *“is this what a serious university should be doing? Why is there so much fuss about entrepreneurship and no one is writing about the serious university research, only these fun and games”*. Others, however, had no such concerns. They noted the considerable value offered by successful gaming startups to the attitudes and aspirations of future entrepreneurs within the university. As one interviewee commented, *“The gaming scene is really taking off in Helsinki. For a lot of the time it was seen as a silly student movement, but now they are showing that this stuff can really have an impact on GDP. It is important to specialise – it is important for self-belief”*.

## A.6.2 Challenges facing the university

Probably the most significant challenge facing the Aalto University ecosystem is located within the university itself and relates to the incorporation of the E&I agenda into university departments. Interestingly, these challenges are largely a product of the unexpected speed and extent of the ecosystem growth, and, in turn, the speed and nature of the university's response.

Figure 16 describes the structure and positioning of the various E&I functions associated with Aalto University. This structure can be considered in three layers; at the top, the university senior management, at the bottom, the various E&I support activities (both those initiated by the students and those developed with the university itself) and, in the centre, the university schools and departments. The 'bottom layer' of this structure has provided the vision and engine for the establishment of the university ecosystem. The 'top layer' has provided "*public and vocal*" endorsement for this emerging entrepreneurship agenda, dedicating, at times, significant resources to these activities. The challenge appears to now lie at the centre of the structure, the tier represented by departments and schools, and the incentives and priorities by which they operate. While the 'bottom layer' has created a suite of world-class opportunities for entrepreneurial development, the 'central layer' – the core university functions – operates around structures and priorities that are almost entirely research-led. As a consequence, "*entrepreneurship is virtually invisible*" in the day-to-day operations of the departments themselves. In other words, Aalto University has not adapted, "*the incentives built into the university*" to reflect its transition into an entrepreneurial institution. The course of the student-led entrepreneurial movement is, by its nature, unpredictable. It appears to be critical that the university takes advantage of the benefits that this movement brings by embedding E&I into the core functions of the departments during the limited time window in which it can maintain its vibrancy, integrity and influence. As one interviewee noted, "*the student revolution has been great ... but we need to get the water level higher in the university*".

Although all three universities involved in the Aalto merger, as with many in Finland, had well-established research collaborations with large multi-national companies, the culture of entrepreneurship and innovation (E&I) was very limited and piecemeal. Despite some significant changes to the academic structures during the creation of Aalto University, such as the introduction of a tenure track, the priorities within the university departments were described by many as "*still pretty traditional*". As one faculty entrepreneur noted, the university is, "*at best, neutral to commercialisation...as long as it does not impact on your research or other duties*". For example, faculty promotion criteria are built primarily around research excellence with no formal consideration of entrepreneurship. The lack of recognition for entrepreneurial engagement is clearly visible to the university PhD and postdoctoral communities, who understand that, "*the rules here are the same as any research university*".

Nonetheless, it is clear that an increasing number of faculty at Aalto University are engaging with the entrepreneurial agenda. For example, over 30 faculty members, from across all six departments in the university, are involved in delivering courses in entrepreneurship via the AVP. The partnership developed with the STVP at Stanford University has played a critical role in strengthening faculty engagement. In the two and a half years since its establishment, 40-45 faculty members have visited Silicon Valley as part of this programme, an experience that, "*opened their eyes to the possibilities of commercialisation*". In particular, the impact that this visit has had on one or two highly-respected research experts from Aalto has clearly been influential and noted by their colleagues, "*the engagement of the respected scientists has shown the younger faculty that this is a good thing to do*". Although the proportion of faculty engaged in such activities is still relatively low, it is clear that "*a cultural change is starting to take place*", particularly amongst some of the university's research leaders. As one interviewee commented, "*you find a huge willingness of the 'best' faculty (and by that I mean 5-10% of the staff who tend to have strong academic and innovation/entrepreneurship values and track record relative to other Aalto faculty) to participate in E&I activities*". The key challenges appear to lie

in the basis by which faculty are currently participating, which was described as “a virtually volunteer basis”. For some, the continued engagement of the “core of university-based [faculty] activists” and the expansion of the entrepreneurial culture into the wider faculty population will depend on the university taking the “more painful” step of formally integrating entrepreneurship into its policies and incentives. There are already some promising signs. Indeed, one senior university manager commented that that “Aalto is actively investigating strengthening its incentive schemes to align academic excellence with innovation and entrepreneurship activities”. With these mooted adjustments to their E&I incentives and policies, the formidable combination of strong leadership commitment, passionate stakeholder engagement and an effective national support system is likely to drive Aalto towards becoming a major international powerhouse for university-based entrepreneurship over the next decade.



# APPENDIX B

## IMPERIAL COLLEGE CASE STUDY

## B.1 Ecosystem context

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### B.1.1 The university: key features

Imperial College was established in 1907 through the merger of the City and Guilds College, the Royal School of Mines and the Royal College of Science, bringing together the disciplines of engineering and natural science. The disciplinary profile of the university was later broadened following the merger with St Mary's Hospital Medical School in 1988 and the formal establishment of the Imperial College Business School in 2003. Imperial College describes itself as the “*only UK university to focus exclusively on science, technology, engineering, medicine and business, and the only one to have had the application of its work to industry, commerce and healthcare central to its mission since its foundation*”. Today, the university is structured across four academic units: the Faculty of Engineering, the Faculty of Natural Science, the Faculty of Medicine and the Business School.

The university is home to 1200 faculty and 14000 full-time students; of the latter, one third are postgraduates (taught and research). The student body is very international – 27% of undergraduates and 62% of postgraduates come from outside the European Union (EU) – and engineering students represent the largest group; 40% of the university's student population, at both undergraduate and postgraduate levels, are in the Faculty of Engineering.

Imperial College is one of three UK universities consistently placed in the top ten of the world rankings. In the government's most recent assessment of university research conducted in 2008, 73% of the university's faculty were rated as either ‘world-leading’ or ‘internationally-excellent’. In 2011/12, the university attracted £314m in research grants and contracts. Of this research income, around £40m was sourced from industry and public corporations, making Imperial College one of the largest academic recipients of corporate R&D funding outside the United States.

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### B.1.2 The regional context

Imperial College is located in the district of Kensington and Chelsea, home to London's major museums. The area is one of the UK's most affluent, with house prices 4.5 times the national average and residents experiencing one of the highest life expectancies in the country. The population is highly international and well educated, with more than half of the residents in the borough born outside the UK and an equal number educated to first degree level or above. The occupational profile of the population is similarly distinctive. Working age adults have the highest employment rates in the ‘financial and insurance’ activities outside the City of London, the UK's financial hub, and a higher proportion hold managerial, director and senior official positions than any other UK region.<sup>31</sup>

London as a whole is home to eight million inhabitants, one eighth of the UK population. The city has the strongest and fastest growing economy of any region in the UK, with London's gross value added (GVA) currently growing almost twice as fast as that of the country as a whole.<sup>32</sup> With over 40 universities, the city is home to one of the highest concentrations of higher education institutions in the world. Together, they produce almost 150,000 graduates each year. In consequence, as one interviewee observed, “*the pool of skilled talent here is phenomenal*”. Many Imperial College-based interviewees also

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<sup>31</sup> Greater London Authority. *Annual Population Survey*, available at <http://data.london.gov.uk/census>

<sup>32</sup> Office for National Statistics. *London's economy has outperformed other regions since 2007*, available at <http://www.ons.gov.uk/ons/rel/regional-trends/regional-economic-indicators/march-2013/sum-london.html>

noted the particular contribution made by universities in the “Golden Triangle”, the area bounded by the cities of London, Oxford and Cambridge. As one interviewee observed, “four of the world’s top ten universities [University of Cambridge, University of Oxford, University College London and Imperial College] are contained within a circle of radius 40 miles. You will not find this concentration of knowledge anywhere else in the world”.

Looking at a national level, the UK higher education landscape is one of significant growth in student numbers despite a considerable increase in student tuition fees in 2011. Today, one in two young Britons enter higher education.<sup>33</sup> The UK is also a major destination for international students, with its share of the international student market growing to 17% in 2011, second only to the US. Around one fifth of this international student population currently remain in the UK for five years or more following graduation.<sup>34</sup> UK universities also enjoy a strong reputation for research quality, with the country’s research publications receiving 11% of global citations and a 14% share of the world’s most highly-cited papers.<sup>35</sup> University patenting in UK is also higher than the OECD average.<sup>36</sup> Indeed, many interviewees reported that attitudes to and capacity for research commercialisation at UK universities had changed dramatically in the past 15 years. For many, this shift was stimulated, in part, by a number of government-led interventions and the publication of a series of influential reports during the late 1990s and early 2000s. Government-led initiatives such as the *Science Enterprise Challenge*, the *University Challenge Fund* and the *Cambridge-MIT Institute* were seen as making a valuable contribution to “concentrating financial resources in fewer ‘genuine’ centres of excellence” and “kick-starting the exploitation of university research and ideas”. Many also noted the particular influence of the 2003 *Lambert Review of Business-University Collaboration*,<sup>37</sup> which called for dedicated, and “predictable” funding to support university technology transfer activities that, in turn, was more responsive to the needs of industry.

Many interviewees spoke about the “massive advantages that London offers as a startup environment”. One interviewee summarised a number of the key benefits: “London is one of the most cosmopolitan cities in the world – the culture and diversity open up so many opportunities. It is also the staging post for international trade. There should be no barriers for access to finance here”. Indeed, according to the *Startup Ecosystem Report 2012*, London is the “most successful Startup Ecosystem in Europe, producing the largest output of startups in the European Union so far”. London is also home to a wide range of regional and national startup support agencies; those most often referenced by interviewees included NACUE<sup>38</sup> (National Association of College and University Entrepreneurs), a national network and association of student entrepreneurs, SeedCamp,<sup>39</sup> an early-stage seed investor and mentoring programme, and FIG<sup>40</sup> (Find Invest Grow), a programme that invests in young entrepreneurs. A particular focus of government investment in entrepreneurship within the capital has been Tech City, a technology cluster established in East London in the late 2000s. Although some interviewees expressed reservations about the underlying performance of this ecosystem, it is widely reported to be “the fastest growing tech cluster in Europe”, supporting around 1300 startups.

<sup>33</sup> Department for Business, Innovation and Skills. *Participation rates in higher education*, available at <https://www.gov.uk/government/publications/participation-rates-in-higher-education-2006-to-2012>

<sup>34</sup> OECD (2013). *Education at a Glance 2013: OECD Indicators, Country Note: United Kingdom*. OECD Publishing, available at [http://www.oecd.org/edu/United%20Kingdom\\_EAG2013%20Country%20Note.pdf](http://www.oecd.org/edu/United%20Kingdom_EAG2013%20Country%20Note.pdf)

<sup>35</sup> Evidence Ltd (November 2011) *International Comparative Performance of the UK Research Base - 2011, A report prepared for the UK Department for Business Innovation and Skills*, available at <http://www.bis.gov.uk/assets/biscore/science/docs/i/11-p123-international-comparative-performance-uk-research-base-2011.pdf>

<sup>36</sup> OECD Science and Innovation, UK, available at [www.oecd.org/unitedkingdom/sti-outlook-2012-united-kingdom.pdf](http://www.oecd.org/unitedkingdom/sti-outlook-2012-united-kingdom.pdf)

<sup>37</sup> HM Treasury (2003) *Lambert Review of Business-University Collaboration*

<sup>38</sup> NACUE, <http://nacue.com>

<sup>39</sup> SeedCamp, <http://www.seedcamp.com>

<sup>40</sup> Find Invest Grow, <http://www.findinvestgrow.com>



### B.1.3 Barriers to the development of an entrepreneurial ecosystem

Interviewees were asked to identify the key barriers to entrepreneurship at a national or regional level. It is interesting to note that London-based interviewees identified significantly fewer barriers than those observers based outside the country. Indeed, some London-based interviewees struggled to identify any barriers, with many describing the city as *“the best place in the world to start up a company”*.

However, a number of barriers were identified by London-based interviewees and more consistently noted by other interviewees, and these are summarised below.

- **Incentives to engage in research commercialisation:** A high proportion of those with experience of the UK university environment identified academic culture and performance metrics as a major barrier to UK academic entrepreneurship and research commercialisation. In particular, the national government-led assessment of university research performance was described as having created *“perverse incentives”* that aligned career progression *“almost exclusively”* with research output and papers published in highly-rated scientific journals in particular. All stages of the academic career ladder were seen to be affected by this pressure. For example, one faculty member noted that *“PhD students are kept away from [research commercialisation]. We don’t want students’ ability to publish compromised by confidentiality concerns”*. The latest (2013/14) national assessment of university research performance, the *Research Excellence Framework*, measures and weights the impact of selected research on the economy and society; however, many interviewees were sceptical that this will result in a major shift in university priorities: *“it is making people think about it – but they are thinking about what they should put into their grant application to meet their ‘impact’ target – but to what extent this will modify their behaviour, I am not sure.”*
- **UK immigration regulations:** A number of interviewees highlighted the important role played by overseas graduates in introducing fresh ideas and driving entrepreneurship in ecosystems across the world. Some also noted, with concern, the recent *“tightening of the UK immigration laws”* and the impact that this appeared to be having on the *“attractiveness of the UK as a destination for overseas students”* as well as *“the opportunities for them to remain in the country”*. As one interviewee observed, *“whatever the reality, the perception certainly is that the UK is becoming less open to overseas students and is making it harder for them to stay”*.
- **Lack of early-stage funding:** A number of interviewees noted the *“lack of seed and follow-on funding with many businesses struggling to get onto their feet in the UK”*. This problem was seen to have been exacerbated following the recent international financial crisis. This observation is supported by the most recent *Global Competitiveness Report*,<sup>41</sup> which identified *“access to finance”* as the most significant barrier to *‘doing business’* in the UK, along with *“tax rates”*.
- **Cultural attitudes to entrepreneurship:** Interviewees from outside London, in particular, highlighted cultural barriers to engaging with entrepreneurship in the UK. Many talked about a *“national risk-averse attitude”*, where entrepreneurship *“is still not seen as a viable career choice for many people in the UK”*. Others, however, also spoke of a recent shift in these attitudes: *“I now see a very different culture coming through in our students. This is a change that has happened in the past two or three years. They are much more interested in entrepreneurship”*.

<sup>41</sup> Schwab, K. The Global Competitiveness Report 2012-2013. World Economic Forum, 2012. Retrieved from <http://reports.weforum.org/global-competitiveness-report-2012-2013/#>

- **National investment in R&D:** Cultural barriers and the lack of startup funding was linked to a wider, and systemic, challenge facing UK university entrepreneurship. As a proportion of GDP, UK R&D spending has fallen over the past 20 years. It currently stands at 1.8%, markedly below the OECD average of 2.38%. Private sector R&D funding in the UK is dominated by a small number of large international businesses, and the total income from this sector as a proportion of GDP is low by international standards.<sup>42</sup> The UK government has sought to address these problems through interventions to spur technology-driven research innovation and foster closer links between universities and business. One example is the Catapult Programme,<sup>43</sup> founded in 2011 by the UK Technology Strategy Board.

## B.2 Historical development of entrepreneurship and innovation at the university

The entrepreneurship and innovation (E&I) profile of Imperial College has been underpinned by three streams of strategic investment. The first stream relates to the university approach, where the E&I focus has developed through a strengthening science and technology research-base and a university business school with a growing international reputation for research in entrepreneurship. The second stream concerns the evolution of the university's affiliated technology transfer and investment company, Imperial Innovation. The third component is the more recent emergence of student-led entrepreneurship activities within the university. Each of these three areas is discussed in turn below.

### B.2.1 Imperial College

Most interviewees noted that the explicit emergence of entrepreneurship at Imperial College has been a relatively recent phenomenon. As one observed, *“up until 20 years ago, there was very little entrepreneurial activity”* within the university. However, many noted that the foundations for the university's entrepreneurial capabilities were laid at a much earlier stage in its history, foundations that many regarded as critical to Imperial's current capacity and reputation in E&I. Interviewees often referred to three critical phases in the development of these foundations, each relating to different stages in the university's history. The first stems from the university's foundation in 1907. Many interviewees noted the prominence of knowledge translation within the Imperial College founding charter, which stated that *“The Objects of the University shall be to provide the highest specialised instruction and the most advanced training, education, research and scholarship in science, technology and medicine, especially in their application to industry”*. For many, this founding vision has played a critical role in shaping the culture and priorities within the university today. As one member of the university's senior management team noted, *“we are not just here to do research and teach students, the translation has always been there. Our activities have always been concerned with the good of society”*. The second stage related to a progressive and significant strengthening of the university's research performance and reputation. This shift was reported by interviewees to have been the result of targeted faculty recruitment efforts and concerted research-focused policies of successive university leaders from the 1980s onwards. The third stage in the establishment of the university's E&I foundations was formed in the late 1980s and early 1990s, with the establishment of two key agencies: Imperial Innovations, founded in 1986, one of the first university technology transfer offices to be opened in the UK, and Imperial College Consultants, founded in 1990, as a wholly-owned subsidiary of the university supporting faculty and researcher consultancy activities.

<sup>42</sup> [http://ukirc.ac.uk/object/report/6403/doc/CIHE\\_1203RDlandscap.pdf](http://ukirc.ac.uk/object/report/6403/doc/CIHE_1203RDlandscap.pdf)

<sup>43</sup> Catapult Programme, <https://www.catapult.org.uk>

Together, these three elements created a university environment of world-class, industry-informed research and innovation, with the tools in place to support a commercialisation agenda. Building on the foundation described above, many interviewees noted that the most dramatic shift towards an explicitly entrepreneurial university profile came in the early 2000s with the appointment of a former CEO of a multinational pharmaceutical company as Imperial College Rector. A highly controversial figure to this day, the Rector implemented a series of far-reaching changes to the university's structure, culture and operation during his seven-year tenure, from 2001 until 2008. Although most were not focused explicitly on entrepreneurship, there was a clear consensus amongst interviewees that the resulting reforms played a dramatic role in improving both the university's reputation and capacity for entrepreneurship. One early target for reform was the introduction of a tiered organisational structure, with the establishment of discipline-based Faculties, such that "65 [Heads of Department] no longer reported individually to the Rector". Many saw this new structure as facilitating inter-disciplinary collaboration and creating new avenues for innovations: "Imperial had tons of IP coming out, but it would only work if people could integrate across disciplines and not be in these silos... creating a new structure was critically important to allow people to talk to one another and build relationships". With this structural reform in place and a number of strategic new appointments to lead the university's key operational functions, the focus of reform shifted towards "improving Imperial's international reputation as a world-class research centre". For example, the physical campus infrastructure was transformed from, "a jumble of 1960s concrete monstrosities" to an environment that "people could enjoy working in. People can now come here and actually see the structure of the university". In addition, considerable emphasis was placed on "establishing a real brand for Imperial College London, appointing a good PR department and promoting what we do". A series of far-reaching and ground-breaking changes were also made to the university's technology transfer function, as outlined in Section B.2.2.

During the same period, the Imperial College Business School grew from "being no more than an offshoot of engineering, with little identity and not reflecting the College's strengths", to a "Business School of science with an international reputation". The establishment of the Innovation and Entrepreneurship Group within the Business School in 2003 also brought the appointment of a leading research expert in the field. Many interviewees noted that, from this point, "suddenly some of the biggest names in the world came [to the Business School] and they quickly attracted a critical mass". By the late 2000s, the Business School was seen to be playing a pivotal role in establishing Imperial's reputation for science-driven entrepreneurship: "having a strong Business School with a focus on innovation and entrepreneurship sends out a clear message that this is what we do". The Business School also played an important role in establishing Design London, in partnership with the university's Faculty of Engineering and the Royal College of Art. Operating between 2007 and 2011, Design London sought to "develop, teach, research, and deliver radical new practices, tools and processes that transform the way organisations innovate, and help them translate their creativity into commercial success".<sup>44</sup>

The university's entrepreneurial ambitions have been further strengthened in recent years, with the design and early construction of the new Imperial West campus. This 23-acre site, situated in the west of London, is due for completion in 2016. It will focus on "translational, inter-disciplinary research, with an innovation centre, incubator pods and co-located companies", creating an environment where industry partners and entrepreneurs can work "at the coalface" with university staff and students.

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<sup>44</sup> Design London History, available at <http://www.rca.ac.uk/more/our-history/design-london/>

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## B.2.2 Imperial Innovations

The mid 2000s saw the start of a series of fundamental changes to the university's technology transfer function, Imperial Innovations. Until this point, Imperial Innovations had been a wholly-owned subsidiary of Imperial College, operating under *"a pretty standard technology transfer model"*. Following a drive by university senior management to ensure that *"non-core university assets were effectively utilised to raise money for research and teaching"*, considerable pressure was exerted on Imperial Innovations to *"demonstrate the value of their activities"*. It was understood that, in order to *"realise money from university IP, we needed three things: we needed to invest, we needed to be properly resourced and we needed experienced people working on the ideas"*. A dual-track structure was created within Imperial Innovations, to separate technology transfer activities (which dealt with issues such as *"IP protection, licensing and development opportunities for spin-out companies"*) from ventures activities (which focused on new business creation). However, *"it became apparent that the funding gap was enormous. Business angels could not stretch to fill this. So they decided that they needed their own investment fund"*.

In 2005, through a private placing of shares, Imperial College sold around 30% of Imperial Innovations, raising US\$38m. The university also signed a 15 year *Technology Pipeline Agreement* by which *"Imperial Innovations had a monopoly, first option, over all Imperial IP. This agreement was to underpin Innovations and allow them to raise money"*. In the following year, Imperial Innovations floated on the stock market, raising a further US\$48m. These dramatic changes were seen to bring three important advantages to the organisation. Firstly, the significant finance allowed Innovations to *"play a long game. By making their own investments, they are able to have a much more stable, long-term relationship with the companies and therefore reap the rewards when the returns come"*. Secondly, the additional finance also allowed the company to appoint *"a team of the best people within the organisation with the skill set that we need"* at competitive levels of remuneration. Thirdly, *"the public placing raised the profile of what we were doing and set us apart from other university technology transfer offices"*. In 2011, a further US\$230m was raised through a share placement, reducing Imperial College's ownership of Imperial Innovations to 30%; a shift identified by a number of interviewees as the point from which Imperial Innovations *"took a step away from the university"*. At the same time, Imperial Innovations approached the University of Oxford, the University of Cambridge and University College London to establish a partnership for investment in their university-generated IP. Interviewees noted that expansion was not met with universal approval amongst Imperial faculty, some of whom expressed concerns that *"we gave away our birth-right"*; unlike Imperial College, the three new universities were not bound by a *Technology Pipeline Agreement* to channel their technology transfer activities through Imperial Innovations, despite deriving equal benefit from the investment fund available. Others noted, however, that this powerful consortium of elite universities provided Imperial Innovations with *"unparalleled access to finance"* that *"put them into a completely different league to any of their peers within Europe"*.

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## B.2.3 Student entrepreneurship

Although student entrepreneurship activities at Imperial College<sup>45</sup> have a relatively short history, levels of engagement in student E&I appear to have grown considerably in the past two years. Some interviewees suggested that this recent shift may have been partially triggered by the global economic slowdown and the resulting reduction in graduate employment opportunities, particularly amongst one sector which has traditionally employed a high proportion of *"Imperial's best engineers"*: the banking sector in the City of London.

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<sup>45</sup> Activities, courses and societies that primarily cater to students within the Imperial College Business School are not considered here, due to the study's principal focus on engineering and technology.

The university's student-led entrepreneurship society, Imperial Entrepreneurs,<sup>46</sup> was formed in 2006. During its early years of operation, membership levels were relatively low and its activities focused almost exclusively on an annual business plan competition. In consequence, the society was not seen as a vehicle for nurturing new entrepreneurial talent or aspiration amongst the wider student population, and generally catered only to those who were “*already committed to a startup idea*”. Over the past two to three years, membership of the society has swelled to 200 and its focus has shifted to offering a much wider range of low-entry networking and social events. There is a strong cross-pollination between the membership and leadership of Imperial Entrepreneurs and the Imperial Finance Society,<sup>47</sup> the largest student society on campus, whose membership grew to 3000 in 2013. As such, Imperial Entrepreneurs offers particular opportunities for students “*to network with banks, investors and business angels*”.

In parallel with the strengthening role of Imperial Entrepreneurs came the emergence of an entrepreneurship agenda within two long-established areas of student activity and interest at Imperial: *product design* and *social enterprise*. Building on Imperial's involvement with Design London from 2007 to 2011, as well as the establishment of the Design Engineering group in the Department of Mechanical Engineering in 2008, a growing emphasis has been placed on product design and the role of design creativity in technology-driven entrepreneurship across the School of Engineering. For example, in 2009 the Department of Mechanical Engineering and Royal College of Art established a new elective, open to all engineering undergraduates, in *Design-Led Innovation and New Venture Creation*. This course, in particular, was credited with inspiring the establishment, in 2012, of the student-led *Imperial Design Collective*, a society focused on understanding the role of creativity and design in new venture creation. Social responsibility has also been a key target for student engagement at Imperial College, with growing numbers of student-led international social development projects established over the past 10-15 years, many of which have been coordinated by the Imperial Hub,<sup>48</sup> the “*focal point for charity and volunteering work at Imperial*”. A number of student and alumni-led startups have emerged from these enterprises. For example, the e.quinox<sup>49</sup> social enterprise project was established in 2008 by a group of Imperial College engineering students to “*find practical and sustainable ways to bring power to rural communities in developing countries*”. Student-led startups evolving from this project have included BBOX,<sup>50</sup> a London-based enterprise producing solar-powered battery boxes for powering small appliances, aimed at the domestic market within developing countries.

Bringing together a number of the student-led E&I activities described above, arguably the most significant student entrepreneurship development at Imperial College was created in 2011; an activity that has since helped to enable a step-change in entrepreneurship engagement amongst the university's undergraduate and postgraduate populations. In response to increasing calls for greater university-level support for student entrepreneurship, Imperial Innovations established a student accelerator for digital technologies in 2011. Funded by a £120k grant from the UK government's Higher Education Innovation Fund, the activity was managed, part-time, by an Imperial Innovation employee with personal experience of and connections across the London entrepreneurial community. During its pilot year of operation (2011/2012), the accelerator, initially called ICStartup, identified a broader demand for student entrepreneurship support, outside the digital technology focus. As a result, the remit of the activity was quickly broadened to cater to all student-led enterprises emerging from the university.

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<sup>46</sup> Imperial Entrepreneurs, <http://imperialentrepreneurs.com>

<sup>47</sup> Finance Society, <https://www.financesociety.co.uk>

<sup>48</sup> Imperial Hub, <http://www.imperialhub.org>

<sup>49</sup> e.quinox, <http://www.e.quinox.org>

<sup>50</sup> BBOX, <http://www.bbox.co.uk/index.php>

In the 2012/13 academic year, the first of its official operation, ICStartup offered a suite of E&I activities including networking events, a business plan competition and mentorship of startup teams. Key student-led partners, primarily Imperial Entrepreneurs and the Imperial Hub, supported its design and delivery, with 200 students participating in the business plan competition. However, organisers were concerned that the activities were “*preaching to the converted*”, with “*70% of participants already engaged in entrepreneurship in some way*” and a limited focus on seeding entrepreneurial ambitions across the wider student body. They also saw opportunities to improve students’ problem-solving skills and create an environment where participants could develop new startup ideas.

Summer/Autumn 2013, the period during which this case study evaluation was compiled, saw a step-change in the ambition, vision and design of the accelerator, which was re-branded as ‘Imperial Create Lab’. Its mission is “*bring together the innovators, makers and game-changers to hack, learn and build things that matter*”.<sup>51</sup> A formal governance structure was established, providing “*oversight and strategic support*” from the university and key student-led organisations. Despite this new formal structure, however, Imperial Create Lab was seen to maintain “*the feel of a startup*”, grass-roots activities delivered by a passionate group of individuals on a voluntary basis. On the basis of the lessons learnt during the previous year, Imperial Create Lab was significantly redesigned, and its focus “*re-pitched to cater for people with no previous experience in entrepreneurship*”. Four key demographic groups were identified as the key targets for the activity. Activities were subsequently designed to both resonate with and benefit each group, which comprise: (i) students with established entrepreneurial interests and skills, (ii) “*career focused students*” who are only likely to engage with entrepreneurship “*if they could see how it would enhance their CV and improve their employability*”, (iii) “*subject focused students*” who bring passion and disciplinary knowledge, but often “*struggle to identify a startup idea*”, and (iv) recent university graduates with a desire to develop an alternative career path. With these four groups in mind, the structure and focus of Imperial Create Lab was redefined to incorporate, for example, a greater focus on low-entry social events that introduce participants to the “*idea of a startup*”, hands-on activities that “*expose [participants] to real-world challenges with the potential for startup ideas*”, and programme elements “*that have a clear value that would easily translate onto a graduate CV*”. Imperial Create Lab now hosts regular informal entrepreneurship events as well as the Venture Catalyst Challenge, a six-week intensive accelerator programme. Further details on the 2013/14 Imperial Create Lab format and content are provided in Table 3.

By late 2013, 1300 users had signed up on the Imperial Create Lab media channel, representing around 10% of the university student population, and a significant number have already applied for the 2014 Venture Catalyst Challenge. With funding for Imperial Create Lab running until 2015, there is a keen awareness that the initiative has “*eighteen months to prove its worth*” and demonstrate the market for its future growth.

This section has identified three important areas of strategic development at Imperial College. They provide the context in which the university has developed its E&I strengths and form the basis of the three key components of Imperial’s E&I infrastructure, as outlined in Section B.3.

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<sup>51</sup> Imperial Create Lab, <http://www.imperialcreatelab.com>

## B.3 University approach to entrepreneurship

### B.3.1 University E&I strategy and IP policy

In line with the common structure adopted for all case study evaluations in this benchmarking study, this Section looks in turn at the approach taken by the university's technology transfer office and the university's E&I strategy.

**Strategy of technology transfer office (or equivalent):** Imperial College has taken an unusual approach to research commercialisation, with its technology transfer activities undertaken by an independent, publicly-listed company, Imperial Innovations. Imperial Innovations brings together two key functions:

1. **Technology transfer office:** Technology transfer services are provided exclusively to Imperial College staff and students that, in line with common practice in UK universities, are part-funded by the UK government's *Higher Education Innovation Fund (HEIF)*. Receiving around 350 invention disclosures per year, the technology transfer business is focused on *"acting as a business partner to the inventor and getting to the bottom of the economics of the idea. We protect the idea, work with the inventor to find proof of concept funding and then carry out an evaluation"*. Imperial Innovations have a target of 30 days *"to decide whether to take up an idea from an academic, otherwise, ownership is passed back to the inventor"*. For ideas that are taken forward, one of two routes is taken:
  - a. **Licensing:** Imperial Innovations *"chooses the path to licensing for a product with an obvious partner"*. Contrasting their approach to other universities, the Imperial Innovations model is described as *"not formulaic. All you want is a fair reflection of what each partner is bringing. Both parties need to be flexible"*. Imperial Innovations sign around 20 licences each year.
  - b. **Formation of new companies:** The startup route is selected for *"technology with a number of applications that needs a dedicated management team for development"*. The technology transfer team will *"provide seed funding to get the business up and running, recruit the management team, put the Board together and raise money for the company; we are the business founder along with the inventor"*.
2. **Ventures:** The Ventures arm of the business builds and invests in technology and healthcare business emerging from the University of Cambridge, University of Oxford, University College London and Imperial College. The Ventures team was described as employing *"the same types of people with the same background as most other venture firms. The difference is that the deal flow comes from a specific background"*. Interviewees from the company also distinguished its Ventures approach from *"traditional venture capital funds"* by emphasising its *"long-term, sustainable"* approach to supporting new enterprises: *"we are creating businesses rather than a fund. Seed funds, business angels, they are all funds. Although they may be as long as seven years, this is still short-term in the life of a company and therefore you get short-term behaviour... The last man standing gets the returns and we are committed to these companies in the long term"*

As suggested above, the Imperial Innovations approach differs from conventional technology transfer models in a number of respects. In particular, its dual role of investor and technology transfer agent was reported to afford the company significant advantages. For example, the company was seen to be in an unusually strong position to secure high-calibre, experienced staff, due to both its ability to offer competitive salaries and the appeal of its world-class portfolio; *"you attract great managers by having*

great investment opportunities”. Its capacity to both “identify an idea and then invest in it” was also seen to allow the company to “play the long game. By making our own investments, we are able to have a more stable relationship with the companies and therefore reap the reward when the returns come”. This long-term relationship necessitated Imperial Innovations taking a “highly selective approach” to supporting new enterprises, where “we need to fail early, and concentrate on things of value”. It also was seen to bring “an added incentive [for Imperial Innovations] to bring in world-class managers at the earliest stage” and “to take a much more active role in terms of founding the business and creating the team”. So, for example, through the Entrepreneurs in Residence scheme, Imperial Innovations employs business professionals on a part-time basis to “work with inventors, helping them to develop a team and grow the business”.

**E&I strategy and promotions policy:** In reference to Imperial College’s E&I policy and approach, many interviews made a clear distinction between *innovation* and *entrepreneurship*. Innovation was noted by many to be integral to the university mission, with clear lines of responsibility for its management and delivery within university senior management: “Imperial’s vision is about innovation to solve industry needs. That is their brand. It is what the university is all about”. As explored further in Section 5, Imperial College’s innovation approach draws on many components and is widely viewed to be highly effective. Entrepreneurship, on the other hand, was described in different terms. Almost every interviewee, including many within the university senior management, were straightforward in their acknowledgement that the College had yet to articulate an explicit entrepreneurship strategy. This has been acknowledged as a priority and foundations for the university’s strategic approach are further discussed in Section B.6.

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### B.3.2 University infrastructure supporting entrepreneurship

Imperial College’s infrastructure supporting entrepreneurship<sup>52</sup> amongst its engineering/technology-based staff and student populations can be considered in three broad categories, as outlined below. Where Section B.2 described the historical development of each of these three areas, this Section will look in more detail at how they cohere in an overarching E&I infrastructure.

1. **Activities supporting research-led, multidisciplinary innovation:** Imperial College hosts an impressive range of facilities and functions that support and nurture industry-informed, cross-disciplinary, research-led innovation. Although most are not designed to support entrepreneurship specifically, many interviewees noted that the university’s innovation output was the foundation stone for its entrepreneurial capabilities. The components supporting this multi-disciplinary, research and innovation culture most often cited by interviewees include: (i) Imperial Consultants, one of the world’s leading university-based consultancy services with revenues of £22m per year, and (ii) the ClimateKIC, an initiative to support E&I activities that respond to the challenge of climate change.
2. **Activities/functions supporting faculty/researcher entrepreneurship:** The major vehicle for supporting research commercialisation amongst the university’s faculty/researcher populations is Imperial Innovations. The company is very clear, however, that “we do not do entrepreneurship. That goes on within Imperial, within the Business School. That is not our area. We only deal with investment and business creation, which is measured and careful and very different from the risk-taking perception of an entrepreneur”. From 2016, E&I activities at Imperial College will also be supported by the new Imperial West campus.

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<sup>52</sup> Activities, courses and societies that primarily cater to individuals within the Imperial College Business School or external corporate partners are not considered here, due to the study’s principal focus on engineering and technology.



**3. Activities/functions supporting student entrepreneurship:** The elements of student entrepreneurship support at the university, available to those within the engineering and technology disciplines, are (i) two optional entrepreneurship courses, delivered by the Business School and the Department of Mechanical Engineering respectively, (ii) two student-led societies: Imperial Entrepreneurs and Imperial College Design Collective, and (iii) the recently established Imperial Create Lab, an organisation offering social networking events, mentorship and workshops in new venture creation.

Further details of the components of the Imperial College E&I infrastructure are provided in Table 3.

Open-access university centre providing entrepreneurship support and advice	
Imperial Create Lab	<p>Officially established in 2012, Imperial Create Lab offers entrepreneurship support, development and mentorship to Imperial students and recent graduates. Re-designed for the 2013/14 academic year, the initiative incorporates three key elements:</p> <ul style="list-style-type: none"> <li>• <b>Events:</b> Imperial Create Lab hosts regular events, many of which are focused on networking and the generation of science and technology-driven startup ideas. Events include <i>Invent the Future</i>, half-day sessions where participants develop new ideas for concepts or products, and <i>Business Labs</i>, sessions where Business MBA students from Imperial College provide one-to-one support and advice to new startup teams.</li> <li>• <b>Venture Catalyst Challenge:</b> a six-week programme providing ten hours per week of structured tuition and mentorship to “turn ideas into successful products”. Applications are open to university students and recent graduates, with 60 places available each year.</li> <li>• <b>Community cohesion:</b> Imperial Create Lab plays an important role in bringing together Imperial’s student entrepreneurship community and connecting this group with the regional startup community. Through informal networking events and active social media channels, community connections have grown significantly in the past 12 months.</li> </ul>
Entrepreneurship courses offered in engineering and technology disciplines	
Design-led innovation and new venture creation	Established in 2009, this elective is offered in partnership with the Royal College of Art and is open to all third and fourth year engineering students. Course participants are asked to “develop a value proposition to wicked problems, then develop an enterprise solution”. Around 150 students enrolled on this course during the academic year 2012/13.
BPES elective in entrepreneurship	BPES (Business for Professional Engineers and Scientists) is an entrepreneurship elective provided by the Business school, enrolling 400-450 science and engineering students each year. Established in 2002, the ten-week course follows the entrepreneurship process, as student teams generate and develop a business idea. The course ends with teams “pitching to an expert panel”.
Student-led entrepreneurship clubs and societies	
Imperial Entrepreneurs	Formed in 2006, the membership of this student-led entrepreneurship society now stands at 200. It hosts around 50 events per year, such as a weekly presentation and social event (StartUp Mondays) which regularly attracts 15-10 participants and the hosting of the 2012 London StartUp Weekend which attracted 65 participants.
Imperial Design Collective (IDC)	This student society was established by a group of Mechanical Engineering undergraduates in October 2012. With a current membership of 65, it seeks to develop “a creative engineering spirit.. blending design and technology to show students what opportunities are out there and how they might create jobs through starting their own business”.
University accelerator/incubator	
Imperial Incubator	Established in 2006, the Imperial Incubator is an on-campus facility managed by Imperial Innovations, providing 12 laboratories and 22 offices.
Other	
Entrepreneurship Hub	Based within the Business School, the Entrepreneurship Hub “translates new insights developed by the academic community into practical tools and guidelines for entrepreneurs and managers active in the areas of innovation, entrepreneurship and design”. In addition to its research portfolio, the Hub offers a number of entrepreneurship courses, including the Innovation, Entrepreneurship and Design course. Since 2012/13, entry to this course has been restricted to MBA students, although any Imperial student or alumnus is still able to submit project ideas.
Imperial Consultants	Established in 1990, Imperial Consultants is a wholly owned subsidiary of Imperial College described as “the UK’s leading academic research consultancy provider”.
Imperial West	A new Imperial College campus in West London is currently under construction, to be completed in 2016. The project represents a £150m investment in E&I through construction costs alone. The site will incorporate multidisciplinary research centres and incubation pods.
ClimateKIC	Imperial College is the UK hub for the Knowledge and Innovation Community (KIC) on Climate Change. Established in 2010, it aims to “spark and deliver innovative and imaginative solutions to climate change” providing support for innovations and startup ideas in this field.

**Table 3. Key E&I components at Imperial College, outside those primarily focused within the Business School.**

## B.4 Achievements and impact

This Section considers Imperial College's innovation and entrepreneurship performance through two lenses: (i) impact through corporate engagement, (ii) impact through commercialisation.

Although the university is in the process of establishing data systems to capture corporate innovation and student and alumni entrepreneurship activity, this information will not be available until late 2014 and therefore is not included here. Participation rates in Imperial Entrepreneurs (the on-campus student-led entrepreneurship society) and Imperial Create Lab (the new university-backed support programme and startup accelerator), however, indicate a sharp increase in entrepreneurship engagement amongst Imperial College students in recent years. Similarly, the College is also looking more closely at its inventive output owned by corporate research funders. As an institution with considerable industrial research funding and agreements where the IP ownership often lies with the funding company, Imperial is aware that a proportion of its innovative activity is typically not captured by traditional UK university statistics.

### B.4.1 Impact through corporate engagement

Two components of Imperial College's impact through corporate engagement are considered below: (i) industrially-funded research, and (ii) academic consultancy.

Three universities dominate the UK market for **corporate funded research** – Imperial College, the University of Oxford and the University of Cambridge. Between them, these institutions account for up to a quarter of the total commercial funding received by UK universities for research purposes. In 2011/12, Imperial College drew an annual research income of around £314m, of which approximately 13% (£40m) was sourced from commercial organisations (see Figure 18).

**Consultancy** plays an increasingly important role in Imperial College's annual industry income. In 2012/13, Imperial Consultants attracted an income of £22m, an increase of 60% in two years. This figure does not represent the total value of consultancy contracts conducted by researchers and faculty at the university, as there is no obligation for staff to take their consultancy through Imperial Consultants. Nonetheless, as a number of interviewees noted, *“the university is probably picking up 50-60% of the consultancy work rather than around 10% in other universities”*. Many attributed the higher level of engagement with university-brokered consultancy at Imperial College to the *“trust that staff feel in Imperial Consultants and the professionalism of their organisation”*.

### B.4.2 Impact through commercialisation

Figure 19 provides an overview of the technology commercialisation activity and performance at Imperial Innovations over the past decade, tracking spinouts, licences<sup>53</sup> and investments.<sup>54</sup> These data should be viewed in the context of the significant organisational changes within Imperial Innovations over the past decade, which accounts for some of the 'spikes' during the mid-2000s.

<sup>53</sup> Licensing data is only available from 2004

<sup>54</sup> It should be noted that, since 2011, the investment data includes investments in the University of Cambridge, the University of Oxford and University College London, in addition to Imperial College.

<sup>55</sup> *Imperial College Ten Years of Success*, available at <http://www.imperialinnovations.co.uk/media/uploads/files/tenyearsofsuccess.pdf>

<sup>56</sup> *Imperial Innovations Group plc Annual Report 2012*, available at <http://www.imperialinnovations.co.uk/investor-relations/>

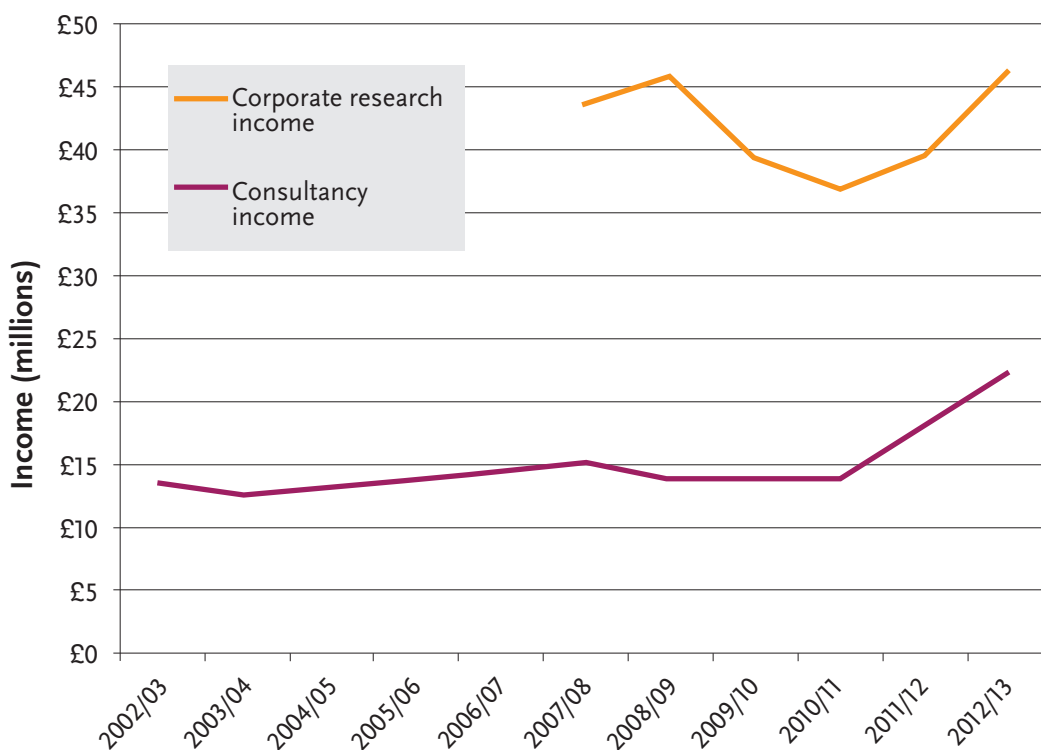


Figure 18. Imperial College industrial income: total industrial research grants and contracts 2007/08–2012/13, shown in orange (source: Higher Education Business and Community Interaction Survey) and consultancy income, 2002/03–2012/13 shown in purple (source: Imperial Consultants). Note: a breakdown of total corporate research income to Imperial College is only available from 2007/08 onwards.

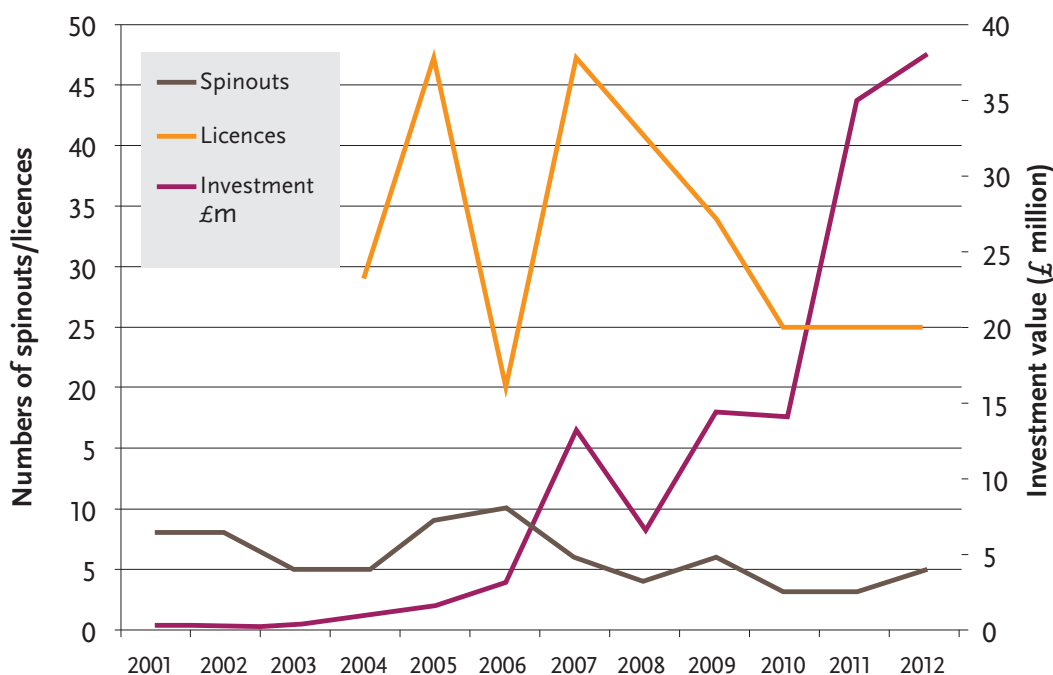


Figure 19. Ten-year performance of technology transfer at Imperial Innovations (Source: *Imperial College Ten Years of Success*<sup>55</sup> and *Imperial Innovations Group plc Annual Report 2012*).<sup>56</sup>

Within the UK context, Imperial College is one of the strongest performers in the establishment of university spinout companies; according to Spinouts UK, Imperial College ranks only second to the University of Oxford in the total number of spinouts produced since 2000 (93 spinouts are attributed to Oxford and 88 are attributed to Imperial).

Although Imperial College performs strongly in both licensing and spinouts, what distinguishes the university from its UK peers *“is its ability to generate public and private investment”*. As illustrated below, the investment portfolio valuation at Imperial College is significantly higher than its two closest peers:

1. Imperial College London – Investment valuations as at October 2012 **£156m**<sup>56</sup>
2. University of Oxford – Investment valuations as at July 2012 **£45m**<sup>57</sup>
3. University of Cambridge – Investment valuations as at 31 July 2012 **£19m**<sup>58</sup>

It should be noted that, since 2011, Imperial Innovations’ portfolio has included investments in spinouts from the Universities of Oxford, Cambridge and University College London. However, as evidenced in Figure 19, before this expansion, Imperial Innovations investments were already strong and rising rapidly. Some of the success of Imperial Innovations may perhaps be attributed to their central London location, and therefore access to ‘smart’ investors, experienced advisors and mentors and a large pool of potential customers. However, many interviewees also noted *“the professional approach to setting up Imperial Innovations and the bold decision to act like (and be) a company who answers to shareholders looking for a financial return”* and their associated success in raising finance as two major contributors to their pre-eminence in securing investment.

## B.5 Success factors

The interviews indicated that five inter-related factors underpin Imperial College’s strength in E&I. Each factor is outlined below.

**World-class science and technology base.** Many interviewees noted both the scale and quality of the science and technology research base at Imperial College, which was described as *“unrivaled across Europe”*. The university was described as being *“one of the world’s great centres of learning and research”* which is a magnet for *“the highest calibre of researchers and students from all corners of the world”*. The integration of science and engineering research with a world-class business school was also considered to offer the university exceptional capacity for technology-driven entrepreneurship; *“to focus on STEM and Business is as good as it gets for commercialisation”*. The pursuit of scientific excellence was seen to be hardwired into the university, driven by a pioneering culture which *“pushed technical and scientific boundaries... and floods through to all parts of the College, the teaching and the research”*. These observations are supported by external evaluations of the university’s performance. For example, Imperial College is consistently placed within the world’s top ten in the international universities rankings.<sup>59</sup> In addition, the most recent national assessment of university research quality<sup>60</sup> judged Imperial College to be home to the highest proportion of ‘world-leading’ and ‘internationally excellent’ research activities of any university in the UK.

<sup>56</sup> *ISIS Innovations Annual Report 2012*, <http://www.isis-innovation.com/documents/IsisAnnualReport2012.pdf>

<sup>58</sup> *Cambridge Enterprise Annual Review 2012*, available at <http://www.enterprise.cam.ac.uk/performance/annual-reviews/>

<sup>59</sup> Imperial College was ranked in fifth position in the 2013 QS World’s Best Universities Ranking and in tenth position in the 2013-2014 *Times Higher Education World University Rankings*.

<sup>60</sup> *Research Assessment Exercise 2008*, <http://www.rae.ac.uk>

**The long-standing emphasis on the application of knowledge.** For many interviewees, particularly those from within the university itself, Imperial's greatest strength as an entrepreneurial institution stems from its long-standing emphasis on innovation and the application of scientific knowledge to the benefit of industry and society at large. As one senior manager noted, *"the College has had a focus on the application of science from the beginnings of its foundations. For most universities, this focus came later. For Imperial, it was there from the formation of our charter. This has influenced progressive generations of academics in a virtuous cycle for the past century"*. Many observed that *"a culture that is fundamentally about innovation pervades the College"*, where *"many academics see industrial engagement as the input – as well as the outcome side – of their work, helping to identify research questions to focus their attention on"*. In consequence, and in contrast its national peers, it was suggested that Imperial's researchers exhibit an openness to scientific commercialisation; as one interviewee commented, *"unlike Oxford and Cambridge, you won't find anyone coming out against entrepreneurship. [Faculty] may not all want to be involved, but they will not resist others engaging"*. Indeed, an interviewee from UK industry noted, *"compared to other UK universities, Imperial academics are less reluctant to be sullied by the dirty issue of money"*.

An additional consequence of the university's innovation culture has been the formation of an *"exceptionally strong set of industrial ties"*, helping to establish Imperial College as the one of the largest academic recipients of corporate research funding outside the US. In turn, these industry linkages have further strengthened *"academics' understanding of how their research can be applied and [their ability to] recognise the commercial opportunities of their work"*. To some, this distinctive, industry-focused culture at Imperial College is exemplified by the *"embedded research centres"* which have been established across the university in partnership with strategic partners such as BP and Rolls Royce. As one senior university manager commented, *"although [these centres] are not unique in the UK, it is certainly unusual and you won't find the concentration of these kind of embedded businesses in any other UK university. This has helped to breed an entrepreneurially-minded type of person"*.

**Multi-disciplinary approach to innovation.** Many interviewees noted Imperial's *"inter-disciplinary attitude to research and innovation on campus"*, which is undoubtedly supported by the co-location of the science and technology disciplines within a tightly constrained campus footprint. A high degree of *"cross-fertilisation between research ideas, disciplines and industry contacts"* is apparent across campus; an approach which is emphatically endorsed and supported by the university at the highest level. Imperial now boasts several multidisciplinary centres and institutes with wide ranging thematic foci from biomedical engineering to mobile applications, synthetic biology and transport, and from energy and the environment, to health, security and climate change.

Arguably, an agency that has played one of the greatest roles in nurturing this cross-disciplinary landscape for university-industry interaction is Imperial Consultants, the on-campus academic consultancy service. One interviewee described Imperial Consultants as a channel through which *"you are able to think about your knowledge and your research in a completely different way, hooking you up with very different people [from] inside and outside the College"*. Interview feedback suggested that the interdisciplinary collaborations and industry networks established as a result of Imperial Consultants' consultancy work have been the springboard for a number of the university's major research projects. Imperial Consultants has been *"incredibly successful in gaining the trust of the academics"* and, in consequence, *"earns six times more money than any other university in the UK in consultancy"*, due to the high participation rates by faculty. Imperial Consultants also benefits from an *"official and explicit rule at the College that 20% of the [salaried] time of an academic can be spent on College activity, but outside their departmental, research and teaching duties"*.

**Lean, dynamic institutional approach.** Interviewees characterised Imperial College as a *"tightly-run, highly-structured university, where it is possible to make decisions ... There is something purposeful about how*

*Imperial runs itself*". As such, interview feedback suggested that the university was *"lean and dynamic"* with the ability to react quickly and decisively to shifts in the external and internal landscape. Some noted that Imperial College's responsive capability has been facilitated by the relatively narrow focus of the university's disciplinary base – with *"no arts or humanities to worry about"* – as well as the relatively small size of the university compared to some of its national and international peers. While cautioning against *"crediting all of our success to one single leader"*, others also acknowledged the positive impact of the major structural changes implemented by Richard Sykes, the university Rector from 2001-2008, from which the university continues to benefit; *"things happened on his watch"*. As one senior university manager noted, *"Richard Sykes would not let it go. He had a view of where Imperial needed to be and pushed, even if it was painful. Without it, we would be financially and reputationally weaker"*.

Many interviewees also commented that Imperial College emerged from these reforms with a more *"entrepreneurial attitude"* to its own development, and a willingness and capacity to bring together expertise from across disciplines to *"tackle many of the emerging challenges facing society and industry today"*. For some, this dynamism and adaptability is also built of necessity; the Imperial College endowment is significantly smaller than any other institution within the world's top ten.<sup>61</sup> In consequence, it is not a university capable of *"managing the peaks and troughs... so we have needed to take risks to survive"*. This *"entrepreneurial university attitude"* was seen to be an increasingly valuable asset within an international higher education landscape that is set for rapid change in the coming decade.

**Reputation of Imperial Innovations and the Imperial College Business School.** Imperial College's position as a leading entrepreneurial institution is particularly linked to the profile of two operations: Imperial Innovations and the Imperial College Business School. Imperial Innovations is highly-regarded within the university technology transfer community, both nationally and internationally. Its reputation appears to be based on two factors. Firstly, it is noted for its *"highly professional approach to technology transfer"* and *"incredible success in raising finance for startups"*. In consequence some interviewees identified Imperial Innovations as *"probably the best technology transfer office in the UK"*. Secondly, its international profile has been enhanced by its relatively unconventional relationship with Imperial College: *"it is certainly unusual for a university to sell shares privately and publicly in a company it has formed with its own brand name attached"*. Their approach was described by one interviewee as *"a novel, and so far successful, experiment"* which is being *"watched with great interest"* by universities across the world.

In addition, the reputation of the Imperial College Business School has grown significantly over the past decade. Interviewees pointed, in particular, to its research activities in *"entrepreneurship and how it relates to science, technology and medicine"* as *"world leading"*. Although most interviewees noted that the Business School *"has only a marginal impact on the [localised] entrepreneurship strategies and activities within the College"*, there is no doubting its national and international influence on the innovation and entrepreneurship agenda within government and the corporate sector as well as across the E&I academic research community. This, in turn, has had a very significant impact on the university's reputation as a major centre for innovation and entrepreneurship expertise.

These five factors – world-class scientific and technological research, long-established engagement with global industry, multidisciplinary approach to innovation, forward-thinking leadership and organisation and internationally-recognised centres of knowledge and expertise in technology transfer and academic entrepreneurship – build on and complement each other. They have combined to position Imperial College as what is widely regarded as one of Europe's leading entrepreneurial universities.

<sup>61</sup> Amongst the top ten universities in the 2012-13 *Times Higher Education World University Rankings*, Imperial College holds the smallest endowment (standing at approximately US\$200m) followed by that of Caltech (which stood at US\$1.8b in 2012/13).

## B.6 On-going issues and challenges

Without doubt, Imperial College offers “one of the best industry-informed research environments in the world”, supported by a range of long-term strategic corporate relationships. Some interviewees noted, however, that this primary focus on large corporate engagement creates an environment not necessarily conducive to the development of risk-taking, entrepreneurial behaviour amongst its student and staff populations. The comments of this interviewee are typical of many: “there is a difference between advancing a domain and developing an enterprise culture that is small-business-oriented. Imperial is well suited to feeding large business. Staff are comfortable with that”. As another faculty member commented, “we work with the mature technology sector; mature and stable. We do the backbone. We are not necessarily edgy”. Interviewee feedback suggested that two particular issues are holding back ecosystem growth within the engineering and technology disciplines, potential barriers that may disproportionately affect the university’s undergraduate and postgraduate populations. These relate in turn to the **culture supporting entrepreneurship within the university** and the **visibility of the entrepreneurial community on campus**. Each issue is discussed below.

### B.6.1 Extension of an entrepreneurial culture across campus

Imperial Innovations plays an important role in identifying and exploiting high-potential ideas emerging from the university’s research community. The members of the Imperial College community engaged with Imperial Innovations in these activities are typically “highly influenced by the experience, becoming much more commercially aware” as a result. However, they are almost exclusively faculty and this group “represents a tiny proportion of the staff and students in the university and the entrepreneurial mind-set is slow to extend beyond them”. The university is clearly committed to broadening and strengthening this entrepreneurial mindset across campus, but is aware that, to date, its resources have been concentrated on a small proportion of the potential pool of its innovation talent ‘pipeline’, across the student, staff and alumni populations. Three particular challenges to the further development of an entrepreneurial culture were highlighted during the interviews, as outlined below.

The first challenge relates to the **university’s entrepreneurial strategy and governance**. There was a strong consensus amongst Imperial-based interviewees, including many from the university’s senior management, that “there is no [top down] entrepreneurship strategy at Imperial” and “no one in senior management has had an explicit mandate to grow this agenda”. Some interviewees track the origins of Imperial College’s lack of clear entrepreneurship agenda back to the mid-2000s, with the separation of Imperial Innovations from the university and the blossoming of the entrepreneurship research group within the Business School. As a result of the success and strong external profile of these centres, interviewees suggested that “the university sees commercialisation and entrepreneurship as the responsibility of Innovations and the Business School. It is as if this function has been outsourced”. However, these two organisations are widely seen to cater to only a small subsection of the university population – “a tiny handful of the best researchers and MBA students [respectively]”. Without a clear mandate in entrepreneurship within the university, some reported that “the policies of Imperial Innovations and the policies of Imperial have become synonymous”, leading to a culture where “only university-protected IP is seen as worthwhile”. As one interviewee commented, “Innovations focus on a narrow pipeline of research IP, to make a profit. Their obligation has to be to their shareholders. But the College strategy should be different. We need a facilitative, unregulated and inclusive model. Innovations is the goose that may lay the golden egg but the College should be more interested in volume”. As a result, interviewees reported that “there is nowhere [on campus] that you can just go for informal advice and information” about startup ideas or the development of entrepreneurship skills. Indeed, interviewees from the London-based entrepreneurial community described the infrastructure supporting Imperial College’s entrepreneurship activities

as “fragmented”, where is it “very hard to know who to deal with” or “find a point of contact within the university itself”.

The second issue relates to the **ownership of student IP and the practice of ‘concealed entrepreneurship’**. Many interviewees discussed the tight controls that appear to be exerted over student IP at Imperial College. Feedback from the student interviewees suggested a significant lack of clarity over their IP ownership rights and many reported being given informal advice by staff and students within the university to “keep my ideas to myself, mention them to no one [within the university] and set something up that is completely independent of Imperial”. There appeared to be a broad distrust of Imperial College and Imperial Innovations amongst the student body, reinforced by “scare stories about students having to turn up with lawyers” to defend the IP ownership of their startup. As a result, interviewees from within and outside the university discussed the practice of “concealed entrepreneurship”, where undergraduates and postgraduates deliberately establish startup activities in isolation from the university because they perceived that their “idea will be taken by [Imperial] Innovations”. As such, some of the university’s most entrepreneurially-minded individuals are intentionally taking their ideas off campus. Despite some concerns about “IP leakage through the student body” expressed by some within the university, the vast majority of interviewees voiced the need for “a more open and permissive attitude to student IP... We are not benefitting financially from the current system – I don’t think Imperial has ever made money from the commercialisation of a student idea – we have only succeeded in disengaging them completely”.

The third issue relates to **attitudes to and perceptions of entrepreneurship amongst science and technology students**. Historically, Imperial College’s science and engineering graduates have been a significant target for recruitment within the financial-services industry in the City of London, with this sector offering very high starting salaries. As one Imperial alumnus commented, “the biggest draw for the most talented students [at Imperial] is the City. Engineering definitely comes second. If you look around in London, the most successful people are in finance. They are not the engineers or even the entrepreneurs. They are the brokers. The money men. That is what you see as a student”. The financial sector is highly visible within the student community on campus, providing sponsorship for the careers service events and mail-outs. Indeed, the largest student society at Imperial is now the Imperial Finance Society, which provides support for securing summer internships – increasingly vital for those wishing to follow a career in financial services – from the first year of study onwards. Perhaps as a result, many technology-based students appear to identify two primary career options apparent to them, “either go and work at a financial institution in the City or stay with engineering, do a PhD or go and work in an engineering company”. One engineering student articulated this distinction in even starker terms: “selling out and just following the money or sticking with the subject that I have always loved and spend my life actually making things”. What is interesting is that many students appear to associate entrepreneurship with the first of these options – a career in finance – rather than a career that aligns with their interests and capabilities in science and technology. Two reasons for this perception appear to be a lack of accessible role models in technology-driven entrepreneurship and “a cultural emphasis on only backing entrepreneurship that will lead to wealth creation”.

Imperial College are well aware of the issues highlighted above and are committed to addressing them. Indeed, this case study appears to have been compiled during a period of considerable change at the university, with a number of significant initiatives and interventions either under discussion or in the process of implementation. For example, the Business School is poised to play a more significant role in supporting E&I across the College, expanding its focus from the suite of entrepreneurship courses, activities and support functions offered to its MBA students.



One intervention, however, that is currently being rolled out has the potential to address several of the issues noted above. The Imperial Create Lab was first launched in 2011 as a pilot, under the original name of IC Startup, to “*empower Imperial students with the opportunity to tread a different path, test out entrepreneurship, build a fantastic network, get the skills needed to create things and make an impact on the world*”. The initiative was originally established as a student business plan development programme focused on accelerating a new generation of emerging digital and software startup ideas from both faculty and students. Over the past 12 months, however, Imperial Create Lab has grown considerably in ambition and is poised to create a vibrant on-campus student-led community for entrepreneurship which actively embraces the regional entrepreneurial community. In particular, the project is seeking to broaden its scope from “*just a business plan competition, which only caters to people who already have a startup idea, to [cater for] all students, helping them to think about different career paths open to them*”. Indeed, within the six-month period of evidence-gathering for the Imperial College case study, a marked increase in awareness and engagement with Imperial Create Lab was apparent from the interviewees, particularly from those amongst the student/alumni populations and within the regional entrepreneurial community. The design of Imperial Create Lab has been built on a thoughtful assessment of the regional entrepreneurial environment and the particular needs and expectations of the student population at Imperial College. In consequence, the initiative is directly targeting key issues such as student IP rights and the visibility of alumni role-model entrepreneurs.

During the time of compiling this case study and in response to growing student-led demand for innovation and entrepreneurship support, Imperial College has brought together all of the major internal players in its entrepreneurial community to look strategically at current and future E&I development: the Business School (representing enterprise education); Imperial's Design Engineering Group (representing this interest and relations with Innovation Design Engineering at the RCA); Imperial Innovations (representing technology transfer and investment); the Student Union (representing innovation, entrepreneurship and design-oriented student societies); and Imperial ThinkSpace (representing acceleration and incubation support in the context of the emerging Imperial West campus). The coordination is being chaired centrally within the College's senior management team, with a focus on providing clear university oversight and coordinated direction in design, delivery and impact evaluation.

The challenge now remains for the College to continue to rebalance its strategy to support entrepreneurship away from any one constituent academic or business unit, into an embedded approach that fosters a greater sense of common purpose across the full spectrum of staff and students, as well as a common sense of ‘community’ in E&I.

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### **B.6.2 Establishment of a visible, on-campus, entrepreneurial community**

Imperial College is a “*trusted partner of the mature corporate technology world*”, and these strategic relationships are highly visible and cut across each department and cross-disciplinary research centre in the university. One of the most striking features of the case studies interviews was the lack of visibility of an equivalent technology-based entrepreneurial community on campus: venture capitalists, angel investors, alumni entrepreneurs, local incubators/accelerators, etc. There appear to be very few entrepreneurial stakeholders visiting campus and the connections between the regional startup community and the technology-based university staff and students appear limited. As one illustration, almost every student and alumni entrepreneur interviewed for this study had sourced their network of investors and support community independently from the university. The causes of this apparent lack of community appear to be threefold, as outlined below.

The first challenge is simply a factor of geography: **Imperial is located in one of the most expensive footprints in the world** and the establishment of new small-scale startups in this vicinity is “*almost impossible*”. Most university-related startups (from Imperial staff, students or alumni) are therefore widely scattered. Without a strong geographical clustering, the development of a cross-fertilising community which attracts and nurtures new talent is particularly challenging. In addition, interviewees did not draw a consistent picture of the location of Imperial’s entrepreneurial ecosystem; instead, it varied from the localised South Kensington postcode, to the greater London area, to the ‘golden triangle’ bounded by Oxford, Cambridge and London, to the country as a whole. Such divergence of view may present a challenge to the College as it seeks to strengthen its entrepreneurial community in the future.

The second challenge relates to the **population of alumni entrepreneurs and their relationship with the university**. Many interviewees noted that Imperial “*does not do a good job at tracking our alumni*”. Although anecdotal evidence suggests that alumni do indeed go on to establish successful startup businesses, Imperial College has not yet been able to identify and connect with this community on any scale. Tracking alumni from Imperial College represents a particular challenge because of the very high proportion of non-EU students studying at the College; due to government visa restrictions, a decreasing proportion of this population now remain in the UK. Alumni success stories are therefore not visible to current generations of students. As one alumnus entrepreneur commented, “*people are not inspired by the ideas of entrepreneurship per se, they are inspired by seeing entrepreneurs. But I did not see any as a student. There were no stories coming down through student folklore about successful entrepreneurs. We were all on our own*”. Others went on to note that, “*if Imperial invited us back [to campus], we would be there in a shot. We are just waiting for the call...*”. The university recognises the challenge of tracking and connecting with their alumni, and are currently “*up-scaling the alumni team*” to develop more coherent and robust methods to manage this process.

The third challenge relates to **university relationships with the regional, national and international entrepreneurial community**. Most Imperial College relationships with the external entrepreneurial community appear to be nurtured and maintained by Imperial Innovations. As a result, many interviewees suggested that the entrepreneurial community is “*held at arm’s length*” from the university and the relationship formed tended to “*focus on specific projects rather than creating informal opportunities for them to mix with staff and students*”. A small number of interviewees took this point further, suggesting that “*the protected position of Innovations has put VCs off getting involved with the College*”, particularly where the broker to this relationship appears, externally, to be Imperial Innovations themselves. As one example, many interviewees noted that Imperial’s relationships with London’s key entrepreneurial hub, Tech City, were very limited, particularly “*if you are talking about the real startup activities, on the ground*”. With Imperial Innovations “*taking a step away from the College*” following its partnership agreement with Oxford, Cambridge and University College London in 2011, some within Imperial suggested that “*now is the time for the College to assert its own position and establish its own network from which we all can benefit*”.

The Imperial West campus development, which is currently under construction, has the potential to help address each of the issues addressed above. In addition to accommodating “*top ten global organisations within key sectors*”, the new 23-acre site will seek to offer significant capacity for “*translational university research*” alongside competitively-priced spaces for new startups. Particular efforts will be dedicated to encouraging Imperial alumni to occupy this space. The site is designed to establish a vibrant, world-class E&I community within “*an environment that manages and embraces failure ... and welcomes the dreamers*”. Through Imperial West, Imperial College is seeking to nurture a localised region for cross-fertilisation between corporate “*sector leaders*”, the university’s research and student populations and the broader entrepreneurial community. As one senior university manager commented “*there will always*

*be a limit to what we can do with ten acres on Imperial campus, but suddenly we have this new opportunity [through Imperial West] to expand our translational activities and entrepreneurship will be a big part of that”.*

With this and other developments, Imperial College is clearly embarking on a new and very exciting phase in its evolution as a world-leading, internationally-recognised entrepreneurial university.

# APPENDIX C

## TUSUR CASE STUDY

## C.1 Ecosystem context

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### C.1.1 The university: key features

Tomsk State University of Control Systems and Radioelectronics (TUSUR) was founded in 1962. A specialist engineering university concentrating on the fields of IT and robotics, it was established to “provide the Soviet Space industry with qualified personnel capable of accomplishing mission impossible”.

By national standards, TUSUR is a relatively small university and its staff and student populations are predominantly Russian nationals. The university is home to 11000 undergraduate students, of whom around 6000 are enrolled under a distance learning programme and therefore not based on campus. For an engineering-based institution, TUSUR has an unusually high proportion of female students; 40% of undergraduate students are women. Fifteen percent of the undergraduate population are overseas students, most of whom originate from countries closest to Tomsk regional borders: Kazakhstan, Kyrgyzstan and Uzbekistan. A very high proportion of TUSUR's undergraduates (98%) find employment on graduation. TUSUR's postgraduate population is very small, currently standing at 460, of which 15% are overseas students. Across its 12 academic divisions, TUSUR employs 970 faculty, of whom 99% are Russian.

The university's research activities are highly specialised, focused within the disciplines of nanotechnology, radiotechnical and telecommunication systems, intelligent power electronics, intelligent information and control systems, information security and innovation theory. In comparison with its national competitors, the university attracts a high percentage of its income from research contracts: in 2013, the R&D expenditure of TUSUR accounted for 42% of the total university budget. Equally unusually, in the Russian context, a high proportion (around 75%) of this research income is sourced from the private sector.

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### C.1.2 The regional context

Tomsk is a town of half a million inhabitants, located in western Siberia, Russia. It is home to an impressive six universities, of which TUSUR is one of the smallest. Many interviewees on the study noted that one in four inhabitants of Tomsk are students, researchers or instructors at one of the town's universities or research institutions. The number and prominence of these academic centres have played a significant role in shaping the attitudes, capabilities and aspirations of Tomsk. The town was described by interviewees as “a very special, intellectually advanced environment” with “a lot of intellectual freedom and openness”. The universities attract an annual wave of new talent into Tomsk to undertake undergraduate study; around 60% of the town's population of about 80,000 students is from outside the Tomsk Oblast region.

Tomsk's population of overseas students – currently standing at 12% – has grown significantly in recent years. Until the early 1990s, Tomsk, and the academic sector in particular, was a major research centre for the defence and nuclear industries. In consequence, the whole town of Tomsk was “closed to foreigners”, with almost no R&D dissemination or external research collaborations. For these historic reasons, perhaps, the level of English language proficiency, even amongst the scientific and academic communities, is relatively low.

Despite the density of academic institutions in Tomsk, many interviewees noted the distinctive profile, culture and focus of each. For example, Tomsk State University, the first university to be founded in

Siberia, was widely described as *“a classical, traditional university”* focused on *“pure research”*. In contrast, Tomsk Polytechnic University, one of Russia’s leading technical universities, is renowned for its strong relationships with strategic industry partners, particularly in the oil and gas sector, and receives among the highest industry research funding of any Russian university. TUSUR is significantly smaller than these two long-established universities, and was described by some as an *“adventurous little brother”* organisation with a *“fierce independence”* and a focus on entrepreneurship and technology-driven startups. Many of the academic interviewees viewed these distinct university profiles and the significant competition between institutions as an important strength of the town. In consequence, despite a national push to amalgamate regional institutions to form *“federal universities”* in recent years, the universities of Tomsk have *“fought to remain separate and independent”*.

Historically, two sectors have dominated the Tomsk economy: the regional oil and gas industry and federally-funded research in the military and nuclear sectors. In particular, for many decades, *“taxes from oil and gas production amounted to 40% of the regional budget”*. In the early 1990s, during a national period of *“economic default”*, the oil and gas industry suffered a significant economic blow; *“oil prices dropped significantly in international markets”*, and the regional Tomsk budget *“dropped two to three times as a result”*. The experience led the Regional Administration to conclude that, *“we cannot rely on only one industry”* to support the region’s economy, and they started to explore alternative, stable sources of revenue. They observed that, despite *“more than a third of the economically-active population of the Tomsk region [being] engaged by the research and education sector, these sectors produced a minimal economic benefit to the region”*. They also recognised the opportunities that the specialised regional engineering skills base provided, alongside a town *“specialising in a narrow niche”*. As a senior member of the Regional Administration from that period commented, *“it became clear that Tomsk could not be the place for cheap mass-production. Our choice was high-tech entrepreneurship close to R&D. High salary and high skill”*.

In the early 2000s, the Tomsk Regional Administration engaged the services of an external consultant to assist them with *“developing a medium-term, socio-economic strategy for the development of Tomsk Oblast up to 2010, with a central emphasis on innovation development”*. This was to be the first in a series of long-term strategic relationships formed between the town and international experts in startup creation and research commercialisation. With a team of professionals in experienced entrepreneurship, the consultant worked with the Regional Administration to *“expose people in Tomsk (businessmen, researchers, administrators) to other practices. We worked hard with them to see and capture the essence of success stories elsewhere and say what it means to Tomsk”*. A cross-section of carefully-selected stakeholders was taken out of Tomsk to witness the operation and performance of key entrepreneurial hubs across the world, an experience that has had a significant influence on attitudes and aspirations in the town. It also brought an understanding of the value of a bold statement of intent for the town: *“you need to create a strong image for Tomsk which precedes reality”*.

In 2003, the Tomsk Regional Administration implemented a strategy to establish Tomsk as *“the first entrepreneurial region in Russia”*. Over the next eight years, the Regional Administration actively engaged in promoting Tomsk as a *“good place to start your business”*, bringing together the academic, entrepreneurial and small business communities in the region. They also lobbied for, and channelled, significant federal funding into the town’s entrepreneurial infrastructure. For example, in 2003 they secured federal funding to establish commercialisation units at three of the town’s universities, including one at TUSUR. In the following year, they invested in a suite of small business incubators in the town’s universities; eight incubators have been established in total since 2004, the first of which was an inter-university student incubator at TUSUR. Arguably the most significant achievement of the Regional Administration came in 2005, when they successfully secured US\$185m in federal funding to establish a Special Economic Zone (SEZ) in Tomsk, one of four across Russia. Focused on *“technology*

*innovation*” within the priority areas of nanotechnologies and new materials, biotechnologies and medicine, and information and communication technologies and electronics, the SEZ offers favourable tax conditions for its residents, a population of co-located companies which has now reached 54.

More recently, the town’s entrepreneurship and innovation (E&I) agenda has focused on the development of partnerships and collaborations across Tomsk for the further development of its entrepreneurial capacity. For example, the INO Tomsk 2020 initiative has recently been launched. Although the majority of funding attached to this initiative is focused on infrastructure development, it also includes an agenda to *“create a consortium of Tomsk research institutes, universities and industry companies... to pull together our resources and allow us to apply for special grants for the development of our particular expertise”*. Tomsk State University and TUSUR have also been involved with the establishment of a new IT cluster which seeks to support the development of regional capabilities in IT-based entrepreneurship *“from kindergarten through to all players in the ecosystem”*. As part of this development, Tomsk will be hosting the World Championship in Cyber Football in 2018.

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### C.1.3 Barriers to the development of an entrepreneurial ecosystem

Interviewees identified a wide range of constraints and barriers to entrepreneurship which were seen to be specific to the Tomsk region. The origin and form of these issues is too complex to be explored in detail in this case study. However, the issues raised most frequently are noted briefly below.

- **‘Funding gap’:** Many interviewees referred to the *“limited translational funding [available] to get research out of the lab and to be commercialised”*. They noted, in particular, that *“it is difficult to get anything beyond US\$50k unless you go to Moscow and approach the venture companies”*. In consequence, there appears to be a high dependence on federal funding in both the startup enterprises and the regional E&I infrastructure. For some, this funding was only offered *“in small blocks for short term goals”*, which did not allow startups to plan strategically for the future. Many interviewees also spoke about the widespread culture of *“grant begging”* in Russia: the practice of creating a startup purely as a means to access federal support funding. Although such behaviour is evident in Tomsk, it appears to be limited.
- **Limited size of the startup community:** Many interviewees noted that *“there is still only a small [entrepreneurial] community in Tomsk, but a strong desire to create one”*. For example, there are currently only two business angels active within the region; despite being described as *“very proactive and personally committed”*, the impact of two individuals is inevitably limited. The entrepreneurial community was also described as *“still young and inexperienced”*, with *“not yet the critical mass of small and medium-sized businesses that would be a driving force for active development of new startups and the environment as a whole”*. For many, the experience-base in Tomsk’s startup community would take many years to develop. As one local entrepreneur noted, *“there is a short history of Russian [technology-driven] business creation. The first generation started businesses just after it was permitted. Their children are not yet grown to take on the culture”*.
- **Limited culture of, and experience in, commercialisation and business creation:** Tomsk is a town populated by individuals mainly employed within, *“the public administration and public research”* sectors. In consequence, many are seen to lack both *“basic business skills”* and the inclination to *“see any commercial potential in any of the big research ideas”*. Interviewees described this culture as *“widespread”* and *“slow to change”*. Despite a strong engineering research base in the town, some interviewees even commented that *“we have the greatest innovations in the world, but they are dying on the shelf. They are going to the grave with the professors”*.

- **Geographic isolation:** Tomsk lies in a relatively isolated region of Russia with a limited local market, and sitting on *“the wrong side of the Ural [Mountains]”* for easy access to the more lucrative European market. As one interviewee noted, *“the local market is closed [and the] way to the global market is not an easy walk”*. Transport links were seen to be poor, with night-flights from Moscow being the only international route into the town until 2013. In consequence, some observed that much of the emerging entrepreneurial talent *“that could bring something to Tomsk prefer to leave”*.

## C.2 Historical development of E&I at the university

TUSUR was established in 1962 when the departments of Radio Engineering and Radio Control split from Tomsk Polytechnic University (TPU) to form a separate university. These two departments were seen to enjoy a unique culture. At the time of their separation from TPU, faculty within the two departments were unusually young and seen to be *“excited to do things differently – this entrepreneurial spirit of independence has been intrinsic to the university since its establishment”*. The departments were *“major recipients of funding for military and space exploration purposes”*, providing these industries with *“highly trained specialist engineers”*. Likewise, research projects were conducted within a narrow disciplinary focus, with long-term and ambitious goals in an R&D environment that was *“always practice oriented”*.

Following the establishment of TUSUR, this distinctive culture and orientation continued. The nature of the university’s military R&D focus necessitated a *“closed culture of strict confidentiality”*, where research activities were not disseminated and external interactions were limited and tightly controlled. As one interviewee commented, *“we had excellent professional researchers, doing fundamental research, but ... they only thought about the military application and always kept in mind that they were not to interact with foreigners”*. The university was also seen to enjoy a *“culture of respect of the opinion of the engineer”*, where *“the engineer was always the head of decisions”*.

TUSUR’s economic basis changed dramatically in the late 1990s as a result of the *“collapse of many national industries”* and the challenging national economic environment. All Russian universities were significantly affected by hyperinflation, which reduced the value of their income from the federal government. The impact on TUSUR was compounded by the almost complete loss of their military research funding from the government, *“one hundred percent of our research collapsed. We were totally dependent on military orders. This was a real crisis”*. With a dramatic reduction in salary levels and employment opportunities, graduates, faculty and researchers *“needed to find a new way to use themselves”* and some started to establish IT-driven enterprises to supplement their income.

In 1999, at the height of this crisis, a new Rector was appointed to TUSUR and *“from this point, the university started to change quickly”*. Previously head of the Industrial Electronics Department, he brought a personal experience of new business creation and *“encouraged some of his colleagues to do likewise”*, further developing the emerging entrepreneurial base within the university. The new Rector also recognised the potential of *“the international technological IT trend”* for supporting the university’s future economic interests. As one interviewee commented, *“the Soviet industry collapsed but the world-wide electronics industry was blooming. It was a real revolution in our own life. And it was in IT, programming. We were exactly in the trend. We were the experts”*. In the early 2000s, in parallel with many of the changes happening at a regional level in Tomsk, TUSUR made the decision to *“transform into an entrepreneurial university”*. As such, the university approach would be to *“create our own market”*, through the establishment of regional IT-based startups that would both provide a source of graduate employment and offer a client base for university R&D. This move was received with great optimism across many parts of the university: *“everyone was hungry, this was a real chance to express ourselves”*.



*We were to be the only Russian university to make it our priority to prepare graduates to be entrepreneurial in high-tech businesses”.*

The move to establish TUSUR as an entrepreneurial university appears to have influenced almost every strategic decision that the institution has made in the decade since. Three early actions, however, have been particularly influential in shaping the path taken by the university and the form of its entrepreneurial culture and infrastructure. The first was the decision to “*give the IP to the inventor*”, which, from the earliest stage, signalled the personal, financial opportunities offered by entrepreneurship to university staff and students. This move, which brought a broad wave of engagement in startup creation amongst the populations of postgraduate and younger faculty, was also supported by the establishment of a Commercialisation Unit in 2003. The second action was to appoint a new team to promote TUSUR as a “*university where each student can set up their own business*”. This team was led by the current Vice-Rector for Innovative Development and International Affairs, an individual who has since played a critical role in improving the university’s entrepreneurial infrastructure and reputation, nationally and internationally. The third action focused on the university’s relationship with technology-driven startups with an affiliation to university faculty, researchers and alumni. As the first wave of these startups was being established, the university Rector approached them informally to “*ask what [TUSUR] could do to help them and say that we will support you, help to bring in federal money and [suggest that they] could look kindly to TUSUR, perhaps to repair premises or to only use researchers from TUSUR, when you start to see some success*”. These approaches were almost universally positively received. In 2004, following a period of negotiation between TUSUR and the university-affiliated enterprises, a non-binding written statement of mutual support and collaboration was agreed which defined the “*principles of partnership, based on equal rights, trust and respect of interest*”. All subsequent startups affiliated to TUSUR have been invited to be party to this agreement.

From 2003, the university started to look critically at the student experience at TUSUR and how this could be adapted to support the development of entrepreneurial capacity. In 2004, with financial support from the Tomsk Regional Administration, TUSUR opened a student business incubator, the first of its kind in Russia. This facility quickly became a centrepiece of the university’s entrepreneurial infrastructure. With this incubator in place, the university turned its attention to “*how to train people for high tech businesses*”. In particular, the university sought to implement a formal curricular programme, open to all undergraduates, that would help them develop the skills and attitudes necessary to create and grow new technology-driven enterprises. Project-based learning was selected as an approach that would provide the best environment to develop these skills. The projects would also use a formal curricular route “*to place students in the student business incubator*” if the ideas developed were suitable for commercialisation. Despite a “*very rigid and tightly controlled set of education requirements*”, the decision to create “*group project-based learning*” coincided with the abolition of compulsory military service for male students at TUSUR, which freed up one full day per week in the curriculum. In 2006, TUSUR implemented optional project-based learning experiences, available for all students from the second year of study onwards. It was the first university in Russia to do so. The reform was supported by a government National Priority Project in education, funding the purchase of new laboratory equipment and the “*skill development and retraining for faculty*” to design and deliver this new educational approach.

From 2007, the university invested further in activities to build aspirations and capability in E&I amongst its faculty and researchers. The Institute for Innovations – referred to as ‘2I’ – was established, whose goal was to prepare “*future graduates in order to realise innovative projects and create competitive knowledge-driven enterprises*”. 2I was to house many of the university’s entrepreneurial functions, including, in 2010, the Faculty of Innovation Technologies, which was focused on “*training specialists to implement innovation projects aimed at organising competitive production of goods and services based on scientific and engineering achievements*”. Towards the end of 2013, TUSUR opened the Technology

Business Incubator, offering in-house incubation facilities for faculty-led commercialisation activities. The sustained investment in E&I over the last decade has enabled the university to become more active on an international stage, developing its global outlook, profile and engagement. For example, TUSUR has become actively involved in the Triple Helix<sup>62</sup> community, with this concept becoming “*quite influential in the leadership’s thinking around entrepreneurship*”. TUSUR will be the host of the Triple Helix International Conference in 2014.

## C.3 University approach to entrepreneurship

### C.3.1 University E&I strategy and IP policy

TUSUR’s entrepreneurial ambitions are explicit and unambiguous; in all marketing literature produced in the past five years, TUSUR defines itself as an “*entrepreneurial university*”. Its stated university mission is to “*generate knowledge and technologies of global importance, to propagate research culture and advance entrepreneurship by supporting students, employees and alumni of the university who start their own hi-tech business*”. Interview feedback suggests that two key targets underpin this overarching strategy. The **first target** is to establish stable, independent sources of funding and employment to the university and its constituents through technology-based startup enterprises. This was the original driver for the development of university’s entrepreneurial agenda. To a much greater extent therefore than the other university case studies considered, TUSUR’s central performance metric is the scale and revenue of these startup enterprises. The **second target** is to nurture regional capacity in “*cutting-edge technology and its applications*” which will in turn inform the university’s research and teaching agenda. This regional capacity, in the form of a community of technology-based companies, would help the university to “*transition from military applications to civilian applications*” and develop its internationally competitive capabilities and reputation.

The university’s technology transfer and IP policies reflect its central mission of creating a regional community of university-linked technology-driven startups. TUSUR therefore issues very few licences; the focus is on startup creation, with “*all of the IP belonging to the inventor*”. As one member of the senior management team noted, “*for many years TUSUR has been promoting the idea that IP should belong to the author. IP capitalisation generates little profit, and requires significant expenses. That is why TUSUR is following such policy*”. In addition, entrepreneurship activities within any of the university populations – students, post-graduate researchers, alumni and faculty – are provided with similarly high levels of support by TUSUR. All resulting startups are invited to sign an informal agreement to join UNIC.

Since 2009, a second avenue for faculty entrepreneurship was established through Russian Federal Law 217 (FL-217), which allows startups to be created within universities in collaboration with industry. By this agreement, TUSUR divides the profits amongst three parties: 15% to the university centre, 5% to the Commercialisation Units and the remaining 80% to the host department. Each department uses its own discretion to distribute the funds, but most give the majority of the income to the inventor/s.

Although no formal procedures are in place, TUSUR faculty entrepreneurs consistently reported an expectation that engagement with technology-driven startup creation was beneficial in their case for university promotion. However, within the next six months, university promotion procedures will be amended to “*ensure direct correlation between salary and performance, including performance in entrepreneurship*”.

<sup>62</sup> The Triple Helix Association, <http://www.triplehelixassociation.org>

### C.3.2 University E&I infrastructure

The entrepreneurial infrastructure at TUSUR is coherent, connected and strongly supported by the university senior management. Although entrepreneurial activity and engagement is visible across the university as a whole, it is most concentrated within 2I, which was established in 2007 and is directed by the Vice-Rector for Innovative Development and International Affairs. Amongst other functions and departments, 2I is home to much of the university's entrepreneurial infrastructure (including the student business incubator, the Commercialisation Unit and the upcoming Technology Business Incubator) as well as the newly established Faculty of Innovation Technologies. As such, 2I was often described by interviewees as *"the engine of supporting entrepreneurship at TUSUR"*.

Almost all of the E&I infrastructure at TUSUR has been designed and implemented by university senior management; there are very few entrepreneurship activities that have developed organically or originated from the university grassroots. Perhaps as a reflection of this ethos, TUSUR has no student-led entrepreneurship society. Many, however, viewed this *"top-down approach"* as an essential mechanism for triggering change in a national environment where there is *"no popularity of entrepreneurship in general ... and entrepreneurial university particularly"*.

TUSUR's E&I infrastructure can be considered in three elements, as summarised below, on the basis of the communities that they serve: (i) undergraduates, (ii) faculty/postgraduates/researchers, and (iii) university-affiliated startups. Further details on the E&I components are given in Table 4.

(i) **E&I infrastructure for undergraduates** at TUSUR has five key components:

- **Student Business Incubator (SBI):** the hub of student-led entrepreneurship activity at TUSUR, comprising an array of different activities and support mechanisms (see Figure 20);
- **Introduction to Entrepreneurship:** a course of undergraduate study, mandatory for all students within 2I;
- **Group project-based learning:** a one-day per week course offered to all students from the second year of study onwards;
- **Masters group projects:** within 2I, Masters students participate in a group project during their two years of study. The majority of the projects are based within startups, either an established enterprise within the UNIC group or a new startup led by TUSUR faculty;
- **E&I Bachelors:** a Bachelors of Engineering in Innovation Management, designed to nurture the *"knowledge, skills and passion to develop innovative products and services"*.

(ii) **E&I infrastructure for faculty and researchers** at TUSUR provides a less structured programme of support compared to that offered to the undergraduate population. At the centre of this support is the Commercialisation Unit. The Unit's role within the university differs from most traditional university technology transfer functions. Its function is to *"attract funding both for research and commercialisation"* activities at TUSUR and *"help scientists to understand the business idea of their scientific results"*. Prior to the establishment of the unit, TUSUR had no formal mechanism to support faculty in identifying and securing sources of federal and private research funding. Bringing together the support for both research and entrepreneurship has provided an important route for the university to identify and assess the commercial potential of its research activities as well as identify synergies for R&D collaboration

Open-access university centre providing entrepreneurship support and advice	
Commercialisation Unit	Established in 2003, the Commercialisation Unit works with university faculty and researchers “at the early stage of business development”. Its key roles are to “identify business opportunities of scientific research results, to develop ways of commercialisation of research results, and to attract investment”.
Student Business Incubator	<p>Established in 2004, the Student Business Incubator (SBI) is housed in an impressive 3000-square-metre facility with 26 project offices, six laboratories and spaces for meetings and conferences. The SBI offers a number of different components, as summarized below, which are offered to students across Tomsk.</p> <ul style="list-style-type: none"> <li>• <b>Weekly networking events:</b> designed to “connect the community” and “start to build basic entrepreneurial skills”, these events attract over 1000 participants annually from across the Tomsk ecosystem. They are used to help to “matchmake people with existing startups” and generate and refine ideas for new enterprises. For example, the Crash Test event is designed “to create an open place when each innovator can talk about his idea and get feedback from other innovators and experts in the community”.</li> <li>• <b>Quarterly project selection events:</b> where “startup teams can talk about their idea and get feedback about what they should do” and members of the regional entrepreneurial community “approve the most promising startup ideas to go into the incubator”. In roughly equal proportion, proposals are received from (i) the outputs from the SBI networking events, (ii) the Group Project-Based Learning teams, and (iii) other student-driven startup ideas emerging from across TUSUR and elsewhere in the Tomsk ecosystem</li> <li>• <b>Intensive accelerator programme:</b> From September 2013, all projects selected to enter the SBI will first participate in an intensive 2-month programme of “education and training in how to create a business plan and a recognizable business document”</li> <li>• <b>The incubator:</b> The majority of around 100 individuals resident in the incubator are engaged full-time on their startup, and around 15-20% have no affiliation to TUSUR. The only stipulation is that at least one member of the team must be a Tomsk student or alumnus. The 12 full-time staff of the SBI “work individually with each team, creating a roadmap for each. Each member of the staff is a specialist and can provide specialist advice, in IP protection, in law, in accountancy, in marketing”. Each team is also provided with a dedicated mentor from the startup community. To date, around 50 startup companies from the SBI have entered the market.</li> </ul>
Technology Business Incubator	To be opened in late 2013, the Technology Business Incubator will cater to the faculty and research populations at TUSUR, offering a parallel suite of activities to the SBI.
Entrepreneurship courses offered in engineering and technology disciplines	
Introduction to entrepreneurship	Since 2011, all students within the Institute for Innovations are enrolled in the weekly Introduction to Entrepreneurship course which is a core part of the curriculum in all four years of study. The course covers topics such as “the theory of leadership, personal competencies of entrepreneurs, the psychology of success and project management”. The course is integrated into the university-wide Group Project Learning and supports the placement of students in startup companies.
Group Project-Based Learning	Since 2006, all undergraduates at TUSUR have had the option to participate in a “group project-based learning” experience for one day per week from their second year of study. These projects are designed to “encourage student participation in realizing real engineering projects”. Around 1500 students, or 30% of the full-time undergraduate population, participate in the projects. Project briefs are often provided by industry partners, who go on to offer internships and employment to students in parallel with their studies. An estimated 10% of these project partners are regional technology-driven startups affiliated with TUSUR. Overall, a similar proportion of the group projects – around 10% – apply to take residency in the Student Business Incubator.
Student-led entrepreneurship clubs and societies	
None	
University accelerator/incubator	
Student Business Incubator	See above
Technology Business Incubator	See above
Funding for startups	
Alumni fund	Small grants are available from the TUSUR alumni association to support startups within the UNIC.
TUSUR Strategy Program	TUSUR was awarded funding from the Ministry of Education and Science to provide funding for student commercialisation during 2012-2014. It provides three awards of US\$6k per year and ten awards of US\$41k per year.
Other funding	TUSUR has also recently established two new funding resources: (i) a university endowment, which will “focus on high-tech projects that TUSUR supports in the Student Business Incubator or Technology Business Incubator”, and (ii) a Venture Fund which will support commercialisation of, “the best student projects coming from the Group Project-Based Learning”. Funding-raising for both funds is currently underway.
Other	
Cyber football	In collaboration with Tomsk State University, TUSUR recently developed a ‘regional cluster’ in robotics, which looks at long-term entrepreneurial development, from children in kindergarten through to the practitioners in the ecosystem. As part of this project, Tomsk will host the world Cyber Football Championships in 2018.

**Table 2. Key E&I components at TUSUR.**

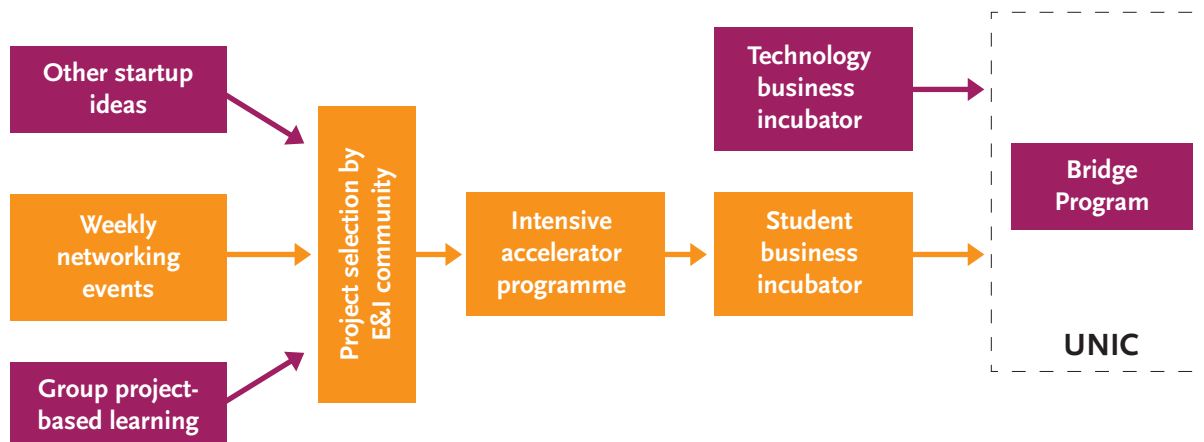


Figure 20. Activities offered by the Student Business Incubator at TUSUR (illustrated in orange) from September 2013.

across the university in the public and private sectors. The unit holds no responsibility for patenting; this activity is dealt with by the Patent Information Department.

**(iii) E&I infrastructure for university-affiliated startups:** in contrast with many universities across the world, TUSUR carefully tracks startup activities by its graduates and has developed a very close relationship with most technology-driven enterprises affiliated with the university via their staff, students or alumni. As discussed previously, all startups in this community are invited to join an informal “mutually beneficial partnership” with TUSUR to form a community of “high-tech spin-off firms”. One interviewee described UNIC as “a communication platform, on which a common understanding of the required joint actions is built... [and where the interests of smaller companies] may be taken into account in a consolidated view of 120 companies in the sectors of IT and electronics in the Tomsk region and can be lobbied by the President of TUSUR at the regional level”. The UNIC consortium is very active and involves a considerable number of ad hoc agreements for research collaboration, use of shared laboratory facilities, funding proposal and student internships. Although most UNIC companies are based within the Tomsk region, some have also been established overseas, including 15 in North America. In 2001, TUSUR established the Bridge Program, linking TUSUR initially with Silicon Valley and then expanding to encompass other centres such as Toronto, Taiwan, Israel and Japan. The Bridge Program is designed to offer “an array of business services to TUSUR students/alumni/faculty and UNIC companies willing to expand their businesses internationally”. These services include “assistance in IP protection, advising on low-cost office and co-location facilities for short- and medium-term tenancy, organizing networking events and connecting TUSUR students with established entrepreneurs for advice and mentorship”.

## C.4 Achievements and impact

TUSUR's entrepreneurial ecosystem is still at an early stage of development. It is 15 years since the first wave of startup activity in Tomsk and less than a decade since TUSUR started to build its entrepreneurial infrastructure. However, there are a number of indicators of early progress.

The first set of indicators relate to the **number of technology-driven startups established by faculty, students and graduates** of TUSUR.

Figure 21 illustrates the cumulative total number of startup businesses created by TUSUR alumni (indicated in purple). It points to a rate of startup creation of between ten and 30 enterprises each year until 2010, an impressive number given the environment and TUSUR's recent history as a “*closed university*”. Although the number of new startups since will be partially offset by prior businesses that have folded, the annual rate of alumni startup creation has clearly slowed in recent years. For some interviewees, this decrease reflects TUSUR's natural transition from a honeymoon period where, “*it was all about enthusiasm, excitement. The government provided a lot of money. It was new and fresh and everyone was trying it.*”, to a period where “*people started to realise how difficult it was and it became more about quality not quantity*”. Other interviewees pointed to a deteriorating national and regional environment for startup creation (see Section C.6). Interestingly, no interviewee attributed this decline to a failure of TUSUR university strategy or the quality of its entrepreneurial environment.

A total of 25 companies have been formed by TUSUR under FL-217, of which the vast majority (19 in total) were established in 2009. These companies have created 72 new jobs.

Figure 21 also illustrates the number of companies operating within UNIC since 2006 (indicated in orange). The period up until 2010 represents the phase where established companies were being invited to join the UNIC consortium, until “*it had absorbed the companies that already existed in the market*”. Companies joining UNIC since 2010 are exclusively recent startups and, as such, the rate of

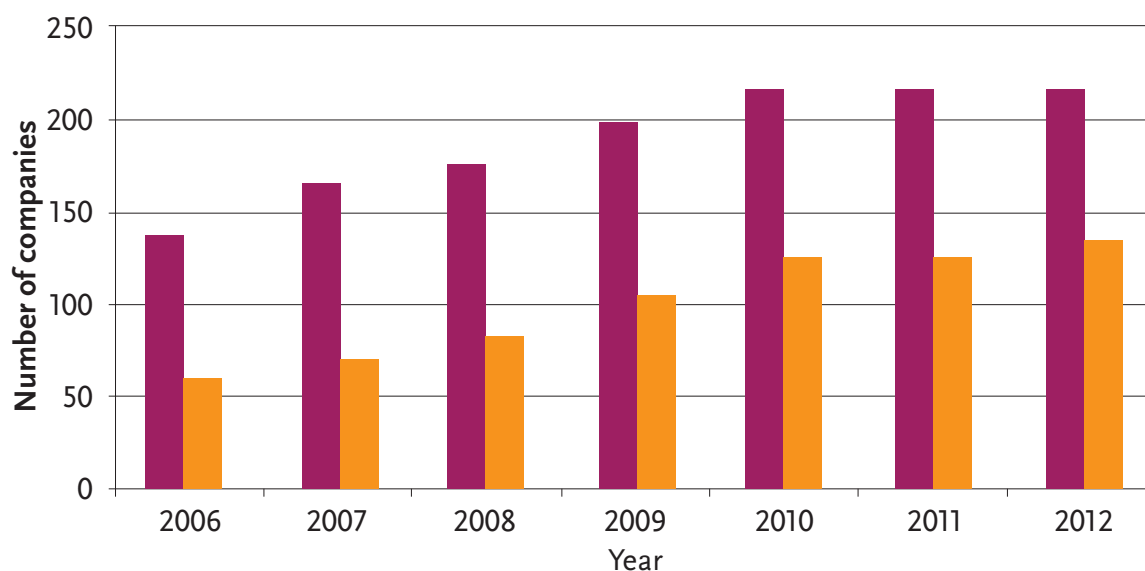


Figure 21. Number of companies formed between 2006-2012, by TUSUR alumni, shown in purple, and within UNIC, shown in orange.

growth now *“entirely depends on the power of the innovation infrastructure of the university”*. The UNIC consortium of TUSUR-affiliated companies plays a very dominant role in the Tomsk entrepreneurial ecosystem, representing around a third of the resident companies in the SEZ. Indeed, the early volume and performance of these companies appears to have been a critical component in the case for bringing the SEZ to Tomsk. TUSUR’s most significant success story is Elecard, located in the SEZ and employing around 140 people. Overall, the UNIC companies are reported to account for *“80% of the revenue from science-intensive businesses in Tomsk”*. In consequence, many observed that, *“if you take out TUSUR, the story in Tomsk would have been and will be very different”*. TUSUR can therefore, arguably, be described as having played a pivotal role in both establishing and populating what was described by an external observer as *“probably the best environment for high-tech startups in Russia”*.

The second set of indicators relates to the **culture of E&I created within the university**, as described by the study interviewees. Many institutions *“lose their entrepreneurs, who leave the university, set up their company and have no further contact with the university”*. This does not appear to be the case at TUSUR. Most postgraduate and faculty entrepreneurs – those whose enterprises fail or succeed – retain their affiliation or employment with the university and bring their experience back into their research and teaching activities. One interviewee commented that *“most of the lecturing staff have [begun to] realise that entrepreneurship is a well-established part of... the life of a university professor”*. The university’s claim that over 10% of students, researchers and younger faculty are engaged with entrepreneurship, in some form, appears well substantiated. Indeed, engagement levels amongst undergraduate students appear to be much higher, with 10% of participants in the Group Project-Based Learning alone applying to take residence in the Student Business Incubator. In addition, despite a relatively small postgraduate population at the university, this group appears to play an important role in university-based entrepreneurship. Many of the startup teams emerging from TUSUR comprise a mix of individuals drawn from the staff, student and alumni populations, with the undergraduate and postgraduate student participants seen to play an *“active role”* – often as *“the main labour power”* – in these companies.

Interview feedback also suggested that the university’s profile and ambitions in E&I are starting to attract *“a different sort of student who are already thinking about their startups and want to come to TUSUR for that reason. They used to think only about their diploma but now it is more than that”*. As the CEO of a local technology-driven business commented, *“this was all really started around five or seven years ago. The students who started then will be graduating now. Over the next few years is when you will really start to see the change. The new students coming in will be different”*. It is interesting to note that over half of the undergraduates in many departments in the Institute for Innovation are female, including the newly-established Faculty of Innovation Technologies. This suggests that there may soon be a large cohort of female Russian entrepreneurs operating within and outside Tomsk.

The **third set of indicators** relates to the university’s ability to create jobs and funding through new technology-driven enterprises and thus bring new talent into Tomsk as a result. Over the past decade, TUSUR has been successful in its strategy to rebuild its research income base. Since 2005, the university’s research income from non-federal sources has increased sevenfold, from US\$3m to US\$22m. What is most impressive, however, is the level of investment that TUSUR has received from the UNIC consortium. By 2012, the university attracted an annual income of US\$14m from the UNIC companies, through the contracting of R&D services, infrastructure investment and the purchase of equipment for the university’s laboratories, departments and research centres.

One of the key goals of the university strategy was to develop a market for university research expertise, and create high-skill employment within Tomsk. On graduation, one third of TUSUR alumni take up their first job within the UNIC companies. Indeed, it is estimated that, by their third year of study, many

of these students are already employed on a part-time basis within these startup enterprises, “*bringing their experience from their jobs into the classroom*”. The university, and the Tomsk region in general, has been less successful in attracting more experienced entrepreneurial talent into the town. Although a high number of young people move to Tomsk for undergraduate study, very few experienced individuals from the wider entrepreneurial community have come into the region at later stages in their careers. Developing the critical mass to attract such human capital is likely to be a significant next step for the Tomsk ecosystem.

## C.5 Success factors

Five key factors appear to have been critical to the success of the TUSUR entrepreneurial ecosystem, as outlined below.

**The urgent need to secure stable university income:** The drivers underpinning TUSUR’s decision to transition to an entrepreneurial university are ones not commonly experienced amongst leading international E&I universities. For TUSUR, technology-driven startups were seen to hold significant potential for creating alternative and stable sources of research income and graduate employment for the university. This underlying motivation has been a dominant force in engaging senior university management with the entrepreneurial agenda over the past decade. It also shaped the decision to assign IP ownership to the inventor, on the basis that this system would result in the greatest number of regional startups and therefore derive the greatest benefit to the university. This decision appears to have been critical in creating a atmosphere of trust, where “*startup ideas do not leave the university*” and both the university and its constituent populations can be confident that they will be the major beneficiary of these enterprises.

**Commitment and vision of a trusted and well-respected university leadership:** As one faculty member commented, “*TUSUR has a dream that is right ahead of us. The leadership has done anything and everything possible – regardless of the environment, of bureaucracy, of a lack of funding – to make this dream a reality*”. Interviewees repeatedly pointed to two individuals in particular: the university Rector from the late 1990s who initially took the university down the entrepreneurial path and the current Vice-Rector for Innovation who has driven the recent educational changes and strengthened the university’s international partnerships. Both individuals appear to be well respected across the university and brought vision and “*one hundred percent commitment to the goal*” of becoming an entrepreneurial university. Some observed that the public and explicit nature of their commitment to this goal itself helped to create the conditions for change. As one local entrepreneur observed, “*if you claim it, it will happen. [TUSUR’s former Rector] claimed that TUSUR makes businessmen. This cannot come from how you study. Businessmen belong to your internal nature. But claiming this means that he can gather people – professionals and the students who are going to be businessmen. The statement made it happen*”.

Both university leaders brought to TUSUR a background in regional politics and local business-creation, and therefore well understood the environment in which the university’s startups would need to operate. The former Rector was also chairman of a number of other organisations, including the *Russian Union of Industrialists and Entrepreneurs*; in consequence, “*industry knew that he would defend their interests too, and he never betrayed this trust*”. The existing regional business community was therefore open and willing to engage with TUSUR. University leaders also actively sought to appoint individuals with business experience to both senior and teaching positions, to “*allow the entrepreneurial spirit to enter TUSUR*”.



**The relationship established between TUSUR and the UNIC consortium:** Critical to the strength of the TUSUR university-based ecosystem has been the UNIC consortium and the culture of trust and mutual support that quickly grew between the university and this group. As a TUSUR faculty member commented, *“this is not just a few people. These are people with a lot of personal ties and connections. This is more than just a business relationship”*.

The close relationship appears to be underpinned by two factors. The first factor is a function of TUSUR’s history. As a small, specialist university in *“a town full of giants”*, TUSUR alumni often have a *“strong sense of pride and loyalty to their alma mater”*. In addition, the history of military research and education within TUSUR created a highly collegial atmosphere; *“we had a trust in people because TUSUR was ‘closed’. This became the corporate culture. Everybody knows that gossip and lying is impossible, so everyone trusts”*. The second factor is the non-binding partnership agreed between TUSUR and the UNIC companies. The benefits to both parties are made explicitly clear:

- (i) for TUSUR, these include improved facilities available at *“mutual labs”*, increased graduate employment opportunities, increased R&D income, role models, mentors and internship opportunities for students, and *“exposure to the most up-to-date demands of the industry, both for academic and research purposes”*.
- (ii) for the UNIC companies, these include access to expertise, laboratories and a skilled workforce with entrepreneurship experience, opportunities for *“mutual counselling for the UNIC companies, sharing experience and effective business networking”*, strategic university partnerships for funding opportunities and support for expansion overseas.

The size and strength of this consortium was seen to offer both its members and the university a degree of *“protection from external forces”* and provide a *“louder voice”* to lobby for their interests.

**Fundamental university changes that are informed by international best practice and critical self-examination:** Over the past decade, TUSUR has implemented a series of significant changes to its mission, organisational structure, infrastructure and education in order to realise its entrepreneurial ambitions. Being a *“small and dynamic university”*, reform has been rapid. Nonetheless, many of these changes— such as the implementation of Group Project-Based Learning into the core curriculum – were *“difficult and painful”*. However, two aspects of the university culture appear to have underpinned almost all of the changes made. Firstly, there is *“a willingness to reach out of Russia and learn what is the best that is out there”*, through engaging, formally and informally, with international partners. Secondly, there has been a willingness to critically assess the strengths and weaknesses of the university’s E&I approach, and design its entrepreneurial strategy accordingly. Indeed, despite many of the changes at TUSUR being largely *“top down”*, many interviewees spoke about a *“feedback loop”* where students and staff feel *“able to just come to [the university’s Vice-Rector] to make suggestions or give honest feedback”*.

Informed by this openness to external and internal intelligence, TUSUR leadership have *“spent a lot of time thinking specifically about entrepreneurship and addressing each issue thoughtfully and carefully”*. As a result, the entrepreneurial infrastructure at TUSUR, although modest by some international standards, has a strong coherence and integration within the university structure. As one faculty member commented, *“a lot of universities could have a nice looking strategy. But at TUSUR there is really something there. So, if you look at the student business incubator, it is not just a label. It has people. It really is something special. You can feel the energy and passion”*.

**The commitment of the outgoing Tomsk Regional Administration to creating a robust entrepreneurial infrastructure and environment within the town:** The outgoing Tomsk Regional Administration have

played an important role in supporting TUSUR's development as an entrepreneurial university; they understood the opportunities that technology-driven entrepreneurship would bring to the region and recognised the potential of TUSUR in particular. More specifically, the Regional Administration provided critical support in raising the national profile of Tomsk as Russia's first entrepreneurial hub, lobbied for federal support for E&I in the region and channelled targeted resources to TUSUR for the establishment of key components of their entrepreneurial infrastructure, such as the student business incubator. Many of the changes implemented at TUSUR over the past decade have been undertaken in parallel to regional initiatives undertaken by the Tomsk Administration, and this source of support and funding has played a critical role.

The Regional Administration also played an important role as a neutral party to bring together the academic community. Historically, there has been very limited collaboration between the universities in Tomsk. Indeed, most are in direct competition with one another for students and resources. As one faculty member noted, *"we are in an environment where we must compete against each other for the same funding. The pie is limited and you can't get a bigger portion if you collaborate. This makes us direct competitors. The role of the Administration here has been important"*. The Tomsk Regional Administration helped to create united cross-institutional bids for funding which *"would not have been possible if this was TUSUR's fight alone"*.

## C.6 On-going issues and challenges

TUSUR has been an important pioneer in the establishment of university-based entrepreneurship in Russia, playing a central role in founding the country's first (i) multi-institutional student business incubator, (ii) technology-driven economic zone, and (iii) system of widespread engineering project-based learning. This pioneering role has brought considerable challenges over the past decade, and many of the challenges have been beyond the control of the university. As one external observer commented, *"TUSUR are building an entrepreneurial university in a state-regulated-economy... while TUSUR focuses on actual demand, the markets are dominated by the government. It is difficult to teach students that everything depends on you when we know it is not always so"*.

The strengths and early success of TUSUR's transition towards becoming an entrepreneurial university are undeniable. However, the university has faced, and continues to face, a great many challenges in realising its vision. In particular, two issues are apparent; (i) the environment for inspiring and nurturing entrepreneurship talent within the university, and (ii) the quantity and performance of TUSUR startups in the market. Each issue is discussed in turn below.

The first set of issues raised by interviewees relates to **the environment within the university for nurturing world-class entrepreneurial talent**. There is no doubt that the spirit of entrepreneurship has been embraced by TUSUR students, with a high proportion of the university's graduates securing their first employment within the group of UNIC companies. Although challenges remain in *"holding onto"* this graduate talent within Tomsk in the years that follow, the positive impact of TUSUR's E&I strategy and infrastructure for nurturing student entrepreneurship is clearly apparent.

TUSUR's on-going challenge lies in creating an equivalent inclusive entrepreneurial culture amongst its faculty; in particular, amongst the generation of older, experienced university professors. Many interviewees at TUSUR referred to a *"generation gap"* amongst the faculty population; *"the big distance between the older faculty, a product of the Soviet era who were trained for space technology and defence, and those who are 25 years younger. There is nothing between. There is a clear division down the university between these two"*. The faculty demographics at TUSUR, similar to many of its national peers, have been shaped significantly by the dramatic economic changes in Russia in the 1990s. This period brought a

wave of redundancies amongst the generation of younger faculty followed by a sustained period where very few new appointments were made. As a result, the university today comprises two very distinct cohorts of faculty, separated by age, experience and seniority; each with very different attitudes to entrepreneurship and both offering some challenges to the university's entrepreneurial aspirations.

The older generation of faculty hold most of the senior research positions in the university, and therefore play an important role in defining the research culture and priorities. These scientists came from a background where they *“worked deep in projects without any commercial pressure. There is therefore a complete lack of commercial understanding and no desire to get involved in anything but fundamental research”*. Levels of engagement with the entrepreneurial agenda amongst this generation of faculty were widely observed to be very low. Despite conducting *“high-end research”*, these individuals *“have never been measured by citations, they only thought about the military application”*. As such, realising the potential for creating a *“world-level research”* base, on which TUSUR can further develop its entrepreneurial aspirations, continues to be a challenge. Within limited interaction and collaboration between departments, the opportunities to engage this older professional cohort with the E&I agenda are restricted.

Although the younger generation of faculty offer a much more limited research experience and portfolio than their older colleagues, their engagement levels with entrepreneurship are much higher. Indeed, many of the TUSUR-affiliated residents of the SEZ are led by young faculty. Many became involved in startup creation *“through necessity”*, to supplement their income. As a result, perhaps, some view their academic and entrepreneurial careers as two relatively separate activities with limited cross-fertilisation between the two. With much of the E&I development to date at TUSUR imposed from the ‘top down’, these younger faculty do yet not appear to be empowered to establish their own ‘grassroots’ entrepreneurial activities within the university. In addition, due to the relatively small size of the entrepreneurial community in Tomsk, the university has struggled to secure experienced entrepreneurs and investors from outside TUSUR to mentor startup teams and lead university courses. As one university manager commented, *“in other countries, a retired entrepreneur would be a mentor, but we do not have these people. There are incentives for businesses to collaborate with TUSUR, but not the incentives for individuals to engage as lecturers or mentors”*. In many departments, therefore, interviewees described much of the curriculum as *“old-style, Soviet teaching”*, which did not necessarily reflect the experience and expertise of the entrepreneurial faculty or the wider regional startup community. The development of the Technology Business Incubator later in 2013, however, offers considerable potential to embed faculty startup expertise into the university structures.

The second set of challenges relates to the **quality and performance of TUSUR startups in the market**. To many interviewees, this was the most significant area for future concern. As illustrated in Figure 21, the annual number of high-tech startups emerging from TUSUR increased steadily from the early 2000s, to reach a peak in 2010. Since this time, the rate of new startup creation has been considerably lower. Many noted that one reason for this recent fall was the artificial inflation of startup numbers in the late 2000s, as a result of the inflow of funding attached to the newly-instated FL-217. As one interviewee noted, *“the KPI was quantity not quality, just the number of startups created. This created, around the country, a vast amount of new startups. Once the funding disappeared, this thing was naked. There was very little funding available to these companies to continue. It created an artificial bloom of entrepreneurship”*. Although many described FL-217 as *“a positive step. It was a good opportunity to reveal ambitions, ideas. It was a unique movement to expose people to what entrepreneurship is”*, it was also noted to have *“created some companies with a low chance of survival”*.

Outside the influence of FL-217, there was a clear consensus amongst interviewees that the challenging environment for entrepreneurship in Tomsk had also played an important role in the decline in new

startups since 2010. Despite the town being described by many as “a positive exception in Russia for its culture of entrepreneurship”, interviewees also noted that, “it is becoming more and more difficult to start and grow businesses in Tomsk. Each year, this is getting worse”. There appear to be multiple causes for this deteriorating environment, but the four factors most often cited were:

- **Change of regional government:** In 2012, a new governor was appointed to the Tomsk Regional Administration. A very high proportion of interviewees discussed this issue and expressed their concern that with this new Administration came a shift in regional priorities aligned with the oil and gas sector rather than with the E&I agenda; “new broom, new sweeps”. Whether valid or not, these concerns appear to be affecting confidence amongst both the Tomsk entrepreneurial community and those considering engaging in startup creation in the future.
- **The resistance of state-owned industries:** A number of interviewees spoke about a lack of support for new technology-driven startups by the Russian state-owned industries, where “the Russian companies do not have an appetite for Russian innovations” and, in consequence, “business investments into innovations are rare and cautious”. Some went further and indicated that “the monopolies do not agree with these new competitors... once these enterprises have an income over US\$50m, they have raised to attack their shareholders. No one in Russia can be independent in a high-tech company”.
- **Imbalanced E&I investment:** Many interviewees spoke about issues relating to the allocation of E&I funding from both regional and federal sources. Firstly, interviewees noted an “overinvestment in construction projects” at the expense of investment in “people and young businesses”, adding that “this is a common problem in Russia”. Secondly, many observed that the limited funding directed towards startups is invariably allocated in what was seen to be an indiscriminating way, with very limited discretion to take account of the quality and potential of the enterprise. As one interviewee put it, “[there is an] allocation of funds according to the principle of a [litte] to everybody”, rather than, “selecting in high-priority science and technology focal areas, which could receive the maximum resources and preferential treatment from development programmes”.
- **Lack of community cohesion and policy coordination:** Despite the aspiration of initiatives such as INO Tomsk 2020 and the small and geographically-concentrated nature of the Tomsk E&I community, only limited collaboration is apparent between its members. Interaction and partnership in E&I between the universities is particularly limited. One major issue impeding this community cohesion appears to be the high level of dependence on federal funding, which has encouraged a culture of competition between startups and the providers of E&I support. A number of interviewees also pointed to “the absence of a single coordinated innovation policy at all three levels – federal, regional and municipal”, leading to a “situation where not all members of the regional innovation ecosystem can see the results of their projects and initiatives”.

It was also noted that TUSUR startups, similar to others in the region, were highly dependent and focused on the local market, so the above issues have had a disproportionate impact on their development and progress. For many, the great strength of TUSUR’s narrow focus on IT and communications is its ability to operate beyond Siberia in the wider international market. However, despite the early progress of initiatives such as the Bridge Program, TUSUR startups were seen to have struggled to make significant footholds internationally. As one local business angel noted, “Tomsk is very far from all places and markets...but if you speak about high-tech startups, distances are much less important. TUSUR should not be suffering so much from the problems of Tomsk”.

To some, the fault lies in the narrow range of skills within the TUSUR startup teams. In particular, team members were characterised as holding “*great ideas and technical knowledge*”, but often lacked three critical capabilities: strong English language skills, sufficient management skills to develop “*sustainable business models*” and “*a clear understanding of international market needs*”. In consequence, some interviewees suggested that a proof of concept centre within Tomsk would bring great value, and “*allow people to determine the value of their innovation before taking it to market*”.

There is no doubting the considerable environmental barriers currently facing TUSUR startups. However, many interviewees viewed this period as an inevitable stage in the evolution of a new entrepreneurial ecosystem within a challenging national and regional environment, pointing in particular to the town’s status as “*Russia’s first startup hub*”. Interviewees noted that, “[TUSUR] *were the first to do all of these things [in Russia], so they are the first to face all of the problems. They are having to design the solutions as they go*”. They went on to observe that “*during the late 1990s and early 2000s, there was a big [startup] boom in Tomsk and a lot of excitement*”, bringing high levels of expectation for the region’s rapid growth as an entrepreneurial hub. Interviewees observed that the reality will inevitably be much more measured and incremental, reflecting the gradual formation of startup experience and the ability of the entrepreneurial “*community to act as a community*”. To some, therefore, “*the only answer is time; layer by layer, things will improve*”.

There is no doubt that the continued growth of the regional ecosystem will be dependent on the entrepreneurial output from TUSUR. However, the university’s rapid emergence as a key national driver of technology-driven entrepreneurship appears unlikely to wane soon. There is an air of confidence amongst the university’s senior management that TUSUR’s E&I ambitions will be realised. With this *esprit de corps* has come a willingness to “*travel against the current*” and take unconventional approaches to nurture the entrepreneurial capacity across both the university and the region; an approach that has shaped their pioneering reputation. The university’s intimate understanding of the regional and national startup environment also provides them with a capacity to anticipate, and adapt quickly to, emerging challenges and opportunities, a capacity not often associated with academic institutions. With continued commitment and strong leadership, TUSUR is well-placed to overcome regional and national barriers and see further growth in entrepreneurship and reputation over the coming years.

# APPENDIX D

## UNIVERSITY OF AUCKLAND CASE STUDY

## D.1 Ecosystem context

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### D.1.1 The university: key features

Established in 1883, the University of Auckland is the largest university in New Zealand. Comprising eight faculties and two research institutes, the university operates across six campuses and has a faculty population of around 2200. Following a sustained period of expansion in student numbers, the last decade has seen the university focus on educational and research “*quality rather than volume*”. In consequence, the total student population has remained relatively static, at 32000, since 2005. However, the student profile has changed considerably, with an increasing proportion of postgraduates (who now comprise 22% of the student population) and a larger science and engineering student population (including a 30% increase in engineering student numbers).

In 2011/12, the University of Auckland attracted a research income of NZ\$232m, of which NZ\$73m was sourced from industry. It is home to a third of New Zealand’s top ranked academic researchers and three of the country’s seven Centres of Research Excellence. It is also the only national university to rank within the world’s top 100 universities in the *QS World University Rankings 2013*.<sup>63</sup>

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### D.1.2 The regional context

The University of Auckland is located in central Auckland, the country’s largest city and home to around one third of New Zealand’s four million inhabitants. In line with current trends, the country’s population growth is predicted to be concentrated within Auckland and the city is expected to reach two million by 2031. The city is home to two of the country’s eight Crown Research Institutes as well as two universities.

Historically, the New Zealand economy has been strongly dependent on primary products, principally dairy, meat and wool. The long-standing reliance on agriculture was noted by a number of interviewees. As one commented, “*there is a deep understanding of the power and impact of our agricultural sector – it is easy to measure the outputs and impact. I’m not sure the same thing could be said about innovation*”. Even today, 70% of the country’s exports are primary products, around one half of which are unprocessed.

Although increasing, investment in Research and Development (R&D) in New Zealand is low. The total R&D expenditure represents 1.27% of GDP, little more than half of the OECD average of 2.38%. Much of the difference is accounted for by the relatively low levels of private sector investment in R&D in New Zealand compared to other OECD countries. In consequence, New Zealand research capacity is considerably more dependent on government funding; in 2012, 41% of the country’s R&D was funded by the New Zealand government and 40% was funded by New Zealand business.<sup>64</sup> In addition, private sector R&D investment in New Zealand is predominantly driven by small and medium sized businesses, in contrast to the larger-scale businesses that dominate research funding amongst OECD peer countries.<sup>65</sup> As a result of these challenges, the New Zealand government has sought to “*switch the funding focus towards innovation by companies*” through a number of targeted interventions. For example, Callaghan Innovation was established in early 2013 to “*accelerate the commercialisation of New Zealand*

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<sup>63</sup> The University of Auckland was ranked in 94th position in the 2013 *QS World University Rankings* and in 164th position in the 2013-14 *Times Higher Education World University Rankings*.

<sup>64</sup> Source: Statistics New Zealand

<sup>65</sup> New Zealand Ministry for Economic Development *Innovation and the city: Review of the Auckland regional innovation system*. Wellington: MED, 2012.

*innovation*”, connecting high-value technology-driven business with R&D funding and support. This source of research funding is only accessible to New Zealand universities “*if they partner with a company*”.

Despite the constrained R&D landscape, a number of features of the Auckland environment are conducive to supporting and attracting entrepreneurial activity. One factor is the quality of life in the city; a metric in which Auckland scores consistently well. For example, in the United Nations 2013 Human Development Index, which considers indicators of national health, education and living standards, New Zealand was ranked sixth out of the 187 countries for which data were available. In addition, Auckland was ranked in third position of the 2012 Mercer Quality of Living Worldwide City Rankings. Auckland also has the advantage of a very international population; over one third of Auckland’s residents were born overseas, one of the highest proportions in the OECD. Many interviewees noted the benefits this brought: “*a catalyst for innovation is a well-educated immigrant community – that is observable in Auckland*”. Although modest in size, many interviewees also characterised the regional entrepreneurial community as collegial, open and supportive; “*people are happy to stand up and share their war stories*”. The New Zealand population is also highly educated, with around 80% of young people participating in higher education; a significant proportion of whom study vocationally-oriented programmes. New Zealand also attracts a high number of international students, who now comprise 14% of the country’s student population.

Interviewees identified three dominant sectors for innovation and investment within Auckland: (i) digital media and gaming, (ii) software systems development, and (iii) medical devices. They also reported key strengths in food technologies, marine technology, inductive power transfer and materials. The infrastructure supporting entrepreneurship in New Zealand was seen to be “*immature still, but growing*”. When asked to identify the key agencies supporting entrepreneurship and innovation (E&I) in Auckland, five organisations were consistently cited; two providers of investment and R&D funding (*New Zealand Venture Investment Fund and Callaghan Innovation*), one incubator, hosting the country’s largest ‘angel’ network (*ICEHOUSE*), Auckland city’s agency to promote economic development and tourism (*ATEED*) and the various E&I activities and events hosted by the *University of Auckland’s Business School*.

### D.1.3 Barriers to the development of an entrepreneurial ecosystem

Summarised below are the key barriers to entrepreneurship in the Auckland region, as identified by the interviewees. Many of the barriers described relate to New Zealand’s relatively small population and geographical status as “*a remote island nation*” that “*creates more innovation than we can consume*”.

- **‘Brain drain’ and loss of “our best and brightest” talent:** Many interviewees noted that “*New Zealand has [proportionally] one of the biggest expat populations in the world*”. An estimated one million of New Zealand’s skilled population live overseas, equivalent to a quarter of the country’s population. Interviewees observed that a disproportionate number of these individuals “*going off-shore*” were the “*best and brightest*” and those most likely to be catalysts for technology-driven entrepreneurship. As one noted, “*many of our most talented engineers leave the country after graduation. These are just the people who would be fuelling innovation [in New Zealand] but we cannot compete with the salaries they are offered overseas*”. In consequence, and despite what was described as a “*world class system of education*”, the pool of individuals capable of both establishing and growing new technology-based business is seen to be significantly diminished.
- **Overseas experience:** The established practice of taking “*overseas experience after graduation*” was noted as a “*long-standing part of the New Zealand culture*” and “*a rite of passage for many bright young professionals*”. As a result, of the New Zealand graduates who do not secure long-term employment



overseas, a high proportion still spend two to five years outside the country “travelling, taking bar jobs and seeing the world”. Interviewees described how these individuals “come back [to New Zealand] broke, in their late 20s and often with family responsibilities”. Although these “returning Kiwis... are more mature, more experienced and more desirable employees after their overseas experience”, many interviewees observed that they often faced an increased pressure to “settle down and get a reliable job that puts food on the table” rather than “doing crazy things like starting companies”.

- **Lack of motivation to innovate:** Some interviewees spoke about the “comfortable life” enjoyed by professionals in New Zealand, leading to “lower aspirations to innovate and take risks”. As one observed, “in New Zealand, once people have their three Bs, their boat, their batch and their BMW, it is hard to motivate them to take a risk”. Others also spoke about the difficulty of encouraging ambitions for international growth amongst small, established business where “for many people, success is having ten employees and taking home a small profit”.
- **Quality and balance of startup teams:** As a result of the immaturity of the entrepreneurial ecosystem in Auckland, some interviewees spoke about the challenge of “imbalanced” startup teams, “who are very focused on the idea but do not have the business experience to make a company work”. Many saw this problem exacerbated by the “lack of serial entrepreneurs, of role models” who could mentor and support these fledgling teams. As one interviewee noted, “many people talk about the lack of capital [in New Zealand] but, if there is a good idea, it will be funded... the quality of the teams is actually the greater problem. Although we are now getting more serial entrepreneurs, these people are still raw. They are not sufficiently attuned to being CEOs of companies”.
- **Distance from markets:** Many interviewees noted that New Zealand’s twin challenges of “the size of the market and the distance from other major populations” was a “potent combination”. Indeed, there was a consensus amongst many that these combined challenges represented the country’s most significant barriers to entrepreneurship; “1200 miles in any direction from New Zealand, there is absolutely nothing”. As a result of the country’s relatively small population and geographical isolation, many interviewees noted the significant pressure placed on newly-formed business to identify and connect with international markets; “the size of the domestic market means that you have to be international very quickly. The challenge is making them internationally-ready as early as possible. The earlier you get them off-shore the better”. Although seen as a necessity, many highlighted the inherent risks associated with this approach: “firms in New Zealand internationalise earlier, but often at a point that they are still immature. So we have a significant failure rate... for those that want to grow internationally, the risk and challenge is massive”. Others also noted that this global approach brought a significant risk that “these innovative companies leave and never come back”, where “we struggle to hang on to the valuable parts [of the company] and keep them within New Zealand”.

The final two barriers listed – the quality and balance of startup teams and the distance from markets – were repeatedly highlighted by interviewees. As one commented, “both the makeup of teams and the distance from markets can have a profound effect on the quality of the market validation and the competitor intelligence of many New Zealand startups. The failure rate is also sharply affected by the shortcomings in these areas”.

## D.2 Historical development of E&I at the university

This section outlines the history of the University of Auckland's transition to becoming an entrepreneurial institution. It highlights, in particular, the circumstances driving the three key phases in the university's entrepreneurial development: firstly, the formalisation of technology transfer and commercial research activities from 1988; secondly, the focus on external engagement with the national E&I agenda and the development of entrepreneurial cultures and opportunities within the university from the late 1990s; thirdly, the development of cross-disciplinary university centres which have generated new avenues for innovative applied research from the mid-2000s.

### D.2.1 The formalisation of technology transfer and commercial research activities

The seeds of the entrepreneurial ecosystem at the University of Auckland were sown in 1988, with the establishment of UniServices, the first university-based technology transfer unit in Australasia. Spinning out from the Faculty of Engineering, this wholly-owned university subsidiary was originally conceived to operate under a *"fairly traditional tech transfer office"* model. It quickly became clear to the founding CEO of UniServices, however, that *"there was very little activity within the university that would make anyone rich... with no appetite for startups"* and that the first priority should be to *"create the right environment"* for applied research and commercialisation within the institution. Given UniServices' status as a centre receiving no direct financial support from the government or the university, it was also acknowledged that a reliable income stream would be required to establish and grow technology transfer capabilities. A significant funding opportunity was seen in corporate-funded research, which, at the time, was rarely conducted at the university and was an activity which was *"unregulated, with little thought to risk or reputation"*. Soon after its establishment, therefore, the remit of UniServices was expanded to cover all commercial research activity conducted by the university, in addition to its technology transfer function. This enhanced role brought a more explicit requirement to become a *"business facing"* unit, which would help the university to establish beneficial international partnerships with industry and investors alike.

UniServices operation initially focused on *"the research side"*, working with a small number of faculty whose research activities offered the greatest potential for corporate engagement. By its second year of operation, UniServices *"brought all of [its] activities in-house"*, enabling it to *"make its own appointments that were not constrained by university policies"*. In consequence, UniServices started to directly employ a dedicated team of researchers, individuals who would work alongside the growing number of university faculty being seconded to UniServices to undertake corporate research. Despite having this base of dedicated research staff, UniServices policy was never to seek research contracts *"where there was no significant university connection"*. Although some *"antagonism between the university and UniServices"* was reported by interviewees during the early years of its operation, many also described the *"sea-change"* it achieved in the university's ability to access and manage corporate research funding.

It was acknowledged that the *"technology transfer side [of UniServices' operation] was slower to develop"* and, in the early days, commercialisation opportunities were sometimes used as an inducement to engage strategic corporate research partners; *"if we could fully fund multi-million dollar research [contracts] from parties we were licensing, we would consider giving IP away for free"*. Once commercial research activities had become more established, however, UniServices was able to refine its technology transfer approach and start to invest strategically in commercialisation activities.

Over the next decade, with consistent and vocal support from university leadership, UniServices continued to grow, both in the commercial research and the technology transfer domains. Annual revenues grew from \$1.3m in 1988 to over \$60m by 2003 and the workforce directly employed by

UniServices increased to 500. As many interviewees noted, however, the primary focus of UniServices was to “provide research revenue to the university and its staff” and thereby “maximise the returns to our shareholder”. As such, its remit was not to “target E&I for E&I’s sake” through, for example, building the entrepreneurial capabilities of the university’s student population or strengthening regional E&I capacity. With no other E&I activities or community visible on campus, many interviewees commented that university-based opportunities for broader E&I development were limited. As one interviewee observed, “*[at this time] I would not have considered us to be an entrepreneurial university. We were certainly more successful than most at securing contract research and probably better at exploiting the entrepreneurial talent that we had, but I would not say that the university itself was entrepreneurial*”.

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## D.2.2 The national E&I agenda and university-based entrepreneurship activity

While UniServices was thriving, the national economy was facing challenges. By the late 1990s, there was a growing acknowledgement that “New Zealand was in a steady period of decline” where “a lot of people feared for the future of the country”. For example, many interviewees pointed to New Zealand’s slippage down in the OECD rankings, from “one of the richest countries in the world in the 1950s down to the bottom third of the OECD by the end of the 1990s”. Some attributed this decline to an “overdependence on the dairy and agricultural industries” and called for New Zealand to “move from an agricultural base to a knowledge-based economy” in order to reverse this trend. One considerable barrier, noted by a number of interviewees, was the lack of clear national strategy and direction in making such a fundamental shift to the country’s economic basis. New Zealand, at that time, also had a limited capacity to support entrepreneurship and innovation; “there were virtually no serial entrepreneurs, no angel investors and a moribund VC industry”. Interviewees also highlighted the low national investment in R&D, compared to OECD counterparts, as the “government cut-backs were causing massive financial pressure on our universities”.

In 1999, against this backdrop of growing national concerns about New Zealand’s economic outlook, a new Vice-Chancellor was appointed to the University of Auckland. The new leader had a strong business background in Fletcher Challenge, New Zealand’s largest company at the time. In the words of one interviewee, it was a company that “thought big, thought about where the nation was going... and made New Zealand more internationally competitive”. Many interviewees reported that the Vice-Chancellor took the university in a new direction, “taking a unified, national approach” to building capacity in E&I, on the basis that “we can’t achieve what we want within the university without the national infrastructure to support it”. As such, the university sought to “create porous boundaries between the university and the community, without compromising rigour, autonomy or academic freedom”. As one interviewee noted, “in the ‘80s and ‘90s, New Zealand lost its way. It took [the new Vice-Chancellor] to send a clear message that we are the main university in New Zealand, we need to engage with our community. He put down the leadership challenge”.

In 2001, in partnership with the Prime Minister of New Zealand, the university hosted the *Knowledge Wave Conference*, which sought to “spark a national debate” and establish an agenda and community of support for a New Zealand economy underpinned by “knowledge-based creativity and innovation”. This conference was noted by many interviewees as a turning point in the formation of the country’s E&I agenda, and one which put the University of Auckland at its heart. In the same year, the University of Auckland Business School, in collaboration with a number of strategic partners, founded a new business incubator – the ICEHOUSE – which later established and hosted New Zealand’s first angel network.

Early in his tenure, the Vice-Chancellor established a new university function – University of Auckland Developments – to “build closer relationships with the business sector with a view to setting up a *Science Park*” at one of the university’s satellite campuses. It quickly became clear, however, that some fundamental cultural barriers were impeding this partnership development: “the business sector was

*reticent because they thought academics were too theoretical and didn't understand the real world*" and, in turn, *"the academics were very suspicious of the business world"*. The goal for University of Auckland Developments therefore shifted towards enabling a more fundamental cultural change, building relationships of trust between the university and the regional and national business community. The two individuals who drove this agenda, both with a shared background from Fletcher Challenge and *"a passion for seeing New Zealand's future brighter than its past"*, would go on to play a pivotal role in the university's entrepreneurial transformation.

One specific target for the University of Auckland Developments team was the creation of entrepreneurial opportunities within the institution: *"universities were not sparking entrepreneurship in the way that they should ... they were not inducing the mindset in the students that they did not have to tread the bureaucratic treadmill, that there were options in entrepreneurship"*. Between 2002 and 2003, the team members travelled to some of the key entrepreneurial universities across the world to better understand how entrepreneurial talent could be supported and nurtured. One model resonated particularly strongly: the business plan competition at the University of Cambridge, which they understood to have been *"responsible for the biggest cultural change at Cambridge in the past 25 years"* through harnessing the talents and enthusiasm of the student population. The visit to Cambridge also *"brought home that you needed to change the culture before you did anything – it was an epiphany moment"*. A PhD student organiser from the Cambridge business plan competition was invited to spend a week at the University of Auckland to help to lay a framework for a new E&I programme which was to be called Spark. Just seven weeks after this visit, a small team of university students and staff from the newly-established Business School *"put together a new programme, raised \$125k and launched"*.

Spark was established in 2003 as an entrepreneurship programme to *"inspire, educate and motivate"* staff and students across the university. Rather than operating as an autonomous student society, Spark was designed to be student-led, but with mentorship and oversight from key E&I Business School staff. Using this approach, it was felt that, while *"the students could be empowered and nurtured"*, the university could also *"create a process and system that is self-sustaining"* with long-term continuity of vision and institutional memory. Engagement with Spark was high from the outset, tapping into a *"huge appetite for entrepreneurship that many in the university had not known was there"*. Indeed, the launch event for Spark needed to be moved to a venue outside the university, as there was no auditorium at the time that would accommodate the 500-600 attendees. As one early organiser commented, *"as soon as I saw the crowd in the room, I knew this was going to work"*.

The Spark programme *"actively sought participation from the local community"* and *"for the first time, the university was connecting with entrepreneurs across the country"* to support the development of new entrepreneurial talent. Very quickly, Spark established a team of 140 members of the local entrepreneurial community to mentor, judge and support the activities. During its first two years of operation, Spark *"drew heavily off the Cambridge model"* in its design and approach. It offered a business plan competition and a 16-week education programme that were scheduled in succession to *"help us maximise [participation] numbers and so allow us to build a critical mass"*. As Spark evolved, it sought to strengthen its reach and impact across the university. For example, in a move partially designed to increase faculty participation, an introductory competition was introduced – '1000 words for \$1000' – as *"an easy entry point for Spark"*. Although still offered as a resource open to staff and students at all stages, the educational programmes were redesigned to provide tailored disciplinary support as well as training specific to each progressive element of the competition. Considerable attention was also focused on the quality and nature of the feedback given by the judges, such that it could provide constructive advice both to teams who progressed through the competition and those who were *"knocked out"* alike. Significant emphasis was also placed on the training and mentorship of the student leadership of Spark, to *"inculcate the secret sauce"* to successive new generations of these volunteers.

In the decade since the establishment of Spark, its participation numbers, scope and reputation have progressively grown. Partially as a result of this success and with strong support from the current Vice-Chancellor, in the mid 2000s, the Business School made a decision to re-align its strategic goals. These were shifted towards *“building a generation of business-savvy STEM graduates”* with a clear focus on *“making a difference to the country”* and forging strong institutional capabilities in entrepreneurship. Unusually, perhaps, the Business School's entrepreneurial ambitions were not focused primarily on its own constituents; they were explicitly targeted at the whole university population – staff and students across all disciplines – as well as the external community. This new strategic direction was implemented around the time of the opening of an iconic new Business School building; an environment described by university-wide constituents and the external business community alike as *“a building that you just want to come to”* which *“quickly became a meeting point that brought people together, often to meet for the first time”*. The shift also signalled a move to *“mainstreaming entrepreneurship and innovation”* within the university; as one interviewee noted *“up until that point, it was almost all co-curricular, but it was time to formalise E&I in the business of the university”*. For example, during the late 2000s, the Business School started to offer a major in Innovation and Entrepreneurship. In 2009, the Business School established the Entrepreneurs' Challenge, for investment in *“high-growth New Zealand companies with global potential”*.

In 2010, the Business School established the Centre for Entrepreneurial Learning (CfEL) to *“be a focal point for entrepreneurship and pull all of the [E&I] activities together”*. Many interviewees noted that, until that point, the university's E&I activities were highly dependent on the founding mentor of Spark; an individual described as *“inspirational, knowledgeable and trusted by [the entrepreneurial community] inside and outside the university”*. The establishment of the CfEL allowed the Business School to *“institutionalise what we are doing”* by spreading the responsibilities across a broader team.

### D.2.3 Cross-disciplinary and applied research capabilities

The most recent addition to the university's E&I profile has been the development of cross-disciplinary research capabilities, which have been considerably enhanced in the past five years. Many interviewees described how national competition for publicly-funded research had become highly competitive in recent years. As a result, the university has been *“increasingly looking for commercial research opportunities, which are usually multi-disciplinary in nature, rather than being siloed”*. In addition, *“the largest single pot of contestable research funding”* is offered by the Ministry of Business Innovation and Employment, providing *“translational funding linked to economic impact”*. This funding source is seen to favour *“large multi-disciplinary teams that can respond to the research needs of outside companies”*. Recognising these opportunities, the current Vice-Chancellor in partnership with UniServices, led the development of cross-cutting thematic research groups, based on the primary areas of research leadership within the university and an evaluation of the opportunities for innovation. For example, *“we saw a huge capability in food and health, so created a group with 150-200 researchers from medicine, business and engineering”*. These centres are seen to be *“a good docking spot for industry to access university research”*, allowing the external community to identify easily the university's key areas of research strength. The university invests around NZ\$500k in the formation of each centre, of which around 50% is provided by UniServices, following which time they must start to attract *“self-sustaining revenue”*.

These cross-disciplinary centres are complemented by two autonomous multi-disciplinary research institutes established within the university in the early 2000s – the Auckland Bioengineering Institute established in 2001 and the Liggins Institute established in 2004. These institutes operate as autonomous research-only units. Without the *“heavy teaching load that is common in traditional New Zealand university departments”*, they were able to *“build a critical mass of research competency”* which, to many, provided a fertile breeding ground for E&I. The Bioengineering Institute, in particular, established *“an interest in creating an entrepreneurial spirit in the institute, which has really taken off in the past few years”*.

## D.3 University approach to entrepreneurship

### D.3.1 University E&I strategy and IP policy

**Strategy of technology transfer office (or equivalent):** In response to the particular and acute barriers to technology transfer within a “remote island nation”, the university has adopted a highly unconventional, if not unique, approach to managing and funding its commercialisation activities. The UniServices approach brings together “contract research and technology development in one organisation”, a union of sufficient “size and capability” to offer a platform for “accessing overseas markets” and “building effective partnerships with large multi-national companies” across the world. Amalgamating the university’s corporate-funded research and technology transfer activities was also seen to offer other key benefits, such as creating “synergies that lead to new inventions and ideas”.

UniServices is a wholly-owned university subsidiary, described as a “one-stop-shop for business”. It provides a single point of contact for industry partners and corporate funders within “a business culture which is different from the rest of the university”. UniServices operates as an autonomous unit within the university, paying it an annual dividend. In consequence, its operations are designed to be “unaffected by the ups and downs of university life”. The core revenue-generating element of the unit is corporate-funded research; profits from these contracts are used, in part, to subsidise technology transfer through a UniServices overhead.

The unit has 700 employees, of whom 90% are researchers or technicians and 10% are engaged in support activities such as business development or HR. In addition to UniServices-employed researchers, most corporate-funded research contracts engage university-employed faculty, who are “bought out” for a proportion of their time, perhaps one to two days per week, to dedicate to the research project. A reimbursement is provided to the department from UniServices “to compensate for their time away from their contracted teaching, research or service duties within the department”. Outside the UniServices overhead fee, “all profits from the corporate research go to the departments themselves. It is up to the Head of Department to decide how this money is spent. This is a great incentive for academics to get involved [with corporate-funded research]”.

The approach adopted by the University of Auckland establishes “a clear division between the academic staff employed by the university to conduct ‘public good’ research and the staff employed by UniServices to conduct corporate funded research”, although “both communities work seamlessly together in the same laboratories”. This division, and its implications for Intellectual Property (IP) ownership and commercialisation, is summarised below.

- **Public good research:** ‘Public good’ research<sup>66</sup> is conducted exclusively by university-employed faculty and researchers. All IP is owned by the university. Where research commercialisation opportunities arise, university researchers are “obliged to make a record of invention ... which says that the staff member transfers the IP rights to UniServices direct, so cuts out the need for the university to become involved in the negotiation”. The value sharing arrangements are divided “a third of the benefits for UniServices, a third for the inventor and a third for the inventor’s department”. UniServices invests around NZ\$5m each year in university IP, which is supported by NZ\$1.1m annual government pre-seed funding, a total investment which is “largely used to build a concept into an investible proposition via a gated process supervised by three dedicated investment

<sup>66</sup> Interviewees defined ‘public good’ research as that funded by the national government, charities or foundations.

*management committees of external experts*". UniServices employs a number of strategies to assist in the exploitation of university innovations. For example, during the Voices of Market Exposure, UniServices invites an expert panel to a one-day facilitated event, located within the target market region, to assess and evaluate a specific piece of university technology based on university-owned IP.

- **Corporate-funded research.** Corporate-funded research is managed by UniServices, and is delivered by mixed teams of UniServices-employed researchers and university-employed researchers and faculty. IP ownership is held by the corporate funder; *"the principle is – if you fund it, you own it"*. UniServices employs full-time business developers to *"seek out new sources of corporate research"*, focusing both on growing business in existing regions and also, increasingly, on developing capabilities in regions of the Middle East and East Asia. From 2014, many of these business developers will be based *"on the ground"* within target countries. UniServices also employs small student teams, through the Open Innovation Program, to *"scan across the university and UniServices research... and identify something provocative and new"* to offer to prospective corporate clients.

**E&I strategy and promotion policy:** Although the University of Auckland's current strategic plan *"does not address E&I directly, you can read into it very supportive elements"*. The interviews also made clear that both the Vice-Chancellor and the Deans within the science and engineering disciplines are personally committed to the entrepreneurship agenda.

In recent years, the university has been *"pushing very hard to improve our research outputs"*. These priorities are reflected in new promotions procedures, which include *"qualitative criteria for both research outputs and research income"*. Although E&I does not feature prominently, *"patents and licenses are now written in as one measure of research output"*. Although most faculty entrepreneurs consulted for the study saw a positive correlation between E&I engagement and career advancement at the university, many interviewees also noted a widespread perception amongst most faculty *"that promotion criteria are biased towards publication [outputs]"*. It was also observed by some, however, that *"the Deans have made a point of changing perceptions, to make clear that the people who get promotion are involved with commercialisation"*.

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### D.3.2 E&I infrastructure

The E&I infrastructure at the University of Auckland has three primary elements:

1. **UniServices:** UniServices manages and delivers all corporate-funded or commercial activities, including technology transfer, corporate research and consultancy (see above, Section D.3.1).
2. **Business School:** The majority of E&I activities within the university are delivered by or in partnership with the Business School, most with oversight by the Centre for Entrepreneurial Learning (CfEL). In addition to their goal to *"facilitate interaction between many parts of the University's unique entrepreneurial ecosystem and enable the University to make a real impact on the New Zealand economy"*, the CfEL offers a suite of E&I activities, including:
  - a. **Spark:** The lead agency for student-led entrepreneurship, Spark brings together mentorship, entrepreneurship courses, a tiered business-plan competition and a programme of networking events; activities all open to university staff and students alike.
  - b. **Other informal support for student entrepreneurship:** Activities include oversight of CHIASMA, a student-led entrepreneurship society in biotechnology, informal mentoring services for aspiring entrepreneurs and internship opportunities in regional startups.

- c. **Educational programme:** These include (i) an *Innovation and Entrepreneurship major* within the *Bachelor of Commerce* at the undergraduate level, and a *Post-Graduate Certificate/Masters in Commercialisation and Entrepreneurship* for STEM graduates, researchers/PhD students and working professionals, and (iii) a one-week undergraduate course in entrepreneurship that “can be slotted into engineering or science based courses on request”.
- d. **Entrepreneurs Club:** The club provides events and networking opportunities for the regional entrepreneurial community.

Two Business School-affiliated entrepreneurship components lie outside the formal remit of the CfEL; the Entrepreneurs’ Challenge and the ICEHOUSE. Further details on these components as well as other E&I activities affiliated to the Business School are provided in Figure 23.

- 3. **University-based cross-disciplinary centres:** The university’s E&I infrastructure is also supported by a small number of departments and multi-disciplinary institutes. For example, the School of Biological Sciences hosts the Institute for Innovation in Biotechnology, which “has embedded on campus an incubator space where researchers can sit alongside companies” as well as a new Masters programme in Bioscience Enterprise.

An illustration of the university’s entrepreneurial infrastructure as well as its relationship with UniServices is given in Figure 22.

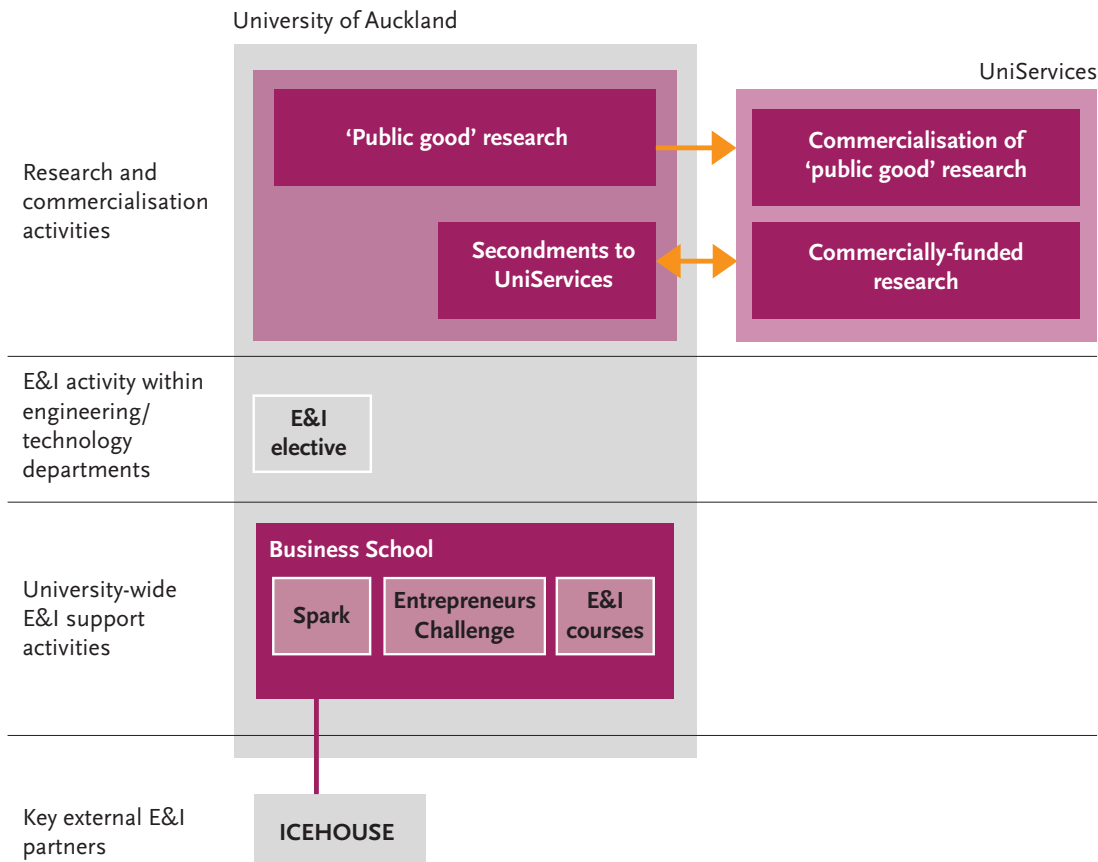


Figure 22. Overview of the University of Auckland’s entrepreneurial infrastructure.



Open-access university centre providing entrepreneurship support and advice	
None	Although there is not a formal 'open-access E&I centre', many interviewees noted that members of the Centre for Entrepreneurial Learning (CfEL) had an "open door" to provide E&I support and advice.
Entrepreneurship courses offered in engineering and technology disciplines	
Innovation and New Product Development (optional)	This elective, open to all fourth year engineering undergraduates, was established in 2007 and is delivered by the Faculty of Engineering. It combines a lecture component (focusing on areas such as design methodology, market research and problem solving) with an industry project (where student teams develop a new product concept for a regional company).
PhD Commercialisation Workshop (optional)	Offered for the first time in 2013, this two-day workshop was developed by the University of Auckland and made available to science and engineering PhD students nationally. It covered topics such as 'the economic role of science in society' and 'identifying potential commercial applications from research'.
Student-led entrepreneurship clubs and societies	
CHIASMA	This student-led entrepreneurship society, established in 2005, focuses on biotechnology. Activities include the <i>Career Catalyst</i> workshops and the <i>Synapse Career Expo</i> to showcase bioscience recruitment opportunities.
Spark	<p>Spark was established in 2003 and continues to be the most significant E&amp;I activity offered by the University of Auckland. It is managed by three full-time employees in the Business School and a committee of 30 volunteer undergraduate and postgraduate students from across the university who are appointed following an annual application process. It also engages 140 people from the local entrepreneurial community as judges, mentors and speakers. The majority of Spark's annual operational costs are covered by the Business School, with the NZ\$150k for events and prizes supported by local companies and UniServices. The student leaders of Spark are offered considerable leadership and training opportunities through formal courses, such as a two-day <i>Professional Development</i> workshop, and informal mentorship by CfEL staff. Spark events run cyclically through the academic year, punctuated by two competitions:</p> <ul style="list-style-type: none"> <li>• <b>The Ideas Challenge:</b> Following the launch event for Spark in March each year, a five-session evening course, <i>Vision2Business</i>, is offered, which is described as "part education, part inspiration". Focused on "turning ideas into a viable, world-class business", it is open to all university staff and students. Participants are invited to submit a proposal to the <i>Ideas Challenge</i> - "1000 words for \$1000". Twenty cash prizes are awarded each year in two categories, social ventures and commercial ideas. Significant emphasis is placed on providing constructive feedback to all entrants, regardless of competition success. Of the 360 entries submitted in 2013, 180 asked for specific feedback from the judges.</li> <li>• <b>The \$100k Challenge:</b> Following the <i>Ideas Challenge</i>, in July, Spark holds a one-day <i>Ideas to Business</i> workshop, covering topics such as 'market validation', 'IP and Law', 'business models' and 'networking opportunities'. Staff and students are then invited to submit ideas to the <i>\$100k Challenge</i>. Each submits a 3000-word Venture Summary, from which 10-15 are selected to participate in stage two of the <i>Challenge</i>. Feedback sessions are also offered for all non-qualifying teams. Successful qualifiers from stage one of the <i>Challenge</i> participate in the Launch Pad programme, a seven week intensive training course. The Spark year ends with selection of the overall competition winners as well as opportunities to provide feedback for the remaining teams. Throughout the <i>\$100k Challenge</i> process, one-to-one team mentoring is provided by members of the regional entrepreneurial ecosystem.</li> </ul>
University accelerator/incubator	
ICEHOUSE	The ICEHOUSE was established in 2001, in partnership with the University of Auckland Business School, although it now operates relatively independently of the university. The ICEHOUSE brings together a number of functions: (i) a startup business incubator, which was named amongst Forbes magazine top ten incubators in 2010, (ii) growth and development programs for SME's, and (iii) hosting of New Zealand's largest angel investment group.
Other	
Entrepreneurs' Challenge	The Entrepreneurs' Challenge provides NZ\$1m per year of investment into high-potential national companies. The Challenge, managed by the Business School, was established in 2009 following a donation from a major benefactor.
Entrepreneurs' Club	The Entrepreneurs' Club (often called <i>EClub</i> ) holds events and networking opportunities for the regional and national entrepreneurial community. The EClub is organised and managed by the Business School.
Systems engineering curriculum change	Over the past two years, in a move largely unconnected with the other E&I activities at the university, the Faculty of Engineering has started to implement <i>Systems Thinking and Scenario-Based Learning</i> into all years of the undergraduate curriculum. This change will bring week-long team-based projects in all years of study. It will also bring mandatory professional development courses in all years, which will incorporate "six or seven lecturers on entrepreneurship as well as a business plan competition" in the fourth year of study.

Figure 23. Key E&I components at the University of Auckland.

## D.4 Achievements and impact

The performance of the entrepreneurial ecosystem at the University of Auckland can be considered through two sets of indicators: (i) impact through corporate engagement and technology transfer, as managed by UniServices, and (ii) impact through engagement and community cohesion in entrepreneurship, as facilitated by the activities of the Business School. Each set of indicators is discussed below.

### D.4.1 Impact through corporate engagement and technology transfer

The success of UniServices in generating revenue for the University of Auckland was described in similarly positive terms by most interviewees, both inside and outside the university. The comment of this North American-based technology transfer office manager was typical of many: *“what UniServices has achieved is impressive in itself, but when you consider the geography and the size of the university, it is phenomenal”*. Many commented on the strength of UniServices’ regional presence, which *“has become something of a benchmark for other TTO offices in Australia and New Zealand”*. For some, the success stemmed, in part, from its unusual business structure and consequential ability to establish *“a company culture whose attentions are not divided and is able to devote itself wholly to its corporate relationships”*.

UniServices work to a target of doubling their revenue every seven years. As illustrated in Figure 24, the 2005-2012 target was achieved, despite the period coinciding with a severe global economic slowdown. These revenues provide an important funding stream to the university; in the words of one senior university manager, *“there are not many universities where the technology transfer office generates 15% of its revenue”*.

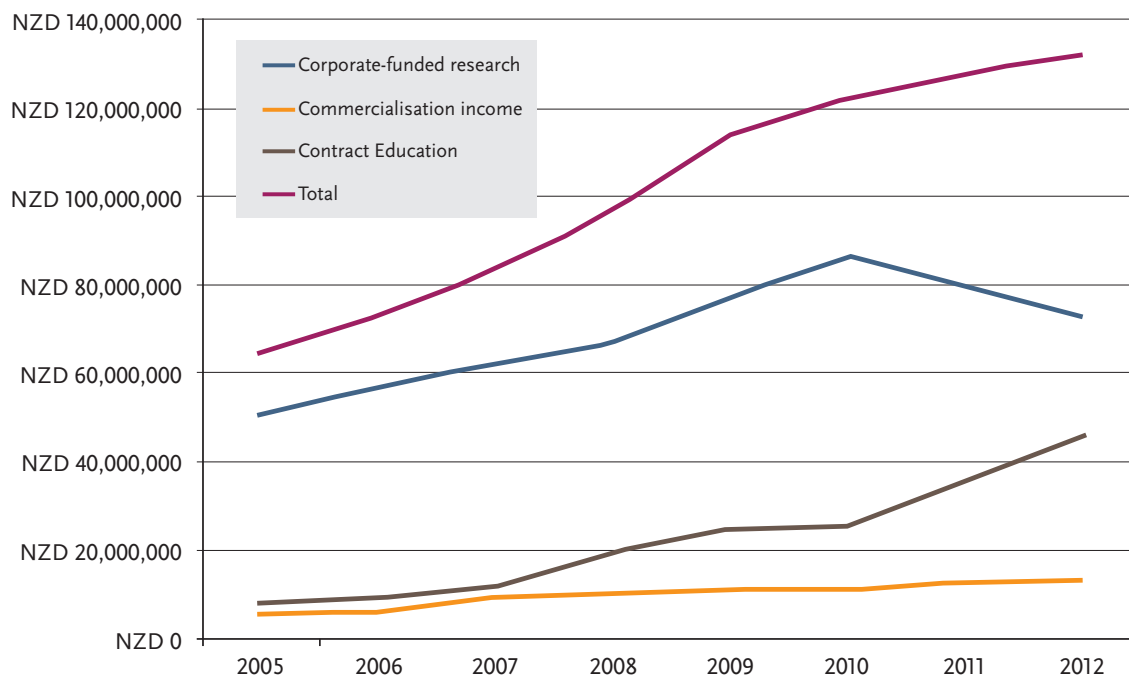
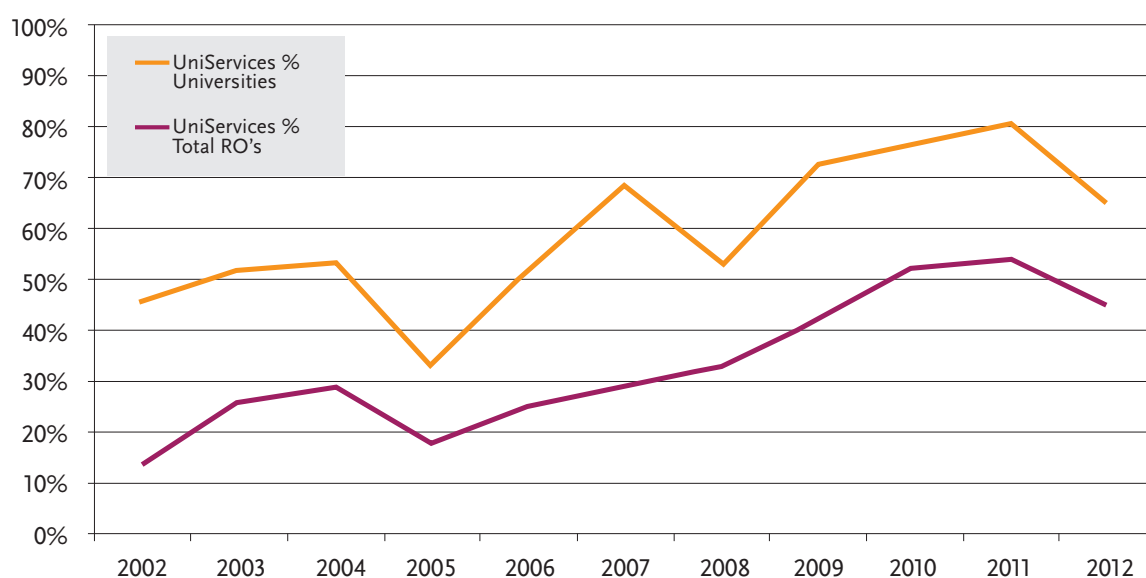


Figure 24. UniServices revenue (2005-2012) by their three key functions: corporate-funded research, commercialisation income and contract education.

**Corporate-funded research** continues to be the major source of revenue for UniServices, a significant proportion of which emanates from the Life Science disciplines. Corporate research was the only sector of UniServices operation that was substantially affected by the global downturn; following annual growth of 11% from 2005 to 2010, revenues in this area reduced by 8% over the next two years (Figure 24). Mirroring the experiences of universities across the world, UniServices struggled “to access new funding avenues or do new things with repeat customers”. They described how, during this period, “many businesses took their R&D projects in-house or shelved their ideas”. Based on the contracts already in place, UniServices anticipated that “2014 will be the first growth year since 2010”.

Despite the challenges encountered in recent years, however, UniServices revenues in corporate research remain high; NZ\$73m in 2012. Indeed, within the Engineering Faculty, corporate-funding represents 50% of their annual research income. However, as a senior manager at UniServices noted, “we have saturated the national market. All of our growth is in overseas”, and by 2013 around 40% of UniServices’ revenue was sourced from outside New Zealand. In consequence, “the target for 2020 will to be much more internationally focused” and the unit has started to establish a new series of UniServices’ roles to “work on the ground within the key growth countries”.

UniServices **commercialisation activities** grew steadily by 13% during the period 2005-2012. By 2012, annual commercialisation revenues stood at around NZ\$13m, of which around one third was driven by R&D activity from the Faculty of Engineering, in areas such as ICT and power transfer. The annual number of licensing deals increased from 18 in 2005 to 59 in 2012; with the ratio of licences to startups now standing at 30:1. During the same period, the annual number of invention disclosures increased by almost a half, to 104 in 2012. Reflecting their position in corporate-funded research, UniServices observe that they are “maxed out in market share in New Zealand” for licensing activity and look to international markets for their future growth. One powerful illustration of UniServices’ dominance in the New Zealand commercialisation landscape is their patenting activity. As illustrated in Figure 25, UniServices accounts for over 60% of patenting activity across all New Zealand universities.



**Figure 25. Proportion of international patent filings by UniServices (2005-2012) as a percentage of (i) total patent filings by all New Zealand universities, (ii) total patent filings by all New Zealand government-funded Research Organisations (ROs), including both universities and Crown Research Institutes.**

### D.4.2 Impact through engagement in entrepreneurship and community cohesion

Many interviewees noted that the strategic decision taken by the University of Auckland Business School to follow an E&I agenda in the early 2000s marked the start of “a major change towards an entrepreneurial culture” both within and outside the university. The Spark initiative, in particular, was singled out as the “beating heart of entrepreneurship at the university”.

Since its establishment a decade ago, the ambitions of and engagement in Spark have increased significantly. What is particularly impressive is the breadth of participation across all university populations. Figure 26 provides a breakdown of the 552 participants in the 2013 Spark Ideas Challenges by both university position and discipline. Following a gradual annual increase in participation levels, “2013 was the first year that we have everyone covered. We have been gradually expanding our reach until we now have someone from every Faculty entering – Law, Performing Arts, Education – everything”. Feedback about the design and influence of Spark was almost universally positive from the 31 interviewees for the study. Many participants spoke about the profound impact that Spark has had on their attitudes, often marking a turning point in their career trajectories. As one Spark mentor commented, “Spark shows students that there is another option for your career and gives them a safe playground to try it. ...The change can be remarkable”. Many interviewees also noted the progression of the Spark approach over the past ten years, “constantly adapting and improving” the structure and content of the activities, such that “the quality of Spark entries improves year on year”.

Overall, since its establishment, 100 ventures have been created through Spark that together have raised NZ140m. Interviewees noted, however, that the “raw startup statistics are just the tip of the iceberg” of Spark’s impact; “Spark has changed the mindset of the graduates, created a sense of belief in their own abilities”. One interviewee from the Auckland city council observed that the “[New Zealand version of

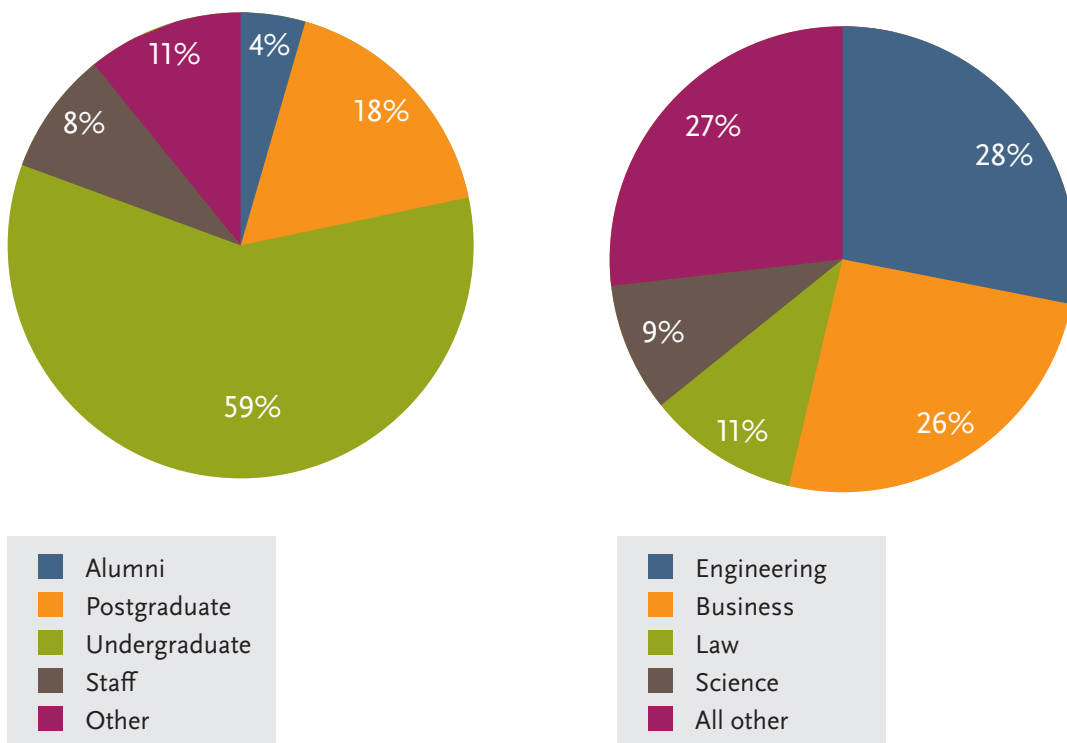


Figure 26. Breakdown of Spark Ideas Challenge participants in 2013 by (i) university position, and (ii) discipline.

*Microsoft's] Imagine Cup was dominated by University of Auckland graduates... many of whom are former Spark participants. They are tremendous poster children for Spark”.*

Interviewees also spoke about the impact of Spark in catalysing the regional entrepreneurial community and forming networks between the university and this population. Many interviewees from Auckland's entrepreneurial community observed that, prior to the establishment of Spark *“there was very little that brought people together”*, with many in the community operating within separate, and often isolated, entrepreneurial networks. The interviewees suggested that the E&I mandate established by the Business School in the early 2000s marked a turning point in the relationship between the university and the wider community. The move was seen to create a focal point for the entrepreneurial community with a suite of activities and networking events. Many noted that the Business School's role as a focus for the regional entrepreneurial network was further catalysed by the establishment of the new Business School building in 2007. As one regional entrepreneur noted *“I don't know of any events or activities for local entrepreneurs that are not connected to the Business School at the university”*. Spark, in particular, was also seen to provide a neutral ground in which business and the university can collaborate and build personal relationships; *“this was not about profit or advantage, this was about people coming together to support New Zealand Inc”*.

## D.5 Success factors

A critical factor underpinning the success of the University of Auckland's entrepreneurial ecosystem is the complementary balance of its E&I features. On the one hand, UniServices creates a robust platform from which to access international markets to commercialise university IP and source new avenues of corporate research funding, thus maximising university revenue. On the other hand, the university Business School nurtures an inclusive entrepreneurial environment and culture through establishing regional E&I networks and harnessing the *“pure passion and raw enthusiasm”* of the student population. The absence of either of these components would severely weaken the performance and reputation of the ecosystem.

Many interviewees noted the long-term impact of UniServices on the university's strategic corporate relationships and ability to compete for international corporate research contracts. In 1988, *“when most other universities [in the region] were taking a very ad hoc approach to corporate research”*, UniServices established a *“commercially focused and business minded”* approach to brokering and nurturing these relationships, one which has continued to grow and strengthen over the past 25 years. A number of interviewees, particularly those from outside New Zealand, also commented on UniServices' *“incredible success”* in the commercialisation of university research, creating *“a vibrant innovation ecosystem ... despite the constraints of the country's size and location”*. In this regard, the profile and global reputation of UniServices was undoubtedly the reason why the international experts consulted for Phase 1 of the study identified the university as a leading entrepreneurial institution. The innovative strategy adopted by UniServices and its successful implementation is a critical factor in the university's success as an entrepreneurial institution with a growing international impact.

UniServices, however, is only one part of the picture. As one interviewee noted, *“UniServices is a commercial operation. Their KPI is about creating revenue for the university”*, leading them to prioritise their growth areas of technology licensing and internationally-sourced research contracts. Although this strategy maximises university revenue, it is not one that *“plays an active, positive role in supporting the [regional entrepreneurial] ecosystem. And nor should it. That is not what they have been asked to do and not what they are being measured on”*. For the creation of a vibrant ecosystem, a balancing dynamic was required, one focused explicitly on culture and regional networks.

From the early 2000s, this balance was provided by the Business School, primarily through the Spark programme. Many interviewees highlighted the critical role that Spark has played in triggering a major, ongoing culture change at the university, a change that has “*bubbled up from the students*”. With a relatively small financial resource, Spark offers an impressive suite of educational courses, events, competitions and mentorship opportunities, all supported by an active group of student volunteers. The commitment, professionalism and enthusiasm of successive groups of these student volunteers have played a pivotal role in engaging internal and external participation in the activities. As one interviewee commented, “*the culture has now spread well beyond the students. We have senior professors involved [in Spark] from every Faculty*”.

From the University of Auckland’s perspective, the rationale for establishing and endorsing UniServices’ unique approach is clear; the unit now generates 15% of the institution’s revenue and has played a major role in strengthening the university’s international profile and reputation. The university’s motivation for investing in activities to nurture institutional and regional entrepreneurial capabilities, however – particularly within a financially-constrained national landscape – are perhaps less obvious to those outside New Zealand. However, this strategic institutional focus has been critical to the vibrancy and growth of the ecosystem. Two driving factors are apparent: (i) the vision and drive of key university leaders, and (ii) the focus on national capacity for growth rather than immediate institutional benefit. Each is discussed below.

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### D.5.1 Vision and drive of key university leaders

Over the past decade, there has been a consistent message of explicit and unequivocal endorsement of E&I as a critical university activity by successive Vice-Chancellors, Deans of the Business School, Deans of science and engineering and other key university leaders. This group of individuals were described as strong and inspirational leaders, who, in the words of one interviewee, “*could have gone anywhere, but had a great affection for the country and the university*” and each had “*a clear vision of what they set out to achieve*”. The consistency of message and clear personal commitment from a wide range of university leaders was one of the most striking outcomes of the interview process.

A number of interviewees spoke about the “*clarity of the entrepreneurial vision*” established by the previous Vice-Chancellor, in the wake of the Knowledge Wave conference in 2001. This commitment to change was clearly communicated within and outside the university and has been further strengthened by the university’s current Vice Chancellor. As one interviewee commented “*the government’s engagement [with the entrepreneurship agenda] ebbed and flowed, but the University of Auckland kept on trucking. If anything, it has got more engaged*”. Interviewees also noted the critical role played by successive Deans of the Business School who “*took on the load of delivering the thing*”. Almost every university-based intervention aimed at nurturing an entrepreneurial culture both within and outside the institution has been organised and managed by the Business School. The “*inclusive style of leadership*” adopted by the Business School has nurtured an atmosphere of open, cross-disciplinary participation in these E&I activities where, in the words of one student “*we don’t feel that we are ‘coming over to the Business School’ [for E&I activities]. It doesn’t feel like ‘us’ and ‘them’. We are all part of this together*”. Interviewees also spoke of the important role played by key university Deans, particularly amongst the Science and Health Sciences disciplines, in supporting “*commercially aware-research excellence, with learning outcomes relevant to business*”.

Interviews with all the university leaders underlined these widespread perceptions; they all spoke with clear conviction about their commitment to promoting the E&I agenda at the university, as well as “*the essential contribution of the university to the innovative capacity of the country*”. This sustained strength of university leadership in E&I has clearly had a significant impact on university attitudes and cultures,

with a growing recognition that *“there are incentives now that go down to staff level...the university is getting pretty good at recognising academics who innovate”*. In the words of one interviewee, the university’s high-level commitment to E&I *“has created an atmosphere where this stuff is okay”*. One individual has perhaps had the single greatest influence on the university’s E&I culture, and that is the instigator and mentor of Spark. Although the Spark activities are student-led, its oversight and mentorship by a team of individuals within the Business School has clearly played a key role in their success; *“the students change each year, but the Business School gives Spark a sense of permanency”*. One member of that team, who has been involved with Spark since its inception, was consistently singled out by interviewees. His role in mentoring the Spark student leaders, brokering relationships with the regional community and *“having an open door to anyone who needed advice”* was widely noted as critically important.

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### **D.5.2 The focus on national capacity for growth rather than immediate institutional benefit**

The Knowledge Wave conference in 2001 changed attitudes to E&I, both within the university and across the country. Many interviewees underlined the economic problems facing New Zealand at the time, where *“there didn’t seem to be any easy solutions... and year on year, things were getting worse, not better”*. The Knowledge Wave event was motivated by two convictions. Firstly, that, as *“the national university”*, it has a responsibility to the country and community as a whole, and secondly, that strengthening the university’s performance and reputation on a world stage would only be possible when positioned within a vibrant, innovative and growing economy. As one senior manager noted, *“building up the [entrepreneurial] ecosystem went hand in hand with building up entrepreneurship in the university. We could not do one without the other”*. Although many of the ambitious goals emerging from the event have not been met, it nevertheless appears to have served a critically-important function: a catalyst to bring business, academic and government communities together to set a common agenda for collective change towards a knowledge economy. The conference, and its subsequent activities and networks, also served to demonstrate to the national business community that the university *“had a genuine commitment to improving New Zealand Inc”* and was not solely driven by institutional benefit. In consequence, this period marked a turning point in the university’s external relationships, and the manner in which the national business community interacted with the university.

The university Business School is the focal point for this external dialogue and interaction and, over the past 12 years, has grown to be an important resource for the regional and national business community. Indeed, interviewees from New Zealand’s entrepreneurial community consistently rated the University of Auckland or the Business School amongst the three leading agencies that supported entrepreneurship in New Zealand. As one regional entrepreneur observed, *“without the university, the Business School, I can’t think of where [the entrepreneurial community] would come together. It pulls people together. Not just the university alumni, but people across the whole community”*. Another noted that *“it is a university that has invested in the ecosystem. People can now see that. There is a growing level of trust [in the University’s commitment to E&I] as a result”*.

These changing attitudes between the university and the regional business community are perhaps best exemplified by the community support for Spark. As one external interviewee observed, *“the student-centred approach [taken by Spark] has helped to engage the community. Then it becomes a virtuous circle – people who went through the Spark system in the early years are now becoming mentors, and supporting the cycle”*. Similarly, another interviewee recalled *“when [Spark] first came along, people looked at it sceptically. They weren’t really sure what the university was trying to achieve. But then they met the students – their enthusiasm – and were just blown away... this was about the next generation and that was so enormously satisfying, for everyone”*.

## D.6 On-going issues and challenges

The case study interviews pointed to three challenges to the entrepreneurial ecosystem at the University of Auckland. As outlined below, these issues relate to (i) the constrained national funding landscape for university research in New Zealand, (ii) the integration of E&I within the university departments, and (iii) the challenges inherent in the unique E&I approach adopted by the university.

### D.6.1 Funding constraints

As noted in Section 2, concerns about the poor national economic outlook in the early 2000s acted as a major driver for catalysing engagement with the E&I agenda by higher education, governmental and business communities, and spurred the establishment of the University of Auckland's entrepreneurial ecosystem. Low levels of investment in R&D by New Zealand business also lay behind UniServices' focus on internationally-sourced corporate research funding, which, in turn, has been a major, stable source of revenue for the university. However, the continued low levels of national investment in R&D appear to present a major constraint on the growth of the university's ecosystem and, indeed, to the country's innovation capacity as a whole. As one interviewee commented, *"we are poised on the brink of something fantastic, it is just funding that is the issue"*.

A large proportion of the 31 interviewees for this case study – based both within and outside the university – raised the issue of national R&D funding. Although a lack of national investment in university research and education is a common complaint across the world, the problem in New Zealand is particularly acute and one which is increasingly undermining its ability to compete on a world stage. Although national expenditure on R&D (by national GDP) in New Zealand has increased a little since 2001, it is still 47% below the OECD average; in the words of one interviewee, it is *"only maintaining our current position, at the back of the pack, and not helping us to recover the ground we have lost"*. Many interviewees suggested that the problem in New Zealand was compounded by the government's recent shift in funding priorities, away from *"fundamental, public good research"* towards *"research which has to show some end user engagement, which is more closely aligned with industry"*. Considerable concern was expressed that this move has limited national capacity to produce *"ground-breaking research and innovation"*, given that, in the words of one senior university manager, *"breakthrough development comes from fundamental research, not widget making"*. Availability of research funding for the University of Auckland further decreased in 2010, when the government reduced the pool of competitive funding available to New Zealand universities in favour of national Crown Research Institutes. As a result, the contestable research funding available to New Zealand universities has decreased by 30% in the last three years. Not surprisingly, interviewees described the landscape for university research funding as *"brutally competitive"* where *"money is so scarce, it is all about survival"*, with many citing examples of *"losing some of our professors [to overseas universities] because we simply can't compete financially"*.

Perhaps as a result of this funding landscape, the University of Auckland, like other national universities, has slipped down the international university rankings over the past decade, moving from 49th position in 2006 to 164th position in 2013 in the *Times Higher Education World University Rankings*. A number of senior university managers observed that this diminishing international profile will constrain the university's ability to secure beneficial international partnerships as well as gain a stronger foothold on the international student market. It also limits the potential for securing external funding to invest in the university's E&I infrastructure. Activities such as Spark rely to a large extent on good will and volunteerism, but their further growth and expansion is likely to require more significant levels of investment. However, observers from outside the university suggested that the University of Auckland



is not well-placed to benefit from any additional government support for their E&I agenda in the near future: *“the university suffers from the ‘tall poppy’ syndrome. New Zealand prides itself on being an egalitarian country and there is a reluctance to pick winners. The government does not want to be seen to be favouring one university... But we can’t have five world-class universities in one small country. The University of Auckland has the greatest chances of success. They have a bold vision and would be right to feel frustrated that they have not had more support from the government”*.

## D.6.2 Diffusion of E&I engagement into academic departments

Benefitting from strong endorsement from senior management, entrepreneurship activities at the University of Auckland are primarily concentrated within two key functions: the Business School and UniServices. The capacity for an E&I culture to spread more widely, and take root within the university departments, is likely to be a key determinant for the expansion and growth of the entrepreneurial ecosystem in the future.

Outside some notable exceptions – such as the School of Biological Sciences and the Bioengineering Institute – most academic departments in the university were described by interviewees as *“largely traditional”* where *“entrepreneurial behaviours are quite localised”* and *“the [university’s] entrepreneurial outlook has not seeped into the academic’s priorities or had an effect on the curriculum”*. Indeed, there was a very straight-forward acknowledgement by many interviewees that *“the number of university staff that UniServices deal with on a meaningful basis is quite low”* and *“by and large, the IP is attributed to around 100 academics who drive the commercialisation agenda across the whole university”*. This group were seen to be *“the university stars in all domains – the best performers for government research, corporate research and commercialisation”* who *“bring in a high proportion of the university’s [external] income”*. Many also highlighted the relatively narrow disciplinary base within which this group operates: *“the top 100 ‘rain-makers’ tend to be split between the three science Faculties”*. Interviewees also noted that, among the university’s most senior researchers, *“half of them will retire in the next decade”*. In consequence, many articulated a clear need to *“nurture an appetite [for entrepreneurship] across a wider group of academics”* and *“get younger generations involved in the process”*.

Interviewee feedback indicated three barriers to the further development of an E&I culture across the university departments. Firstly, a number of interviewees suggested that both the prominence and external positioning of UniServices led some faculty to believe that the establishment of corporate partnerships and entrepreneurial activity was *“someone else’s responsibility”*. These concerns were summarised by one interviewee: *“because UniServices sits between the university and industry, there is sometimes a tendency for academics to disengage and say that UniServices does the commercial world, so we don’t need to”*. Secondly, some reported that, outside the Business School, *“there is very little entrepreneurship education going on in other parts of the university”*, at undergraduate and postgraduate levels. They argued that the *“optional activities”* provided by the Business School *“got the departments off the hook”* in having to improve and adapt their *“largely traditional”* curricula to develop student’s capabilities and experiences in E&I. Others also described occasions where UniServices’ relationships with industry did not always transfer to the classroom; *“teaching misses out when the UniServices researchers have a ring-fence around them. Their function is to pump in the overhead and the students miss out on people with real industry experience”*. Finally, interviewees described *“a problem that is familiar to universities right across the world”*: the perceived pressure to prioritise research outputs over all other academic activities, including innovation and entrepreneurship. As one interviewee noted, *“why would someone care about creating startups when their career will be tied to their research prowess?”*.

The university has already been taking steps to tackle the issues discussed above. For example, the university Vice Chancellor has actively sought to *“tactically hire”* up-and-coming academic leaders who combine international quality research with a driving interest with commercialisation. In addition, UniServices organises one-day off-site *“master classes in commercialisation for selected up-and-coming*

research stars” several times per year, during which university Deans deliver presentations designed to “underline the importance of this activity to the university”. The Business School is also considering the development of a cross-disciplinary “hatchery space, somewhere on campus with a bit of a buzz whether entrepreneurial staff and students can get together and new ideas can bubble up”.

### D.6.3 Challenges inherent in the university’s E&I approach

The UniServices model for managing technology transfer and sourcing external research funding was consistently identified as unusual, if not unique. As interviewees noted, this approach “may not work anywhere else”, but “it is right for New Zealand. We are a remote island nation.... We need a dedicated, professional team to access foreign markets. This is not something that departments could do alone”. The UniServices approach brings clear advantages to the university, both in terms of revenue generation and market position. However, interview feedback highlighted “inherent tensions” associated with the model, relating to (i) the interface between UniServices and the regional entrepreneurial ecosystem, and (ii) the interface between UniServices and the rest of the university. The majority of interviewees spoke at considerable length on one or both of these issues, feedback which is summarised below.

**The first challenge** relates to conflict between UniServices’ mandate – “to create revenue for the university” – on one hand, and the expectations of the unit by the local entrepreneurial community – to support “New Zealand Inc and growing home-grown startups” – on the other hand.

Many in the regional entrepreneurial community recognise that UniServices now manage “arguably the most valuable patent portfolios in New Zealand”. As a result, the unit’s potential value as a “weapon of [regional and national] economic development” is well understood and this potential is one that many would like to see realised. UniServices’ mission, however, as set out by the university, is not aligned with these expectations; “we take a commercial approach to delivering the best financial returns to our shareholder”, and, as such, “the best path to market is always taken”. In consequence, UniServices only supports “E&I activity in Auckland, New Zealand and overseas when it makes business sense to do so”.

UniServices’ strategic priorities appear to be the subject of considerable debate across the regional entrepreneurial community, both within and outside the university. Indeed, many in the external community expressed frustration at the apparent prioritisation by UniServices of “licensing for maximum profit, generally to people outside of New Zealand... rather than spinning out into companies”; last year the ratio of licences to spinouts by UniServices was 30:1. As a result, some interviewees suggested that UniServices “is not really anchored into the [regional] ecosystem”, which, in turn, “is not likely to benefit from” the university’s research outputs and commercialisation activities because “the money all flies off-shore”. Such feedback is likely to be familiar to successful technology transfer offices in other universities across the world that are operating in challenging entrepreneurial environments. However, due to UniServices’ role as the “broker between the university and the corporate world”, the challenges at the University of Auckland appear to be magnified. In other words, UniServices’ focus on generating university revenue was seen by some interviewees as having “more far-reaching consequences” than its international peers because of the unit’s accompanying role as the primary “means through which the academics interact with industry”.

A number of interviewees both from within and beyond the university noted that these tensions were inevitable for an ecosystem that was distant from markets and in the early stages of its growth. They also observed that, “as New Zealand’s competencies in the ecosystem increase, so the work that is done on shore [by UniServices] will rise”. In addition, with time and a strengthening of the regional entrepreneurial community, lines of communication and greater transparency in the roles performed by each of the key players have grown; features that will inevitably help to ease conflict.

Further, and in recognition of the challenges outlined above, UniServices has developed a programme of activities that proactively supports regional and national entrepreneurial capacity. For example, in 2012, with financial support from the New Zealand government, UniServices established Return on Science, which *“allows any university or Crown Research Institute in the country to put their ideas through the UniServices investment committee... anyone can come and pitch their idea for free”*.

The **second challenge** relates to the division of responsibilities between UniServices and the rest of the university, where *“there is potential for a disconnect”*. As one interviewee observed, *“the UniServices’ model is unique and presents a whole host of issues of visibility over the whole funding landscape and understanding the potential for interaction”*.

One issue repeatedly raised by faculty interviewees was the *“tension at the interface between UniServices and the Research Office”*, where the former supports corporate-funded research and the latter supports research funded by government, charities and foundations. A number of interviewees observed that the division presented particular challenges for the university in *“having visibility over the full [research] funding lifecycle and understanding the potential for innovation in the future”*. Some also noted that the government’s increased emphasis on research partnerships with industry in its funding allocation had *“blurred the lines”* between corporate and government funded research, a blurring that was *“not easily accommodated”* by the university’s separation of the two.

Individuals based both at the university and in UniServices were keenly aware of the inherent challenges. For example, operating on *“relatively thin surpluses of existing money”*, UniServices’ capability for horizon-scanning or developing capacity in emerging research fields is limited; *“we can do little more than influence new research areas... we are always in responsive mode”*. This challenge was typically viewed through a different lens by faculty interviewees, some of whom expressed some concern that the university *“is not being front-footed about commercial research. UniServices need to be better at hunting and seeking out new sources of research income”*. However, despite this potential for conflict, a number of interviewees clearly articulated that *“there are more common interests between .. UniServices and the Research Office than there are differences”*, where the skill of the university has been *“to find and exploit the [areas of] common interest”*.

In response to some of these issues, a new university role, Sector Innovation Managers, is being trialled in three science and engineering disciplines. Funded in equal parts by UniServices, the Research Office and the Faculty, these individuals will be embedded within departments to provide oversight of all commercially-focused research and teaching activities and *“provide the glue that fits all the pieces together”*.

The University of Auckland has built a robust and well-balanced model for establishing and growing an effective E&I ecosystem within a challenging environment, a non-conventional model that offers an exciting blueprint for others across the world. Its design responds directly to the constraints of the environment, establishing a platform for international corporate engagement in response to the distance of the country from its key markets and establishing inclusive community-based E&I activities in response to the weak national entrepreneurship capacity. What has been achieved is impressive. However, the university is not complacent. It recognises that the approach requires constant re-calibration and careful management. As a number of interviewees observed, *“some work is still needed to connect the dots... and coordinate all of the parts”*. The university’s success is therefore testament to the quality and conviction of its leadership. This leadership, together with the complementary dynamic of the commercially-focused activities of UniServices and community-focused activities of the Business School, have established the University of Auckland as an emerging international centre of excellence in entrepreneurship and innovation.

# APPENDIX E

## INSTITUTIONAL DATA: SOURCES AND FURTHER INFORMATION

This Appendix provides further information to complement Figure 10 on page 18 of this report, which characterises the profile, E&I approach and research commercialisation performance of ten top-ranked universities. Information on the metrics used in the table is provided below (Figure 27) and further information relating to each of the top-ranked universities is provided on the pages that follow.

Unless otherwise stated, all data relates to the year 2013. Where available, references to relevant web-based information or documentation are provided as hyper-links.

<p><b>1. University ranking:</b></p> <ul style="list-style-type: none"> <li>a. The expert ranking achieved in this study for the world's most successful technology innovation ecosystems</li> <li>b. The expert ranking achieved in this study for highly effective technology innovation ecosystems operating in a challenging environment</li> <li>c. Position in the <i>Times Higher Education's 2013/14 World University Rankings</i></li> <li>d. Position in the <i>QS World University Rankings 2013/14</i></li> </ul>
<p><b>2. University profile:</b></p> <ul style="list-style-type: none"> <li>a. Annual university revenue (operating revenue, where available) in US Dollars</li> <li>b. Total university endowment in US Dollars</li> <li>c. Annual sponsored (or contract) research income in US Dollars</li> <li>d. Annual industry sponsored research income in US Dollars</li> <li>e. Total number of university undergraduates (part- plus full-time)</li> <li>f. Total number of graduate students (part- plus full-time)</li> <li>g. Total number of tenured and tenured track (or equivalent) faculty (part- plus full-time)</li> </ul>
<p><b>3. An overview of the E&amp;I approach:</b></p> <ul style="list-style-type: none"> <li>a. Does the university offer centres actively promoting E&amp;I to university staff and students?</li> <li>b. Does the university offer E&amp;I courses to students across campus (not just those within the business school or equivalent)?</li> <li>c. Are there university-wide E&amp;I competitions (i.e. open to ALL university faculty and/or students)?</li> <li>d. Are there active E&amp;I student clubs and societies available to students across campus?</li> <li>e. Does the university offer seed funding?</li> <li>f. Does the university offer proof of concept funding?</li> <li>g. Does the university offer an accelerator or incubator?</li> <li>h. Does the university engage in active partnerships to support the development of other university-based entrepreneurial ecosystems around the world?</li> <li>i. Who owns the IP for government-funded research?</li> <li>j. Who owns the IP for industry-funded research?</li> <li>k. Are bodies external to the university providing active support to drive the development of the ecosystem (such as angel groups, alumni networks etc.)?</li> </ul>
<p><b>4. Research commercialisation activity:</b></p> <ul style="list-style-type: none"> <li>a. Annual IP disclosures</li> <li>b. Annual patents filed (all filings, all jurisdictions)</li> <li>c. Annual patents issued (all jurisdictions)</li> <li>d. Number of licences per year</li> <li>e. Number of licences to spin outs per year</li> <li>f. Gross licence income received per year</li> <li>g. IP expenses per year: expenditure on patents</li> </ul>

Figure 27. The information gathered for ten of the top-ranked universities.

## E.1 Aalto University

Question	Response	Further information/data source
University revenue	\$581m	From Aalto University Annual Report 2013 (page 32, Total Operative Income 2013, €418m)
University endowment	\$1.3b	From Aalto University Annual Report 2013 (page 29, Market value of endowment portfolio, €936m)
Sponsored research	\$68m	From Aalto University Annual Report 2013 (page 17, competitive research funding 2013, €49.2m)
Industry funded research	\$31m	Data provided by university contact
University centres promoting E&I?	✓	Aalto Center for Entrepreneurship (“ACE”), Aalto Ventures Program, Open Innovation House, Aalto Design Factory, AppCampus, Aalto Startup Center, Aalto Small Business Center.
E&I courses offered to students across campus?	✓	All students are able to access courses from Aalto Ventures Program and Aalto Design Factory. There are also a number of courses in Engineering and Arts and Design schools with entrepreneurship embedded.
University-wide E&I competitions?	✓	Examples include the Summer of Startups programme
Student E&I clubs?	✓	Range of student-led activities including Aalto Entrepreneurship Society, Startup Sauna accelerator programme, Startup Life internship programme, SLUSH conference and Summer of Startups programme and the National Day of Failure annual events
Does university offer seed funding?	✓	In some sense this should be termed “pre-seed funding” since Aalto does NOT invest into a company, but into a project where it may receive equity in lieu of IP once the company is formed. ACE can fund up to €500k into commercialising a technology, and receives founders shares and/or royalties in return. Approximately 50% of the funding is provided by Aalto, and 50% matching funding is provided by the Finnish Funding Agency for Technology and Innovation (TEKES).
Does university offer POC funding?	✓	Through ACE, Aalto provides grants of up to 50k for proof of concept projects.
University accelerator/incubator	✓	Aalto University hosts a number of accelerator programmes, including Startup Sauna, AppCampus, and Summer of Startups. In addition, Aalto has an incubator called Aalto Startup Center, with over 80 startups resident, and collaborates and partially funds a second incubator, Spinno Enterprise Center.
IP ownership for gov’t funded research?	University	See the university IP Policy
IP ownership for ind. funded research?	Industry	In general the IP is owned by the University while the project is on-going, but is assigned to the sponsoring company at the end of the project.
Active support offered to other ecosystems?	✓	Aalto University provide support for the ecosystem development at Kaunas Technical University in Lithuania, and recently universities in Vietnam and South Africa. It also serves as a consultant on specific commercialization projects to several Finnish universities (Laurea, Sibelius Academy, Metropolia).
Active external partners?	✓	Finnish Business Angel Association and VIGO (Finnish start-up accelerator association)

Data on research commercialisation and sponsored research income was provided by Aalto University. Information relating to the university population was sourced from Aalto University Key Figures. All financial data has been converted from Euros to US Dollars based on an exchange rate of 1EUR = 1.39 USD (March 2014)

## E.2 University of Auckland

Question	Response	Further information/data source
University revenue	\$801m	From The University of Auckland 2012 Annual Report (page 49, Total operating revenue 2012, NZ\$931m)
University endowment	\$49m	From The University of Auckland Foundation Annual Report 2012 (page 10, Endowment Investment Pool, NZ\$57.1m)
Sponsored research	\$197m	From The University of Auckland 2012 Annual Report, (page 33, Total external research income earned, NZ\$229m)
Industry-funded research	\$63m	Data provided by university contact (NZ\$73m for 2012)
Undergraduate students	26915*	From The University of Auckland 2012 Annual Report (page 9)*
Postgraduate students	5686*	
Academic faculty	2160*	From The University of Auckland 2012 Annual Report (page 8)*
University centres promoting E&I?	✓	Centre for Entrepreneurial Learning
E&I courses offered to students across campus?	✗	Courses are not offered to all students, but bespoke programs are available such as an MBA in Entrepreneurship, a Master of Bioscience Enterprise and an optional course for engineering students on Innovation and New Product Development
University-wide E&I competitions?	✓	Spark, including the Ideas Challenge and the \$100k Challenge
Student E&I clubs?	✓	Spark and Chiasma
Does university offer seed funding?	✗	UniServices only invests in pre-seed. Seed Funding available from external bodies - Seed Co-Investment Fund and Trans-Tasman Commercialisation Fund.
Does university offer POC funding?	✓	Through UniServices (which invests \$3.5 million in pre-seed funding annually)
University accelerator/incubator	✗	Incubation provided externally through ICEHOUSE, which was founded by the University of Auckland Business School
IP ownership for gov't funded research?	University	See university IP policy
IP ownership for ind. funded research?	Industry	See university IP policy
Active support offered to other ecosystems?	✓	They provide their services to other research providers (e.g. other universities, Crown Research Institutes and Defence Technology Agency) in New Zealand through the <i>Return on Science programme</i>
Active external partners?	✓	Trans-Tasman Commercialisation Fund (TTCF), Pre-Seed Accelerator Fund (PSAF), Seed Co-Investment Fund (SCIF) and ICEHOUSE

Commercialisation data was provided directly by UniServices, University of Auckland.

All financial data has been converted from New Zealand Dollars to US Dollars based on an exchange rate of 1 NZD = 0.86 USD (March 2014)

\*Please note that academic staff and student numbers are full-time equivalent (rather than headcount, as presented for the other universities)

### E.3 University of Cambridge

Question	Response	Further information/data source
University revenue	\$2.5b	From University of Cambridge Reports and Financial Statements for the year ended 31st July 2013 (page 28)
University endowment	\$1.8b	University of Cambridge Financial Management Information for the Year Ended 31st July 2013, Endowment assets as at 31st July 2013, £1059.5m (note: this does not include the endowments of the university Colleges)
Sponsored research Industry funded research	\$542m \$49m	University of Cambridge Financial Management Information for the Year Ended 31st July 2013, Section L: Research Grants and Contracts (Total Research grants and contracts, £327m; Total UK and overseas Industry, £29.5m)
Undergraduate students Postgraduate students	12140 7245	Data accessed from UK Higher Education Statistics Agency: Student and Qualifiers Data Tables (see Institution Level: 2012/13)
Academic faculty	4915	Data accessed from UK Higher Education Statistics Agency: Staff Data Tables (see Institution Level: 2012/13)
University centres promoting E&I?	✓	Examples include Centre for Entrepreneurial Learning, Hauser Forum and Cambridge University Venture Capital & Private Equity Club
E&I courses offered to students across campus?	✓	Examples include iTeams, a range of programmes offered by the Centre for Entrepreneurial Learning and the MoTI (Management of Innovation and Technology) programme for graduate students in science, engineering and technology.
University-wide E&I competitions?	✓	Examples include the Cambridge University Entrepreneurs competition and various competitions organized by individual university Colleges, such as the Parmee Prize for Entrepreneurship and Enterprise and Downing Enterprise.
Student E&I clubs?	✓	Examples include Cambridge University Technology and Enterprise Club, Cambridge University Entrepreneurs and Beyond Profit.
Does university offer seed funding?	✓	University of Cambridge Seed Funds
Does university offer POC funding?	✓	University of Cambridge Proof of Concept Funding
University accelerator/incubator	✓	Examples include IdeaSpace Accelerate Cambridge and Hauser Forum
IP ownership for gov't funded research?	University	See university IP Policy
IP ownership for ind. funded research?	University	See university IP Policy
Active support offered to other ecosystems?	✗	The university states in its HEIF 2011-2015 Institutional Strategy "a potential growth area is the provision of revenue-generating technology transfer advice to overseas universities in countries of strategic interest to the UK and the University".
Active external partners?	✓	Examples include Cambridge Network and One Nucleus

Data on IP disclosures and patents was accessed from the UK Higher Education Statistics Agency Business and Community Interaction Survey 2012/13. All other commercialisation data was accessed from the Cambridge Enterprise Annual Review 2013, to the year ending 31st July 2013 or was provided directly by Cambridge Enterprise. All financial data has been converted from Great British Pounds to US Dollars based on an exchange rate of 1 GBP = 1.66 USD (March 2014).



## E.4 Imperial College London

Question	Response	Further information/data source
University revenue	\$1.4b	From Imperial College Annual Report and Accounts 2012-13 (page 7, Total income, £822m)
University endowment	\$160m	From Imperial College Annual Report and Accounts 2012-13 (page 40, Endowment asset investments, £96.7m)
Sponsored research	\$547m	From Imperial College Annual Report and Accounts 2012-13 (page 7, Research income, £329.5m) Data provided by university contact (2012 figures)
Industry funded research	\$66m	
Undergraduate students	8810	Data accessed from UK Higher Education Statistics Agency: Student and Qualifiers Data Tables (see Institution Level: 2012/13)
Postgraduate students	7195	
Academic faculty	3825	Data accessed from UK Higher Education Statistics Agency: Staff Data Tables (see Institution Level: 2012/13)
University centres promoting E&I?	✓	Entrepreneurship Hub and Imperial Create Lab. The European Knowledge Innovation Centre for Climate Change also provides support for E&I relating to climate change.
E&I courses offered to students across campus?	✓	Business for Professional Engineers and Scientists is an entrepreneurship elective open to students across campus.
University-wide E&I competitions?	✓	Venture Catalyst Challenge, offered by Imperial Create Lab.
Student E&I clubs?	✓	Imperial Entrepreneurs and the Imperial Design Collective
Does university offer seed funding?	✓	Offered through Imperial Innovations
Does university offer POC funding?	✓	Offered through Imperial Innovations
University accelerator/incubator	✓	Imperial Incubator and ThinkSpace
IP ownership for gov't funded research?	University	See university IP Policy
IP ownership for ind. funded research?	University	The IP for industrially-funded research is owned by the university unless otherwise stated in the contract. See university IP Policy
Active support offered to other ecosystems?	✗	
Active external partners?	✗	Imperial Innovations establishes external connections on a case-by-case basis, based on the needs and market of each individual project.

Data on IP disclosures, patents filed and patents issued was accessed from the UK Higher Education Statistics Agency Business and Community Interaction Survey 2012/13. All other commercialisation data was accessed from the Imperial Innovations Group Annual Report and Accounts for the year ended 31st July 2013 or provided directly by Imperial College. All financial data has been converted from Great British Pounds to US Dollars based on an exchange rate of 1 GBP = 1.66 USD (March 2014).

## E.5 University of Michigan

Question	Response	Further information/data source
University revenue	\$5.3b	From University of Michigan: 2013 Financial Report (Total Operating Revenues, page 63)
University endowment	\$8.4b	From University of Michigan: University Endowment Fund Profile, June 30 2013
Sponsored research	\$1.3b	From University of Michigan: 2013 Financial Report (page 26)
Industry funded research	\$72m	
Undergraduate students	28283	From The University of Michigan: Enrolment Reports (130: Enrolment by Age, Unit and Level by School or College, Fall 2013) 2
Postgraduate students	12724	
Academic faculty	3059	From The University of Michigan – Ann Arbor: Faculty and Staff Headcounts (Tenured and Tenure-Track Faculty, 2013)
University centres promoting E&I?	✓	Examples include the Center for Entrepreneurship and the Zell Lurie Institute for Entrepreneurial Studies
E&I courses offered to students across campus?	✓	The Center for Entrepreneurship, based within the College of Engineering, offers a wide variety of courses as well as the Master of Entrepreneurship and Program in Entrepreneurship.
University-wide E&I competitions?	✓	Examples include Michigan Business Challenge, Makeathon and 1000 Pitches
Student E&I clubs?	✓	Examples include MPowered Entrepreneurship, Michigan Entrepreneur & Venture Club and Net Impact
Does university offer seed funding?	✓	Examples include Michigan Investment in New Technology Startups (MINTS), Zell Lurie Commercialization Fund and Social Venture Fund
Does university offer POC funding?	✓	Examples include JumpStart grants and Dare to Dream (for students) and the College of Engineering Technology Development Fund
University accelerator/incubator	✓	Examples include TechArb Student Start-Up Accelerator and Michigan Venture Center Accelerator
IP ownership for gov't funded research?	University	See university IP Policy
IP ownership for ind. funded research?	University	See university IP Policy
Active support offered to other ecosystems?	✗	No active partnerships supporting entrepreneurial ecosystems elsewhere in the world currently operates at the university.
Active external partners?	✓	Examples include Accelerate Michigan, a2geeks, Bizdom, SPARK Business Accelerator, Great Lakes Entrepreneurship Quest, Michigan Small Business & Technology Development Center, RPM Ventures and the New Enterprise Forum

All commercialisation data was accessed from University of Michigan TechTransfer: Facts and Figures or provided directly by the Office of Technology Transfer, University of Michigan. Data on patents filed covers any US application, including both provisional applications and PCT filings designating the US. Data on patents issued includes only US patents issued.

## E.6 MIT

Question	Response	Further information/data source
University revenue	\$3.2b	MIT Report of the Treasurer for the year ended June 30, 2013 (page 1, Operating Revenues, 2013)
University endowment	\$11b	MIT Report of the Treasurer for the year ended June 30, 2013 (page 1, Endowment, 2013)
Sponsored research	\$674m	MIT Facts: Research Expenditure (Fiscal Year 2013)
Industry funded research	\$106m	
Undergraduate students	4528	MIT Facts: Enrolments 2013-2014
Postgraduate students	6773	
Academic faculty	1030	MIT Facts: Faculty and Staff (2013)
University centres promoting E&I?	✓	Examples include Martin Trust Center for MIT Entrepreneurship, Deshpande Center and Legatum Center for Development and Entrepreneurship
E&I courses offered to students across campus?	✓	Various courses offered including through the Martin Trust Center for MIT Entrepreneurship
University-wide E&I competitions?	✓	Examples include IDEAS Global Challenge, MIT 100k Entrepreneurship Competition, MIT 100k ACCELERATE Contest, MIT-Chief “Pitch to China” Business Plan Contest and MIT Clean Energy Prize
Student E&I clubs?	✓	Examples include The MIT Entrepreneurs Club (e-club) and StartLabs
Does university offer seed funding?	✓	Examples include the MIT Energy Initiative Seed Fund Program and the MISTI Global Seed Funds
Does university offer POC funding?	✓	Provided through the Deshpande Center, such as the Ignition Grants
University accelerator/incubator	✓	Examples include the Global Founders Skills Accelerator and the Beehive Cooperative
IP ownership for gov’t funded research?	University	See University IP Policy
IP ownership for ind. funded research?	University	See University IP Policy
Active support offered to other ecosystems?	✓	Examples include the MIT Skoltech Initiative, MIT Portugal Program and the Singapore-MIT Alliance for Research and Technology
Active external partners?	✓	Examples include the Cambridge Innovation Centre, the Venture Cafe, MassChallenge, the Massachusetts Technology Transfer Center, MIT ENTERPRISE forum and TiE Boston

Commercialisation data relating to IP disclosures, patents and licences were provided directly by the MIT Technology Licensing Office. Other commercialisation data was accessed from the MIT TLO Statistics for Fiscal Year 2013. Data on patents filed covers any US application, including both provisional applications and PCT filings designating the US. Data on patents issued includes only US patents issued.

## E.7 University of Oxford

Question	Response	Further information/data source
University revenue	\$1.8b	From University of Oxford, Financial Statements 2012/13 (page 1, summary of key statistics, total income 2013: £1086.9m)
University endowment	\$1.1b	University of Oxford Facts and Figures (Endowment assets: £686m, note: this does not include the endowments of the university Colleges)
Sponsored research	\$725m	From University of Oxford, Financial Statements 2012/13 (page 31, Research Grants and contracts, 2013: £436.8m)
Industry funded research	\$93m	From University of Oxford, External Research Income, 2012/13 (UK & Overseas Industry contracts: £56m)
Undergraduate students	16745	Data accessed from UK Higher Education Statistics Agency: Student and Qualifiers Data Tables (see Institution Level: 2012/13)
Postgraduate students	8925	
Academic faculty	5965	Data accessed from UK Higher Education Statistics Agency: Staff Data Tables (see Institution Level: 2012/13)
University centres promoting E&I?	✓	Examples include the Entrepreneurship Centre, Oxford Innovation Society and Skoll Centre for Social Entrepreneurship
E&I courses offered to students across campus?	✓	Examples include Building a Business (open to all university students, alumni, researchers and faculty)
University-wide E&I competitions?	✓	Said Global Entrepreneur Challenge (SGEC) and TATA Ideas Idol
Student E&I clubs?	✓	Oxford Entrepreneurs
Does university offer seed funding?	✓	Isis Innovation offer both the University Challenge Seed Fund and the Oxford Invention Fund
Does university offer POC funding?	✓	Isis Innovation offer a proof of concept fund (see seed funding options, above)
University accelerator/incubator	✓	Oxford Entrepreneurs Incubation Centre (for students or recent graduates), Isis Software Incubator, incubators also available at Begbroke Science Park
IP ownership for gov't funded research?	University	See university IP Policy
IP ownership for ind. funded research?	University	See university IP Policy
Active support offered to other ecosystems?	✓	Through Isis Enterprise
Active external partners?	✓	Examples include Oxford Innovation and Oxfordshire Local Enterprise Partnerships

Data on IP disclosures, patents filed and patents issued was accessed from the UK Higher Education Statistics Agency Business and Community Interaction Survey 2012/13. All other commercialisation data was provided directly by Isis Innovation, University of Oxford, and relates to the year ending 31st March 2014. All financial data has been converted from Great British Pounds to US Dollars based on an exchange rate of 1 GBP = 1.66 USD (March 2014).

## E.8 Stanford University

Question	Response	Further information/data source
University revenue	\$4.1b	From Stanford Annual report 2013
University endowment	\$18.7b	From Stanford Facts 2014 (page 44)
Sponsored research	\$1.2b	From Stanford Annual report 2013
Industry funded research	-	No information was found in the public domain on the university's industrially-funded research income
Undergraduate students	6980	From Stanford Facts: Academics, Undergraduate Student Profile
Postgraduate students	8897	From Stanford Facts: Academics, Graduate Student profile
Academic faculty	1429	From Stanford Facts: Academics (Tenure Line)
University centres promoting E&I?	✓	Examples include Center for Entrepreneurial Studies, Stanford biodesign, Entrepreneurship Corner, Stanford Entrepreneurial Network, epicentre and the Stanford Technology Ventures Program
E&I courses offered to students across campus?	✓	Numerous examples, including those offered through Stanford Technology Ventures Program and the d.school (such as Entrepreneurial Design for Extreme Affordability and Launchpad: Design and Launch your Product or Service)
University-wide E&I competitions?	✓	BASES Challenge
Student E&I clubs?	✓	Examples include Business Association of Stanford Entrepreneurial Students (BASES), Stanford Venture Capital Club and Society for Entrepreneurship in Latin America
Does university offer seed funding?	✓	Various opportunities available across campus
Does university offer POC funding?	✓	Offered through the iFarm Team Program
University accelerator/incubator	✓	StartX (run by Stanford Student Enterprises)
IP ownership for gov't funded research?	University	See University IP policy
IP ownership for ind. funded research?	University	See University IP policy
Active support offered to other ecosystems?	✓	Stanford Technology Ventures Program offers a number of Global Programs, including Global Partnerships with universities such as Aalto University (Finland) and Universidad del Desarrollo (Chile).
Active external partners?	✓	Numerous example, including PharmaSTART, Stanford Angels & Entrepreneurs and Joint Venture Silicon Valley

Commercialisation data was accessed from Translating Potential: Stanford University Office of Technology Licensing Annual Report 2013. Data on patents filed covers any US application, including both provisional applications and PCT filings designating the US. Data on patents issued includes only US patents issued.

## E.9 Technion

Question	Response	Further information/data source
University revenue	\$678m	From Dun's 100 Israel's Largest Enterprises: Universities by Total Revenue, 2013 (Technion, Total revenue: NIS2340m)
University endowment	\$1.6b	Data provided directly by the Technion
Sponsored research	\$84m	Data provided directly by the Technion
Industry funded research	\$7m	
Undergraduate students	9754	From Technion Presidents report 2013 (Page 101, number of students 2012/13)
Postgraduate students	3499	
Academic faculty	616	Technion university web-page: Fast Facts
University centres promoting E&I?	✓	Bronica Entrepreneurship Center at the Technion, Knowledge Center for Innovation and Alfred Mann Institute
E&I courses offered to students across campus?	✓	Bronica Entrepreneurship Center at the Technion supports a wide variety of E&I courses
University-wide E&I competitions?	✗	Although Technion is significantly involved with the national BizTEC Entrepreneurship Challenge
Student E&I clubs?	✓	Technion eClub
Does university offer seed funding?	✓	Funding offered on a case by case basis via Technion Technology Transfer
Does university offer POC funding?	✓	Examples include the H. & M. Halevy Fund for Innovative Applied Engineering Research, Anonymous Fund for applied research at the Technion, Gurwin Fund for Scientific Research and the Mitchell Entrepreneurial Foundation.
University accelerator/incubator	✓	Via the Alfred Mann Institute – the Incubator for Pharma and Bio-Medical Devices. The Technion is currently in the process of building an accelerator on campus.
IP ownership for gov't funded research?	University	IP typically held by the university, although a few exceptions exist
IP ownership for ind. funded research?	University	IP typically held by the university, although a few exceptions exist
Active support offered to other ecosystems?	✓	For example, the Technion Cornell Innovation Institute in New York City
Active external partners?	✓	Examples include Technion for Life and Microsoft Ventures Accelerator

Commercialisation data was provided directly by Technion.

All financial data has been converted from Israeli Shekel to US Dollars based on an exchange rate of 1 ILS = 0.29 USD (March 2014).

## E.10 UC San Diego

Question	Response	Further information/data source
University revenue	\$3.0b	From UC San Diego Financial Overview 2011-12 (2012 Operating Revenue, page 50)
University endowment	\$642m	From University of California Annual Endowment Report: Fiscal Year Ended June 30 2013 (page 4)
Sponsored research	\$985m	From UC San Diego Contracts and Grant Reports 2013, Awards by Major Agency, Ten Year Analysis
Industry funded research	\$120m	
Undergraduate students	23805	From UC San Diego: Registrars enrolment report, Fall quarter 2013 (graduate numbers include Heath Sciences)
Postgraduate students	6505	
Academic faculty	1196	From University of California San Diego: Full and Part Time Head Count October 2013 (Regular Teaching Faculty-Ladder Ranks)
University centres promoting E&I?	✓	California Institute for Innovation and Development, von Liebig Entrepreneurism Center, Moxie Center for Student Entrepreneurship, US-Israel Center on Innovation & Economic Sustainability and the Rady Centure Fund
E&I courses offered to students across campus?	✓	Examples include Innovation to Market, Product Design & Entrepreneurship and Entrepreneurship and New Venture Creation
University-wide E&I competitions?	✓	Examples include the TriNet Challenge, Student Venture Open and the UC San Diego Entrepreneur Challenge (which includes a 100k Business Plan competition, an Elevator Pitch Series and a Hackathon)
Student E&I clubs?	✓	Pathways Ventures and Entrepreneur Challenge
Does university offer seed funding?	✓	Offered through the Rady Venture Fund, mystartupXX and the von Liebig Entrepreneurism Center (including the von Liebig Center NSF I-CORPS Program)
Does university offer POC funding?	✓	Offered through the von Liebig Entrepreneurism Center and the Rady School of Management, such as the IEM/Rady Commercialization Project and mystartupXX
University accelerator/incubator	✓	Moxie Center, StartR and mystartupXX
IP ownership for gov't funded research?	University	See UC San Diego Patent Policy
IP ownership for ind. funded research?	University	See UC San Diego Patent Policy
Active support offered to other ecosystems?	✓	Through GlobalCONNECT and Rady Innovation Fellows
Active external partners?	✓	Examples include CONNECT, Sanford-Burnham Biotechnology Accelerator, Ansir Innovation Center and CommNexus

Commercialisation data was accessed from Technology Transfer Office FY2012 annual report, UC San Diego or provided directly by the Technology Transfer Office at UC San Diego. Data on patents filed covers any US application, including both provisional applications and PCT filings designating the US. Data on patents issued includes only US patents issued.







