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Executive Summary

University Spinouts: exploring women’s participation is a discussion paper undertaken by the Centre for Diversity Policy Research and Practice at Oxford Brookes University with a view to engaging interested parties in discussion and further research. University research is on the cutting edge of innovation and spinout companies have huge potential to improve economic competitiveness as well as the quality of life in the United Kingdom and globally. Universities have been actively engaged in commercialising their intellectual property for over fifteen years. In the 2014-2015 academic year, £52.8 million was realised from the sale of shares in these companies. Diversity of experience and thought has long been recognised as contributors to innovation but little has been documented about the involvement and contribution of women in spinout companies.

Encouraging and understanding women’s engagement in spinout companies is relevant to the UK’s new Industrial Strategy which aims to increase investment in science, research and innovation and to support businesses start up and growth. Increasing the number of women in science, technology, engineering, mathematics and manufacturing (STEMM) is an integral part of this strategy. Finally, it is germane to a broader focus on increasing the number of women in leadership roles across the public, private and third sectors.

Overview of findings

The report shows that women leaders are underrepresented in the founding and governance of spinout companies as well as in technology transfer support and in venture capital funding. In the roles studied, women hold from 5% to 27% of leadership roles.

Founders

- In the 131 spinout companies incorporated in 2015 and 2016, only 20 founders or co-founders are female. They are predominantly from universities that actively promote women in STEMM through the Athena SWAN initiative. Founders take active roles in their companies as directors and/or executives.

Company governance

- The boards of these companies are small and almost exclusively male. 260 (88%) of directors are male while 49 (12%) are women. Only 8% of the companies have a gender-balanced board of between 40% - 60% women.
- When a chair of the board is designated, the person is almost always male. Of 38 chairs identified, only 2 (5%) are female. Like male chairs, the two women chairs have extensive experience in the spinout company’s sector and/or venture capital experience.
- There are 77 designated chief executives in the sample of spinout companies. Only 7 (9%) of these are women. All but one of the CEOs was a founder or co-founder of the company.
- Key executives were identified in 74 of the spinout companies in the sample. Out of 289 executives 43 (15%) are female.

Technology Transfer Offices (TTOs)

- Of the nine TTOs analysed in report, women held 12 (19%) of director roles.
- Named chairs were identified for 8 of the TTOs and they are all male.
- Of the nine chief executives, only one is a woman.
- Executive teams of TTOs have better diversity. Out of 55 executive team members identified, 15 (27%) are women.

Venture Capital Companies

- Out of a total of 61 directors, 8 (13%) are women.
- The 10 venture capital companies studied are led by male chairs and chief executives. One has a female chair and one has a female co-managing partner.
- Executive teams were identified for 9 of the venture capital companies and 20% of team members are women.

From findings to further research

The report shows that men hold the majority of leadership roles in key aspects of the spinouts process and this raises questions about possible contributing factors to the under-representation of women. Further research and discussion is
needed to determine policies and actions that would result in more balanced leadership. The next step will be to capture the views of interested parties on the findings in this paper and on the following suggested areas for further research:

**Trend data.** The report focusses on women’s leadership in very young spinout companies that were formed in 2015 and 2016. Trend data would help us to understand how the demographics of women’s participation in key roles over time. As it can take 10 years for a spinout to achieve an Initial Public Offering (IPO) or trade sale, trend data would also give a better understanding of the success and failure rates of spinouts founded by women.

**Comparative information between men and women.** Participation rates tell only part of the story. It would be useful to know if the characteristics of men and women in governance roles differ in terms of qualifications and experience and how they were selected. Do female founders differ from their male counterparts in terms of access to research funding, venture capital and share allocations? Do their entrepreneurial aspirations differ and do they affect preferences of licensing agreements or consultancy over spinout company formation?

**Structured interviews with female founders.** The number of female founders, which is relatively small, doesn’t tell us about their journey, their motivation, the impact on their academic careers, factors they consider critical to their success and barriers they face. Also of interest is their interaction with TTOs and venture capital companies. Would they be interested in creating another spinout company or recommend that path to commercialising research to others?

**Governance and organisational development.** The spinout companies studied have very small board membership. How they will change in size and diversity over time is unclear but company boards play a critical role in setting vision and strategy, ensuring accountability and creating relationships with external stakeholders. Should universities be more active through their shareholdings or intellectual property licenses to develop the boards of spinout companies?

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University spinouts

Exploring women’s participation

Should they draw on the diverse talent within the university, particularly their business schools, for board members, observers or mentors?

If you would like to discuss the findings of University Spinouts: exploring women's participation and discuss future research, please contact cdprp@brookes.ac.uk
University spinouts  
Exploring women’s participation

1. Introduction

University research plays a key role in the 21st century knowledge era and is often on the cutting edge of new discoveries. It produces inventions and innovations that, when applied, increase the competitiveness of the UK economy as well as contribute to our quality of life. Health, communications technology, energy, environment, engineering and chemicals are major sectors that benefit from university research and they have a large impact on individuals and the larger society. Government and funding councils have long encouraged universities to commercialise their intellectual property in order to further develop and apply it. Commercialisation also offers an opportunity for universities to recapture research costs and develop new streams of income. In the 2014-2015 academic year, universities earned £155.4 million from Intellectual Property (IP) with £52.8 of this coming from the sale of shares in spinout companies.¹

1.1 Commercialising research.
Universities generate income from their IP through licenses, consultancy contracts and spinout companies. Spinouts are initiated by academic entrepreneurs who want to take their innovations and inventions into the wider marketplace. As owners of the IP, the university’s consent and active involvement in the process is essential. Universities protect their IP rights through shares and/or licensing agreements. For most spinouts, the desired outcomes are a stock market listing through an Initial Public Offering (IPO) or an acquisition by an industry partner. It may take ten years to achieve the desired income and requires access to proof of concept funding and the involvement of venture capitalists. Technology Transfer Offices (TTOs) within universities play a pivotal role by helping spinouts get started and by providing links to potential funders and investors.

1.2 Gender diversity and spinout companies.
Over 1700 spinout companies have been created since 2000 according to Spinouts UK’s database² but information on the role of women in their development and formation is scarce. In 2014 the Enterprise Research Centre surveyed a sample of 350 active spinouts in the UK and found that women were the main founder in only 8.3% of them.³ Most research on this topic is based on activity globally or in the United States. Despite limited information on women’s leadership in spinout companies in the UK, their engagement matters to the public, private and university sectors:

- The UK is currently developing an industrial strategy that addresses the long-term challenges to the UK economy. In the first quarter of 2017, the Department for Business, Energy and Industrial Strategy issued a consultation document, Building our Industrial Strategy: green paper⁴, that proposed new approaches to increasing UK competitiveness. It includes “investing in science, research and innovation” as well as “supporting businesses to start and grow” as two of the ten pillars of the new strategy. University spinouts can contribute to these pillars and be supported by them. Among the options identified in the green paper are: investing in local science and innovation strengths; increasing support for commercialisation; increasing research talent in science, technology, engineering and mathematics (STEMM) and improving access to capital for start-ups.

- Because of the importance of STEMM to the UK’s competitiveness, increasing the under-representation of women in STEMM subjects has become an important focus. In additional to raising the total number of STEMM workers, increasing women’s participation brings diversity benefits to the innovation process. Universities across the UK have embraced the Athena SWAN⁵ initiative to advance women in STEMM disciplines. Research into spinout companies is particularly relevant to Athena SWAN as most of these companies are in STEMM areas.

- Advancing women’s leadership has been a high-profile, cross-sector issue in the economy and society for many years. The research and
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analysis in this report aims to complement the work of others who are focussed on increasing the number of women leaders and fully tapping the talent they offer as directors, executives, entrepreneurs and scientists.

1.3 Purpose of this report.

*University Spinouts: exploring women’s participation* is a scoping report commissioned by the Centre for Diversity Policy Research & Practice at Oxford Brookes University. It provides a baseline understanding and metrics of women’s leadership in various aspects of the spinout process and identifies future research to delve more deeply into the subject. The report is intended to be used as a discussion document with others interested in women’s engagement in creating and developing spinout companies.

The report documents gender diversity in leadership roles in spinout companies formed in 2015 and 2016 and in a sample of technology commercialisation and venture capital companies. It also provides some brief profiles of women in key roles and the companies with which they are associated. It posits questions for future research. Finally, the report suggests next steps to explore more fully women’s involvement or lack of it in the spinout process.

The participation of women in spinout companies in the following four key areas is analysed:

- Academic founders
- Governance
- Technology transfer support
- Venture capital investment

Key lines of enquiry arising from the initial findings encompass:

- Trend data over a longer period time

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Exploring women’s participation

- Structured interviews with female founders
- Comparative information between men and women in leadership roles
- Governance and organisational development
- Roundtable discussions with interested parties across sectors.

A note about methodology.

The research in this report is desk based and has drawn on information and publications available on websites. The 131 companies analysed in the study are those listed on the Spinouts UK database as having been formed in calendar years 2015 and 2016. Spinout companies are defined as those that are set up to commercialise intellectual property developed at and owned by a university. They do not include the many start-up companies formed by staff or recent graduates that do not involve intellectual property owned by university. Information on individuals in leadership roles was obtained from information published on the websites of Companies House, spinout companies, universities and venture capital companies. University and venture capital websites were also accessed to gain an understanding of the role Technology Transfer Offices (TTOs) and venture capital companies play in the spinout process. The sample of TTOs and venture capital companies analysed was compiled from those involved in spinouts incorporated in 2015 and 2016.

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2. Academic Founders

Founders of spinout companies are academic entrepreneurs who take their discoveries out of the laboratory into the marketplace to reap financial rewards as well as the satisfaction of seeing their research applied. Regardless of gender, academic entrepreneurs need the acumen to recognise business opportunities, a willingness to take risks and the ability to combine demanding academic commitments with the additional work of creating and initially running a spinout company. They must be able to manoeuvre through their academic departments and technology transfer units to get approval and support for their spinout initiative. Finally, they will need to secure external investment to launch on the stock exchange as an Initial Public Offering (IPO) or to develop the company with a trade partner.

A study of spinout founders from 20 leading universities in the UK found that male and female founders displayed similar motivations to entrepreneurship but that women were a small proportion of academic entrepreneurs in these universities. The disproportionately low numbers of women founders are not limited to spinouts in the UK. Osage University Partners studied 6,000 start-ups in 90 university partners worldwide and found that only 11% of these companies had a female founder or co-founder. A review of studies published by Birkbeck University London shows that women constitute a small percentage of academic entrepreneurs in the United States and Europe and register fewer patents. However, the quality and impact of women’s patents were equal to or superior to those of male scientists.

Spinout companies are almost exclusively in STEMM areas that have historically attracted fewer women than men. This adversely impacts the pool of female scientists who could potentially create spinout companies. The Equality Challenge Unit reports that only 18.5% of all professors and only 25.5% of academic senior managers in STEMM disciplines are women. However, postgraduate researchers in STEMM are 43.4% women and are also potential entrepreneurs. Being a professor or senior academic is not a prerequisite to becoming a spinout founder although senior academics, who have published widely and been on conference platforms, would more easily attract the attention of venture capitalists and industry partners.

Birkbeck University’s review concluded that women founders faced a different set of challenges than their male colleagues as did the study of female founders at 20 leading UK universities and the OSAGE study. The Athena SWAN initiative actively addresses some of the challenges identified which include lack of mentoring, balancing work and caring responsibilities, access to networks and unconscious bias. These are relevant to female academics having the time and the support to succeed as an academic entrepreneur.

2.1 Findings: female founders.
This report identified a total of 20 female founders or co-founders of the 131 spinout companies incorporated in the UK in 2015 and 2016. An analysis of the founders shows:

**Female founders reflect diversity in university research teams.**
- Most of the female founders are co-founders with male colleagues with whom they worked on research leading to the spinout.

**Female founders take active roles after the spinout company is formed.**
- There are 14 female founders who are directors. Five of these are also the chief executive officer of the spinout company and three have other executive roles within the company.
- A further five founders who are not directors appear on web-sites as members of the executive team.

**Female founders are from universities engaged in Athena SWAN.**
- 13 female founders are from institutes or departments that have achieved a Silver Athena SWAN award.
- Three are from an institute or department that holds a Bronze Athena SWAN award.
- One is from a university which holds a bronze award at an institution level.
Most spinouts with female founders have attracted some level of investment.

- Investment by venture capitalists, university seed funds or government entities was identified for 18 of the 20 companies with female founders.
- Three have individually attracted £10 million or more in external investment. This includes one company which raised £95 million.
- Six have attracted external investment between £200,000 to £2 million.

Almost half of female founders are significant shareholders in their spinouts.

- Persons or corporate bodies with 25% or more shares are identified on the Companies House website by individual company. Founder’s shareholdings are normally allocated at the time of incorporation but may become diluted when other shareholders are attracted through venture capital or IPO flotations.
- Of the 20 female founders identified, nine have a significant shareholding in their companies (25% of shares of more).

Questions:

- How do male and female founders differ in terms of their backgrounds and career history?
- What is the difference in the number of patents held by male and female founders?
- Do male and female founders have similar levels of grant funding or principal investigator roles for their research?
- Do spinouts founded by men or with a male co-founder attract higher levels of investment?
- Do male and female founders differ in the percentage of shares they control?

Professor Dame Carol Robinson is a co-founder of OMass Technologies and is renowned for pioneering the use of mass spectrometry for her ground-breaking research into the 3D structure of proteins. Professor Robinson holds the Chair of Dr Lee’s Professor of Chemistry at the University of Oxford and is Chief Scientific Consultant to OMass Technologies Ltd. Based in Oxford, OMass has raised £1 million from Oxford Sciences Innovation and has established partnerships with international pharmaceutical and biotechnology companies to guide their drug discovery programmes.

Professor Robinson is the first female Professor of Chemistry at the University of Oxford and was previously the first female Professor of Chemistry at the University of Cambridge. She began her career as a laboratory technician at Pfizer where she learned to use the mass spectrometer. Inspired by this experience she studied part-time for seven years and graduated from the Royal Society of Chemistry. She then went on to gain her PhD in two years from the University of Cambridge and afterwards completed a one-year MRC Training Fellowship at the University of Bristol Medical School. Following her MRC Training Fellowship, she took an eight-year career break to raise her children and returned to academia to build a highly successful career. In addition to her current role, she has been a Royal Society Research Professor and is the recipient of many awards and medals.
Spinout founder and director becomes Pro Vice Chancellor for Research and Global Partnerships

Professor Linda King was appointed Pro Vice Chancellor for Research and Global Partnerships at Oxford Brookes University in 2015. She has a strong track record in research and knowledge exchange and is both a founder and a director of spinout companies. Professor King is co-founder and director of Oxford Expression Technologies Ltd (OET) which resulted from a collaboration between Oxford Brookes University and the Natural Environment Research Council. The company provides products, services and consultancy to the global pharmaceutical and biotechnology industries from its base in Oxford and has become a world renowned centre of excellence for baculovirus protein expression. OET is co-located and works closely with the Oxford Brookes University Insect Virus Research Group within the Department of Biological & Medical Sciences.

Since completing her doctorate in molecular virology at Oxford University, Professor King’s research has focused on understanding the biology of insect viruses and on their exploitation in agriculture, medicine and biotechnology. She has published more than 100 papers in peer-reviewed journals, reviews and book chapters and has spoken at numerous national and international meetings. She is a Member of the Microbiology Society, a Member of the Society for Invertebrate Pathology and a Fellow of the Royal Society of Biology.

Currently, Professor King is supporting the formation of another Oxford Brookes’ spinout as a University shareholder of Clinical Digital Diagnostics Ltd. The company is founded by Professor Helen Dawes who holds the Elizabeth Casson Trust Chair at Oxford Brookes and leads the Movement Science Group based in the Faculty of Health and Life Sciences. Clinical Digital Diagnostics uses inertial measurement units to measure gait and analyses the results to support the diagnosis of neurological disorders affecting movement.

3. Governance

Most Spinouts are registered at Companies House as private companies limited by shares although a few are registered as public limited companies or community interest companies. Founders are initial shareholders of the limited company and normally take on director roles as well. Universities usually take a shareholding in the company and/or enter into IP agreements with it. An IP agreement is critical to a company’s ability to trade. Although external investors could be included at this stage, they are more likely to be engaged after incorporation.

Spinout companies normally adopt model Articles of Association as prescribed by the Companies Act Regulations 2008 which empowers them to run the company, appoint additional directors, delegate powers to executives and issue and allocate additional shares. As the initial directors and shareholders of the company, founders and universities have a very large say in the company’s future development.

3.1 Findings: Directors.

Directors for the companies in this study tend to be academics involved in the original research, venture capitalists, and university representatives that are involved in technology transfers and or seed funding. Some companies also appoint directors with recognised business and technical experience in a relevant industry. The average size of effective boards in the UK has been suggested as being between six and ten directors, depending on the size and complexity of the company. Spinout company boards in this report have far fewer directors. This may be an indication of how recently they were incorporated as boards tend to grow and evolve over time.

Spinout company boards are small...
- The 131 companies in the sample have a total of 403 directors or an average of 3 directors per board.
- The number of directors per company range from 1-9 directors.
- Almost one-fifth of the companies have only 1 director.

and men fill most of the director roles.
- 260 (88%) of all directors are male. Out 49 (12%) are women.
- The average number of women per board is less than one woman (.4)
- The range of female directors on boards is 0-3 directors compared to 1-9 directors for men.
- Women are better represented on the very small number of community interest companies (CICs) in the sample. Four of the companies are CIC companies and women have 70% of the director roles.

Almost all the female directors have a degree in a STEMM discipline.
- 29 (59%) of female directors have degrees in life sciences such as biology, microbiology, biochemistry, medicine and botany.
- 9 (18%) of female directors hold degrees in the physical sciences such as chemistry, physics and engineering.
- 5 (10%) of female directors are in the social sciences.
- 4 (8%) of female directors have degrees in business disciplines. (Not included in this figure are two of the STEMM directors who also have an MBA).
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Gender-balanced boards are scarce.

Gender balanced boards are 40%-60% male or female.
- Only 10 (8%) of spinout companies in the sample have gender-balanced boards.
- 5 (4% number) of all spinouts have more than 60% women while 116 (87%) have more than 60% men.
- 94 (72%) of all boards have no female directors but a scant 2 (2%) of all companies have no male directors.

Gender-balanced Boards

The percentage of women on spinout boards decreased from 2015 to 2016.
- Companies spun out in 2015 had 41 (15.8%) women on their boards. Companies incorporated in 2016 had only 8 (5.5%) female directors.
- The number of spinouts also decreased from 2015 to 2016 on the Spinouts UK database. Thus, women are getting a smaller share of director roles in a declining number of spinouts.

Questions:
- Should universities ensure that spinout boards are larger and more diverse at an early stage?
- Do men and women directors differ in their backgrounds and expertise?

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- Do university technology units take on the normal functions of a board, i.e. vision, strategy, financial accountability in these small companies?
- Do older, more mature companies have a better balance on their boards. Does it make a difference if they have achieved a FTSE AIM listing?
- What is known, if anything, about women’s preference for social enterprise as opposed to companies limited by shares or plcs?
- Does the decrease in the percentage of women directors between 2015-2016 indicate a trend?
- Does the decreasing number of companies being spun out each year reflect a tightening of resources or risk decisions that disproportionately affect women?

3.2: Findings: Chairs of Spinout company boards.

Chairs were identified for only 38 companies or 29% of the total sample. The small number of Chairs reflects the very small size of these boards and the companies' early stages of development. Chairs appear more likely to be appointed after venture capital is attracted with investors having a substantial say in who is recruited.

Spinout chairs are almost exclusively male...
- Of 38 chairs identified, only 2 chairs (5%) are women.
- The boards chaired by the two females each have 40% women directors.
- Of the 33 male chairs, only two lead gender-balanced boards (40%-60% women).

but male and female chairs have similar backgrounds.
- A typical profile for either a male or female chair is someone with extensive experience relevant to the spinout company’s sector and/ or venture capital experience. Some have been involved in multiple spinouts.
- Only one male chair is an academic but he is also on the board of a leading venture capital company.
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Questions:

- How do spinout companies select a chair?
- Who is involved in the selection process?
- Are executive external search firms utilised?

Kelsey Lynn-Skinner is the Chair of Inflowmatix, an Imperial College spinout that enables affordable, high-resolution pressure monitoring in water supply networks. She is a Partner and Director of Technology Ventures at Touchstone Innovations which has invested in the company. She was previously a Partner and Principal of Firelake Capital Management LLC where she focused on commercialisation of materials technologies and business models. She is a Director of Concirrus, Econic Technologies and Aqdot and has been a director or observer on 12 different startup boards between the UK and the US since becoming a venture capital investor in 2008. Ms Lynn-Skinner has a B.S. and M.S. Degree in Mechanical Engineering and an MBA from Stanford University.

Dr Barbara Domayne-Hayman chairs the board of Puridify, a UCL spinout that provides purification solutions for biotherapeutic manufacturing. She is currently Chief Business Officer at Autifony Therapeutics, and is also a Non-Executive Director of Yaqrit, another UCL spin-out, focused on liver disease. In addition she is a member of the Cambridge Enterprise Seed Investment Committee. Barbara is the former CEO of Stabilitech where she raised funding and established twelve commercial collaborations. She was Commercial Director at Arrow Therapeutics and Senior Business Development Manager at Celltech. Dr Doymayne-Hayman spent ten years with Zeneca in international commercial and marketing positions. She holds a Sloan fellowship from London Business School and has a BA and DPhil in chemistry from Oxford University. She has been an “Entrepreneur-in-residence” at the Stevenage Bioscience Catalyst.

3.3 Findings: Chief Executive Officers. Almost 60% of spinouts in the sample have a designated Chief Executive Officer. A total of 77 CEOs were identified in the 131 companies in the sample.

A very small number of CEOs are female.

- There are only 7 women CEOs which is 9% of the 77 identified CEOs. They are all Executive Directors of their respective spinouts.
- All but one of the female CEOs is a founder or co-founder of the spinout.
- Five of the CEOs are in STEMM disciplines while one has a finance and economics background. STEMM backgrounds are biology, biochemistry, chemistry and medicine.

- Two of the CEOS are foreign nationals with one resident outside Britain.
- Four of the female CEOs are academics, two are from the pharmaceutical industry and one describes herself as an entrepreneur.

Questions:

- How is the Chief Executive Officer selected?
- Are external executive search firms engaged?
- Do male CEOs have similar backgrounds to female CEOs? (NB. male CEO backgrounds have not been researched at this stage).
From student entrepreneur to Chief Executive Officer
Dr. Alina Rakhimova, is CEO and Co-founder of EnzBond, a biotechnology company spun out of Oxford University to commercialise in-silico technology, which makes utilising enzymes in drug manufacturing both cost-effective and time-efficient. Her co-founder, Dr Robert Simon, is the company’s Chief Technology Officer. As PhD students, EnzBond’s founders did everything from develop the underlying technology to pitching the technology to pharmaceutical partners and investors. They officially founded the company upon completion of their studies. Oxford University Innovation was involved in the spinout and Oxford Sciences Innovation provided £350,000 in seed funding.

Prior to embarking on her PhD in Biochemistry at Oxford, Dr Rakhimova gained experience as a Senior Specialist at the Advanced Technology Center (ATC) in Moscow which was one of the top tech start-ups in Russia. She graduated Summa Cum Laude with a Master’s Degree in Bio-organic Chemistry from Lomonosov Moscow State University. She worked for ATC while studying for her Master’s Degree and for a short period after graduation. She has more than 9 years of research experience in the fields of biochemistry and molecular biology.

“The process has been both rewarding and challenging. At EnzBond we had to build our strength as we go, learning all the aspects of business development in real life. Looking back, I can say that this experience is priceless.” Dr Alina Rakhimova, CEO and Co-founder, EnzBond.

From research fellow to Chief Executive
Dr Olivia Champion, co-founder and Chief Executive of BioSystems Technology, was named one of 50 entrepreneurs by world leading university business incubator, SETsquared, in 2017. She was selected for her pioneering spin-out company which she co-founded at Exeter University as a Research Fellow. The company offers a proprietary method for breeding and sterilising the larvae of the greater wax moth, called TruLarv, to help reduce the reliance on the involvement of mammals for conducting research. Through SetSquared the company received an initial £200,000 from private backers and within a year it had more than 50 customers and began exporting to eight countries.

Dr Champion has a MSc in Clinical Microbiology from Queen Mary and Westfield, University of London and a Doctorate from The London School of Hygiene and Tropical Medicine in Molecular Microbiology after which she took up her first post-doctoral position at the University of British Columbia in Vancouver, Canada. She has been a research Fellow at Exeter University for over nine years and earlier in her career was a Clinical Scientist at Public Health England and an Intern with the World Health Organisation. During her career, she has published over 20 peer reviewed research articles, six book chapters and filed two patents, against a background of three career breaks for maternity.

“I am aware that my position as a female in two male dominated areas, science and business, provides me with an opportunity to be a strong role model and mentor for other females and I am keen to find opportunities to provide support for others.” Dr Olivia Champion, CEO BioSystems Technology
3.4 Findings: Executives.
Given company size and stage of development, not all the companies in the sample have well developed websites that profile an executive team. However, 74 companies did provide information on the key people running the company.

**Executive teams are small but have better gender representation than do boards, chief executives or chairs.**
- The average size of an executive team is four members.
- Out of 289 executives 43 (15%) are female.
- Seven or about 10% of the companies had gender-balanced executive teams.
- Almost half of the companies have no female executives.

Companies at flotation stage may have better gender diversity.
Four spinouts had Initial Public Offerings (IPO) in 2015 and 2017 but were originally incorporated 2 to 14 years earlier.
- Among them they averaged 19% women directors and 29% women executive team members.
- One of the four companies had a female CEO but none have a female Chair.

Pertinax: an invention to protect against and treat bacterial and fungal infections
Pertinax Pharma is a 2015 spinout from the University of Bristol’s Dental School that has attracted £1,025,000 equity-based investment and an additional £489,000 from Innovate UK’s Aid for Start-ups scheme. Pertinax is a slow release technology for chlorhexidine (CHX) which confers long lasting anti-bacterial and anti-fungal protection. It was invented by the spinout’s founder Dr Michele Barbour and her research group which investigates the application of nanoscience and nanotechnology to dentistry and dental materials. Pertinax provides benefits beyond dentistry and has applications in the field of medical devices and wound care for human and veterinary use.

Dr Michele Barbour is Reader in Biomaterials and Deputy Head of Bristol Dental School as well as Academic Founder, Director and Chief Scientific Officer of Pertinax Pharma. Highly respected in the field of biomaterials research, she has over 50 peer-reviewed publications to her name. Dr Barbour took her first degree in physics at the University of Oxford. Wanting to apply her knowledge to a human health area, she then took up an inter-disciplinary PhD opportunity at the University of Bristol working on the development of a new kind of soft drink that wouldn’t damage teeth. Following her PhD and a period as a postdoc, she joined the Bristol Dental School’s academic staff.

“We’re very excited about Pertinax’s potential. Our primary target market will be in the wound care, where there are a number of important applications of the technology, but in time we expect Pertinax to also find application in other areas of medicine, as well as veterinary care and dental technologies. Pertinax has the potential to be a very useful tool in the fight against antimicrobial resistance, as pressure to reduce antibiotic use will cause more and more clinicians to turn to non-antibiotic technologies to protect and treat their patients.” Dr Michele Barbour

4. University support for creating spinouts

Universities offer support to researchers, staff and students who are seeking to commercialise innovations, research and expertise. They do this through Technology Transfer Offices (TTOs) which may be incorporated as limited companies. Throughout the commercialisation process, TTOs look after the university’s intellectual property rights as well as those of the funders who have contributed to the research. They play a pivotal role in patent registration, licensing agreements, consulting contracts and access to proof of concept funding and venture capital. Technology transfer professionals from leading universities have issued a briefing note, Technology Transfer: behind the headlines, that provides a comprehensive overview of the role and responsibilities of TTOs.

Spinouts are but one avenue of commercialising a university’s IP and involves a thorough process to determine if it is the best route. TTOs, in discussion with others, consider if market opportunities justify the future investment required, if there is a sound business case, if there is a suite of IP with new IP expected and whether the technology is disruptive or novel and applicable in more than one market. TTOs would pursue these deliberations and discussions without reference to the gender of the innovator. However, given the small numbers of female founders of spinout companies, the issue of unconscious bias in decision making should be explored.

An exercise conducted in the United States with 239 technology transfer licensing officers from 81 leading research universities indicates unconscious bias may be a factor in the lower number of spinouts by academic women. Identical invention disclosure and inventor descriptions with male or female pictures and names were distributed to the technology transfer officers. The officers, were asked if the inventor wanted to start a company, how much would they try to dissuade him or her. Licensing officers, whether male or female, were significantly more likely to say they would dissuade the female inventors.

4.1 Findings: Technology Transfer Offices.

The participation of women leaders in these companies was captured by directors, chairs and chief executive officers. This study looked at the gender of leadership in nine technology transfer companies. These technology transfer companies are linked to universities who have the highest level of spinouts on the Spinouts UK database.

- Alta Innovations
- Cambridge Enterprise
- Edinburgh Research and Innovation
- Imperial Innovations
- Oxford University Innovation
- Quibis
- UMI3
- UCL Business
- Warwick Ventures

Women comprise 19% of directors on these technology transfer/investment companies.

- There is a total of 62 directors but only 12 are women.
- None of the boards are gender-balanced with between 40-60% women.
- Imperial Innovations has no women on its board nor does Alta Innovations at the University of Birmingham.
- Warwick Ventures is unusual in that two of its three directors are women.

Chairs and Chief Executives are almost exclusively male.

- Named chairs were found for 8 of these companies and they are male.
- Of the nine chief executives, only the CEO at UCL Business is a woman.

Executive teams have better gender diversity.

- Fifty-five executive team members were identified across eight technology commercialisation companies. Women are 27% of these executive team members.
- Four of the eight companies appear to have no women in their top management team.
Female staff are appointed to spinout company boards.
- Seven women from these technology commercialisation companies are directors of ten companies spun out in 2015-16.

Questions:
- Do male and female founders or potential founders have the same experience with TTOs?
- Do TTOs gender proof their policies and procedures, they train for unconscious bias and monitor outcomes by gender?

Providing expertise to spinout companies and their boards

Dr Anne Dobrée is Head of Seed Funds at Cambridge Enterprise and has worked in technology commercialisation since 1999. She first joined the technology transfer team at the University of Cambridge in 2001, and has held a number of roles with Cambridge Enterprise and its predecessors including Head of Technology Transfer and Interim Director.

Dr Dobrée joined the Seed Funds team in 2008 and was appointed Head of Seed Funds in 2011. During her time at CE, she has supported many early stage companies and served on the boards of Pneumacare, Cambridge CMOS Sensors, Aqdot and Cambridge Touch Technologies to name a few. She was a founding member of Praxis, the UK Technology Transfer Training Programme.

Before joining Cambridge Enterprise, Dr Dobrée worked in technology transfer at Imperial College Innovations Limited, in pharmaceutical development at Evans Medical, and in pharmaceutical product training at Information Transfer. Anne holds a BSc in Medical Microbiology and a PhD in Immunology.

5. Venture Capital Companies

Venture capitalists are vital to a spinout company reaching an Initial Public Offering (IPO) stage and being listed on a stock exchange. The Lambert Review of Business - University Collaboration posited that “The best way to judge quality is by looking at the ability of a spinout to attract external private equity. This indicates whether there is a real market interest in the new company”. While this may be true for spinouts wishing to realise monetary benefit by selling shares, it is not the standard applicable to successful community interest companies which are primarily concerned with social benefit. Although few in number, community interest companies could grow in popularity and sustain themselves through earned income and grant funding.

Since the Lambert Review was published in 2003, the partnership between venture capital companies and universities has evolved and strengthened. Some venture capitalists become involved at a seed stage to support proof of concept and then take the spinout to market. Some, such as Cambridge Innovation Capital and Oxford Sciences Innovation are focussed on particular universities. Universities may enter into long-term partnership agreements with venture capital companies that give them first right of refusal for funding new spinouts or give them for some form of profit sharing based on the spinout’s success.

The issue of male dominance in the venture capital sector and how it affects female entrepreneurs has been a prominent global issue for some years. A study by TechCrunch of the top 100 venture firms globally revealed that only 7% of investing partners, which is 54 out of 755, are women. The same study showed that start-ups with at least one female founder received only 10% of venture capital invested in start-ups from 2010 to 2015. Investment decisions may be influenced not only by the gender of the founder but also the gender profile of the management team. An analysis of over 6700 firms in the United States that received venture capital funding between 2011 and 2013 showed that only 15% of the companies had a woman on the executive team.

Venture capitalists tend to be a highly networked group of male individuals. They collaborate with one another to provide joint funding and with universities that produce a high volume of spinout companies. They often place colleagues on the boards in which they have invested and play a critical role in selecting other directors, the chair and executive staff. That unconscious biases may come into play is demonstrated by a study that analysed how venture capitalists talked differently about men and women entrepreneurs when making decisions. The financiers rhetorically produced stereotypical images of women as having qualities the opposite to those considered important to being an entrepreneur. Conversely, men were stereotyped as having these important qualities.

The global TechCrunch study did point out the number of female-founded venture firms was growing albeit from a very low base. From 2010 to 2015, 12% of newly licensed venture and micro venture firms had at least one women founder. Specialist funds and initiatives that support female entrepreneurs are also on the rise although they are dwarfed by the funds available through traditional venture capital investment. More documentation and analysis is needed on the impact of such funds on female academic entrepreneurs.

5.1 Findings: Venture Capital Companies.

The study analysed gender diversity in venture capital companies involved in the spinouts that were researched. This analysis confirms that the leadership of these venture capital companies is overwhelmingly male.

The joint venture capital companies analysed were:
- Braveheart Investment Group
- Cambridge Innovation Capital
- Epidarex Capital
- IP Group plc
- Mercia Technologies
- MTI Partners
- New Wave Ventures
University spinouts

- Oxford Sciences Innovation
- Syncona
- Touchstone Innovations

Board Directors in these venture capital companies are 87% male.
- A total of 61 directors were found and eight of those were female.
- Four of the ten companies in the sample had no female directors.
- Epidarex is unusual in that two of its three directors are female.

Male chairs and chief executives lead these venture capital companies.
- Chairs were identified for eight companies in the sample and only the chair of Mercia Technologies is a woman.
- The most senior executive in nine of the ten companies is male and one has a male and a female as Managing Partners.

Executive Teams have a higher proportion of women.
- Executive teams were identified for nine of the venture capital companies. These teams are 20% female.

Four of these companies have no woman on the executive team.

Questions:
- What are the differences in seed and venture capital funding obtained by male and female founders? Are their implications for the Government’s new Industrial strategy?
- Do founders have different networks that bring them into contact with potential funders?
- Do universities engage in equal opportunities and unconscious bias training with their venture partners and ask for any monitoring data?

Susan Searle is Non-Executive Chair of Mercia Technologies Ltd. She served as chief executive officer of Imperial Innovations Group plc from January 2002 to July 2013 where she led funding rounds of some £250 million. During her tenure, Imperial Innovations invested £121 million in a portfolio of healthcare, engineering and software businesses. Previously, Mrs Searle worked at Montech in Australia (science commercialisation), Signet Group PLC, Bank of Nova Scotia and Shell Chemicals, in a variety of business development and commercial roles. She currently serves as a non-executive director of Benchmark Holdings plc, Horizon Discovery plc and QinetiQ Group plc, and is chair of Woodford Patient Capital Trust plc. She was previously the Non-Executive Deputy Chair of Mercia Technologies. Mrs Searle has an MA in chemistry from Oxford University.
Skinbiotix Ltd was established in 2016 as joint venture between Manchester University and OPtiBiotix who invested £260,000. The company is a spinout of the University’s Centre for Dermatological Research and is based on the ground-breaking research of Dr Catherine O’Neill and Professor Andrew Mc Bain on the human microbiome. The company is expected to create new products in global markets for skincare, Health Care Acquired infections and eczema.

In April 2017, the company was floated on the FTSE Aim market as SkinBiotherapeutics PLC which was an exceptional undertaking. A spinout’s journey to an IPO is an average of 10 years but Skinbiotix achieved it in a year. The company is valued at over £12million with the flotation having raised significant cash to further develop the underlying research.

Dr Catherine O’Neill, now Chief Executive of SkinBiotherapeutics, previously co-founded a specialist dermatology business, Curapel Limited, and led it through its formation and development stage. As an innovator and expert, she has worked as an advisor for several skincare businesses and brand owners. This includes delivering technology from the lab, through development and onto new product concepts in partnership with global corporations.

A biochemist by training, Dr O’Neill has a BSc(Hons) and a PhD. in Biochemistry from the Bangor University. She took a secondment to be SkinBiotherapeutics’s Chief Executive while Senior Lecturer in Clinical Biochemistry at the University of Manchester and Deputy Associate Dean for Business Engagement.

“I want to see a pot of cream on a shelf in a pharmacy that I have helped develop.” Dr Catherine O’Neill.

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20. Malmstrom,M. et al. (2017). We recorded VCs’ Conversations and Analyzed How Differently They Talk About Female Entrepreneurs. [online] https://hbr.org/2017/05/we-recorded-vc-s-conversations-and-analyzed-how-differently-they-talk-
6. From findings to further research

The data from this study shows that women have low participation rates in the governance and executive direction of the most recent spinout companies. Female founders or co-founders of spinout companies are also very much in the minority. A large majority of directors and senior executives who facilitate and fund the commercialisation of research are also male. However, the profiles of women involved in spinouts as founders, directors and executives reveal exceptional talent, commitment and entrepreneurism.

The study provides a baseline understanding of women’s current participation in the spinout process and raises queries which may affect their low levels. However, it lacks trend data from previous years and does not delve deeply into the underlying factors that spur success or the barriers that impede it. Further investigation is required and the following would be useful next steps:

6.1 Capturing trend data on participation of women in governance, executive and founding roles.

One of the very informative initiatives on women’s leadership roles in FTSE companies has been the collection and analysis of annual data for some fifteen years. While resources may not permit a year by year study of spinouts, it would be possible to look at the last ten years or designated years within that timeframe. This trend data would not only help understand the demographics of women’s participation in key roles but also their success rates in terms of company failures or flotations and trade sales. It can take ten years or more before companies are floated or sold.

6.2 Comparative information between men and women. Participation rates only tell part of the story.

It would be useful to know if characteristics of males and females in governance roles differ in terms of qualifications and experience as well as how they were selected. How male and female founders differ in their characteristics and experience would also be valuable information as would their previous access to funding for research, their success rates in acquiring venture capital and the payback they receive for their efforts. Entrepreneurial motivations may differ and have an impact on the type of company formed or on the preference for a consultancy or IP agreement over a spinout.

6.3 Structured interviews with female founders.

The data from 2015 -16 shows us that the number of women founders is relatively small as only 15% of companies appear to have them. However, it doesn’t tell us about their journey i.e. what and who inspired them to become spinout entrepreneurs, what factors they view as critical to their success and what barriers they encountered. Also of interest is their relationship and interaction with intermediaries that support spinout formation and provide seed funding and venture capital. What vision do they have for their companies and whether they would create another spinout?

6.4 Governance and organisational development.

The spinout companies incorporated in 2015 and 2016 have very small boards and executive teams which are mainly male and from STEMM disciplines. Many do not identify either a Chair or a Chief Executive. How boards and executive teams change in size and diversity over time is unclear but they do play a critical role in setting vision, strategy, ensuring accountability and creating relationships with external stakeholders. Universities have considerable influence when their TTOs assist in setting up a company. Should they be more actively involved as shareholders or through IP contractual agreements in ensuring that the company has a diverse team? There is a huge pool of diverse talent within a university, particularly business schools, which could potentially be tapped as board members,
observers or mentors.

6.5 Next Step: Discussions on the current study and on priorities for future research.

There are many who potentially have an interest in understanding and increasing women’s participation in spinout companies. Efforts should be made to engage research councils, university technology transfer departments and commercialisation companies, venture capitalists and those in the public sector addressing equality issues or innovation and growth in the economy. Discussions need to take place with these interested parties before further research is conducted to inform its content and approach and to identify others who would like to join as partners in the project.
References

General


Female founders and women in science


Technology Transfer Offices


University spinouts

Exploring women’s participation


Seed Funds and Venture Capital


Appendix 1: Author Profiles

Norma Jarboe OBE
Norma Jarboe OBE has extensive experience in women’s development and diversity and has worked at senior levels in public/private partnerships, the private sector and the not-for-profit sector. She was previously Director of Opportunity Now (1999-2008), the UK’s leading employer network to advance women in the workplace. Norma’s recent work, as founder and director of WomenCount, benchmarks the participation of women in leadership roles in Higher Education and the third sector, analyses the findings and explores actions to accelerate progress. Publications include WomenCount: Leaders in Higher Education 2016 and WomenCount: Charity Leaders 2012. Norma works in partnership with other organisations and initiatives committed to diversity, and until recently was a trustee and the Chair of the Women’s Equality Network Wales which is funded by the Welsh Assembly Government. She has an MA in International Studies from the University of Denver and a Diploma from the Stonier Graduate School of Banking at Rutgers University.

Dr Louise Grisoni
Louise Grisoni is senior research fellow at Oxford Brookes Business School. She has spent over 30 years in Higher Education and is an associate of the Centre for Diversity Policy Research and Practice. Her current research focus is on equality and gender, gendered leadership, women’s careers and work-life-balance. She is widely published in this area. She also has an interest in the aesthetic dimensions of work and uses a range of arts-based methods to examine organisational phenomena.

Professor Simonetta Manfredi
Simonetta Manfredi is Professor of Equality and Diversity Management, Director of the Centre for Diversity Policy Research and Practice and acting Assistant Dean for Research and Knowledge Exchange in the Faculty of Business at Oxford Brookes University. Her research interests and expertise are primarily focused on gender and leadership, age discrimination and retirement policies, work-life balance, and applied diversity policy research in the Higher Education sector. She has published widely in these areas, led several projects funded by a range of organisations which include the European Commission, the Higher Education Funding Council for England, the Leadership Foundation for Higher Education and Equality Challenge Unit. Simonetta is regularly invited to speak at academic and practitioner conferences and her work has been featured by the press and media. She is co-author of Managing Equality and Diversity, published by Oxford University Press, which received the Charted Management Institute Management Book of the Year Award in 2013 (under the management and leadership category).
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