



Exploring the influence of innovativeness on the pace of internationalisation of University Spin-Outs: A Born Global Perspective

Messina, L., Miller, K., Cunningham, J., McAdam, R., & Hewitt-Dundas, N. (2022). Exploring the influence of innovativeness on the pace of internationalisation of University Spin-Outs: A Born Global Perspective. *Studies in Higher Education*, 47(10), 2071-2087. Advance online publication. <https://doi.org/10.1080/03075079.2022.2122660>

[Link to publication record in Ulster University Research Portal](#)

Published in:
Studies in Higher Education

Publication Status:
Published online: 14/09/2022

DOI:
[10.1080/03075079.2022.2122660](https://doi.org/10.1080/03075079.2022.2122660)

Document Version
Publisher's PDF, also known as Version of record

Document Licence:
CC BY-NC-ND

General rights

The copyright and moral rights to the output are retained by the output author(s), unless otherwise stated by the document licence.

Unless otherwise stated, users are permitted to download a copy of the output for personal study or non-commercial research and are permitted to freely distribute the URL of the output. They are not permitted to alter, reproduce, distribute or make any commercial use of the output without obtaining the permission of the author(s).

If the document is licenced under Creative Commons, the rights of users of the documents can be found at <https://creativecommons.org/share-your-work/licenses/>.

Take down policy

The Research Portal is Ulster University's institutional repository that provides access to Ulster's research outputs. Every effort has been made to ensure that content in the Research Portal does not infringe any person's rights, or applicable UK laws. If you discover content in the Research Portal that you believe breaches copyright or violates any law, please contact pure-support@ulster.ac.uk



Exploring the influence of innovativeness on the pace of internationalisation of university spin-outs: a born global perspective

Lisa Messina, Kristel Miller, James A. Cunningham, Rodney McAdam & Nola Hewitt-Dundas

To cite this article: Lisa Messina, Kristel Miller, James A. Cunningham, Rodney McAdam & Nola Hewitt-Dundas (2022) Exploring the influence of innovativeness on the pace of internationalisation of university spin-outs: a born global perspective, *Studies in Higher Education*, 47:10, 2071-2087, DOI: [10.1080/03075079.2022.2122660](https://doi.org/10.1080/03075079.2022.2122660)

To link to this article: <https://doi.org/10.1080/03075079.2022.2122660>



© 2022 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group



Published online: 14 Sep 2022.



Submit your article to this journal [↗](#)



Article views: 322



View related articles [↗](#)



View Crossmark data [↗](#)



Exploring the influence of innovativeness on the pace of internationalisation of university spin-outs: a born global perspective

Lisa Messina^a, Kristel Miller^b, James A. Cunningham^{c,d}, Rodney McAdam^b and Nola Hewitt-Dundas^a

^aQueens Management School, Queens University Belfast, Belfast, Northern Ireland; ^bUlster University Business School, Ulster University, Belfast, Northern Ireland; ^cNewcastle University Business School, Newcastle University, Newcastle, UK; ^dCentre for Innovation Research, Lund University, Lund, Sweden

ABSTRACT

To date, understanding and empirical investigation of the internationalisation processes of university spin-outs (USOs) have been limited. Few studies have explored the role of the specific characteristics of their core technology, in particular their innovativeness, as a determinant of their early internationalisation. This is also an issue which is under-explored within the general international business field. To address this gap, the purpose of our paper is to examine how the innovativeness of USOs influence the pace of their internationalisation. To achieve this, we explore how innovativeness is nurtured and cumulatively developed during born global (BG) and non-born global (NBG) USOs' pre-foundation technology development trajectory. BGs represent a category of young, usually, high-technology firms that internationalise within 3 years of inception. By exploring the pre-foundation technology development process of Italian USOs across two research-intensive universities, we found that BG and NBG USOs differed in aspects around their *innovative proclivity*, *firm innovativeness* and *the nature of the innovation*. Specifically, we found that BG USOs had a longer pre-foundation period, focused on a specific invention with limited fields of application, and offered 'really new' innovations. BG USOs' products or services were also developed and largely standardised before market entry, which accelerated their internationalisation. In contrast, NBG USOs were characterised by short pre-foundation periods, relied on incremental innovation and a wide spectrum of innovative competencies. They also relied on technologies with a broad scope of market application and customised their offerings based on client needs, which slowed their market entry and internationalisation.

KEYWORDS

University spin-outs; innovativeness; born global; pre-foundation; technology commercialization; internationalisation; entrepreneurship; innovation

1. Introduction

University spin-outs (USOs) represent a unique type of start-up typically created by academics or doctoral students who seek to commercialise university research outputs (Mathisen and Rasmussen 2019). Whilst the regional contribution of USOs is widely documented, less is known about how such firms gain international reach (Baier-Fuentes, Guerrero, and Ernesto Amoros 2021; Messina and

CONTACT Kristel Miller  k.miller@ulster.ac.uk  Ulster University Business School, Ulster University, Belfast, Northern Ireland

© 2022 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group

This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives License (<http://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited, and is not altered, transformed, or built upon in any way.

Hewitt-Dundas 2021). Exploring the internationalisation of USOs is important as it can support them in achieving their full market potential, as well as helping universities move towards their third mission (Miller, Cunningham, and Lehmann 2021; Meoli and Vismara 2016) and impact objectives in the context of domestic (country of USO origin) and international economies (countries outside USO origin).

Given the paucity of research on USO internationalisation and the consequential lack of theoretical development in this area, we draw on wider literature on the internationalisation of high-technology firms which has emerged at the cross-roads between international business and entrepreneurship (Kriz and Welch 2018; Cavusgil and Knight 2015), known as international entrepreneurship. In particular, we focus on the concept of born globals (BGs). BGs represent a category of young, usually, high-technology firms that internationalise within 3 years of inception (Knight and Cavusgil 1996). In contrast, non-born globals (NBGs) refer to firms that either focus on domestic markets or have a slower pace of internationalisation (Knight and Liesch 2016). The creation of new innovative offerings has been regarded as essential to ensuring BGs' rapid entrance and success in the marketplace (Cavusgil and Knight 2015). Despite this, few studies have devoted attention to the specific characteristics of a firm's technology, its innovativeness, as a determinant of their internationalisation strategy (Taheri and van Geenhuizen 2019) and, in particular, of its market entry timing (Messina, Miller, and Hewitt-Dundas 2022; Lamotte and Colovic 2015). Studies which have explored how firms' strategies can satisfy the needs of international markets from firm inception (Cavusgil and Knight 2015), often assume that the core technologies being offered are stable and ready for market launch. However, this may not be true for all firms. We argue that in some high-technology firm contexts, such as USOs, decisions and processes relating to internationalisation could be concurrent with, and dependent upon, their technology development phase, which itself could span beyond the market entry.

Scholars have called for further research exploring varying dimensions of internationalisation in different contexts (Caputo et al. 2022). Furthermore, within the context of USOs, there is limited research that explores how innovativeness unfolds (Taheri and van Geenhuizen 2019). We aim to contribute new insights by exploring the following research question: how does the innovativeness of USOs influence the pace of their internationalisation? Prior research suggests that the activities and processes that take place within a USO's pre-foundation phase will determine their speed of formation and market entry strategies (Messina and Hewitt-Dundas 2021). Therefore, we specifically focus on how innovativeness is nurtured and cumulatively developed during BG and NBG USOs' pre-foundation technology development trajectories.

2. Conceptual framing

2.1. Born globals and USOs

The BG phenomenon refers to small, usually high-technology firms that are found to be international within three years from foundation (Knight and Cavusgil 2004; Knight and Liesch 2016). It challenges traditional internationalisation theory which suggests that firms internationalise gradually to manage the risks posed by foreign market entry (Oviatt and McDougall 2005). Some scholars have associated early internationalisation with BG founders' international experience and superior entrepreneurial attributes, such as vision and leadership (Knight and Cavusgil 1996). Others have argued that BGs possess superior dynamic capabilities (Weerawardena et al. 2007), most notably innovation capabilities (Nguyen and Sullivan 2021). Despite theoretical progress, BG literature lacks an accepted theoretical framework explaining how these firms can internationalise shortly after foundation. Furthermore, much remains unknown on the key defining capabilities and characteristics which underpin BGs and NBGs (Paul and Rosado-Serrano 2019), particularly across different firm contexts such as USOs (Baier-Fuentes, Guerrero, and Ernesto Amoros 2021; Messina and Hewitt-Dundas 2021; Taheri and van Geenhuizen 2019; Evers, Cunningham, and Hoholm 2016).

Like other small high-technology firms, USOs face resource limitations. However, they also face unique challenges stemming from their academic origins (Cunningham, Guerrero, and Urbano 2017; Messina, Miller, and Hewitt-Dundas 2022) which can lead to difficulties in combining their scientific know-how with market knowledge, given their limited market orientation (Miller et al. 2016; Messina et al. 2022; Neves and Franco 2018). To address limitations in their entrepreneurial skills and experiences (Lockett and Wright 2005), and to inform their strategic direction, many USO founders rely on the support of the wider university ecosystem during commercialisation. The technology development trajectory of USOs often takes place during lengthy pre-foundation periods (Vohora, Wright, and Lockett 2004). During this phase, USOs navigate a series of stages aimed at concurrently developing firm capabilities and strategy, and increasing the technology's market readiness (Messina, Miller, and Hewitt-Dundas 2022). While prior research has suggested that the activities and processes that take place within a USO's pre-foundation phase determine their speed of formation and market entry (Messina and Hewitt-Dundas 2021), much remains unknown regarding the characteristics of USOs' technologies, innovativeness and development trajectories as determinants of their internationalisation strategy (Taheri and van Geenhuizen 2019) and timing (Messina, Miller, and Hewitt-Dundas 2022; Lamotte and Colovic 2015). These micro-level factors will be explored in this study.

2.2. Innovativeness and the pace of internationalisation

Many studies suggest a positive and mutually reinforcing relationship between innovation and internationalisation (see Kriz and Welch 2018; O'Cass and Weerawardena 2009). It is often assumed that high-technology firms begin their internationalisation efforts by offering innovative, ready-for-market technologies (Kriz and Welch 2018). However, technology development processes are complex and involve time-consuming trials, testing and debugging to increase the innovativeness of offerings (Magistretti, Dell'Era, and Verganti 2020). Furthermore, it may also be the case that the process of technology emergence and the characteristics of technologies influence firms' internationalisation patterns.

Prior research identified two aspects of innovativeness as being important for firm internationalisation: firm innovativeness, and product/service innovativeness. Firm innovativeness represents a broad notion of innovation that is defined as *'the application of ideas that are new to the firm'* and are aimed at creating value, either for the firm and/or for the customer, through newness *'in products, processes, services, or in work organisation, management or marketing systems'* (O'Cass and Weerawardena 2009, 1331). Firm innovativeness has also been found to facilitate the acquisition of new knowledge, leading to additional capabilities that drive international performance and early internationalisation (Gabrielsson et al. 2008). Studies have found that firms with high levels of firm innovativeness tend to internationalise earlier than firms that lack an innovation culture (Gabrielsson et al. 2008). Product/service innovativeness refers to the nature and relative newness of firms' offerings vis-à-vis existing offerings in the market (Garcia and Calantone 2002). Studies have associated early internationalisation with high product/service innovativeness and, in particular, with the possession of specialised knowledge, proprietary products, knowledge-intensive products, high-technology products, high-value products, and high-quality products (Efrat and Shoham 2012; Weerawardena et al. 2007).

Overall, prior research suggests that firms possessing complex technology-based knowledge are more likely to experience accelerated internationalisation, as they have unique sustainable advantages that can address profitable opportunities in international markets (Oviatt and McDougall 2005). Consequently, USOs possess the necessary and appropriate characteristics to be BGs. However, much still remains unknown about how USOs' offerings and their pre-foundation technology development processes influence their pace of internationalisation. In particular, there is a lack of understanding of the interrelationship between USO innovativeness and internationalisation timing.

3. Methodology

An exploratory qualitative, intrinsic case study approach (Patton 2002) was undertaken to examine cases that were theoretically relevant. Accordingly, we sought out USOs which had successfully internationalised to address our research question and to facilitate contextual explanations (Plakoyiannak and Budhwar 2021) of the BG phenomenon. USOs originating from two research-intensive universities in Italy were chosen due to their inherently international orientation, largely stemming from the international nature of academic research and the small size of the domestic economy (European Commission 2015). Furthermore, Italy was identified as an interesting context given the increasing emphasis placed on university commercialisation processes on behalf of its universities and government, as evidenced by the continuous transformation of the country's national innovation systems over the past decade (Grimaldi et al. 2021). To ensure that we could trace the process of technology development from its earliest phases, we focused on the pre-foundation period of USO development, which is a more transparently observable inception period of USOs (Messina and Hewitt-Dundas 2021).

3.1. Data collection

Overall, twenty-two USOs were selected from two research-intensive Italian universities in Northern Italy. The selected universities are world-leading in engineering and technology research (QS World University Rankings 2022), and are among the most proficient institutions in the creation of USOs (NETVAL 2020). Both universities were comparable in terms of their values, mission, technology transfer office (TTO) structure, related technology commercialisation support and ecosystems. All USOs were in the high technology sector which increased comparability in terms of the quality and nature of the technology, the experience of the founders, their commercialisation path, and the macroeconomic conditions faced by the companies. Semi-structured interviews were conducted with USO founder(s) ($n = 22$), two TTO directors and two incubator senior managers from the universities, who provided contextual data and reflective insights on the USOs' formation. The USOs were split into early internationalising firms that possessed characteristics of BGs by entering an international market within 3 years of inception (i.e. exporting within 3 years, labelled 'BG') and late internationalising firms, that entered an international market after 3 years (i.e. exporting after 3 years, labelled 'NBS'). Additionally, documents relating to TTO processes, publicly available reports and online media related to the USOs were analysed to aid triangulation, which helped address any anomalies or preferential hindsight (Yin 2018). Table 1 provides an overview of USO stakeholder respondents. Table 2 provides an overview of BG USO firms and founders interviewed, and Table 3 provides an overview of NBS USO firms and founders interviewed.

Table 1. USO Stakeholder interviewee respondents.

Stakeholder Type	Respondent	University
TTO	Head of TTO	University 1
	Head of TTO	University 2
Incubator	Director General of Incubator	University 1
	CTO of Incubator	University 2
Trade Agencies	External Relations Manager of a national trade agency	Worked with both universities
	Head of Sponsorships and Partnerships of international trade agency	Worked with both universities
	Deputy Consul General and Deputy Director of Trade and Investment	Worked with both universities
Investors	Business Angel and Assistant Business Angel	Worked with both universities
	Industrial Partner 1	Worked with both universities
	Industrial Partner 2	Worked with both universities

Table 2. USO founder respondents and overview of BG and NBG USOs.

USO	University	Research Field	Technology	USO Respondent	FoundYR	International
BG1	Uni1	Nuclear engineering	Algorithm and model development for the performance of industrial systems.	CEO/Co-founder	2012	< 3 years
BG2	Uni1	Electronics and ICT	Diagnostic device for industrial processes.	CEO/Co-founder	2014	< 3 years
BG3	Uni1	Energy	Technology for the remote supply of energy.	CEO/Co-founder	2009	< 3 years
BG4	Uni1	Mechanics	Robots for Industrial automation in the pharmaceutical industry.	CEO/Co-founder	2014	< 3 years
BG5	Uni1	Electronics and ICT	Technology for the characterisation of MEMS sensors.	President/Co-founder & CEO/Co-founder	2014	< 3 years
BG6	Uni1	Biomedical engineering	Diagnostic device for respiratory pathologies.	CEO/Co-founder/R&D Director	2010	< 3 years
BG7	Uni1	Aerospace engineering	Algorithm for the millimetric measurement and monitoring of geophysical phenomena	CEO/Co-founder	2000	< 3 years
BG8	Uni1	Electronics	Technology for X-ray and Gamma-ray applications.	CEO/Co-founder	2009	< 3 years
BG9	Uni1	Electronics	Innovative e-Bike motor.	Co-founder/Marketing Manager	2013	< 3 years
BG10	Uni2	Fire engineering	Custom-made numerical solutions in the fields of fire engineering and thermal science.	CEO/Co-founder	2007	< 3 years
BG11	Uni2	Energy	Storage systems for renewable energy.	CTO/Co-founder	2005	< 3 years
BG12	Uni2	Electronics	Innovative software for the resolution of modelling problems.	President/Co-founder	2007	< 3 years
NBG1	Uni1	Mechanics	Robots for Industrial automation and bin picking.	CEO and director of Industrial partner	2006	> 3 years
NBG2	Uni1	Energy	Consulting services in the field of renewable energy and power electronics.	Senior Partner and Director Industrial Partner	2006	> 3 years
NBG3	Uni2	Electronics	Intelligent LED lighting bulbs.	CEO/Co-founder & Scientific Advisor/Co-founder	2013	> 3 years
NBG4	Uni1	Mechanics	Technology for the conversion of traditional vehicles into hybrid or electric vehicles.	Executive assistant involved in USO foundation (no ownership)	2012	> 3 years
NBG5	Uni1	Chemistry	Custom-made solutions for surface coatings.	CEO/Co-founder	2012	> 3 years
NBG6	Uni1	Geomatics	Custom-made solutions using Geomatic technologies.	CEO/Co-founder/researcher & Co-founder/researcher	2012	> 3 years
NBG7	Uni1	Mathematics	Custom-made solutions and software in a wide range of industries.	CEO/Co-founder	2010	> 3 years
NBG8	Uni1	Energy	Custom-made solutions in the field of energy efficiency.	Co-founder	2013	> 3 years
NBG9	Uni2	Aerospace engineering	Custom-made technologies for aerial surveillance.	President/Co-founder	2005	> 3 years
NBG10	Uni2	ICT	Technology aimed at efficient energy consumption.	CEO/Co-founder	2011	> 3 years

3.2. Data analysis

Transcripts were coded following a thematic coding technique outlined by Miles, Huberman, and Saldana (2014) with the support of NVIVO 11. Furthermore, within and cross-case

analysis was used to interpret the codes concerning the research question. The first phase of analysis involved openly coding the interview transcripts (Miles, Huberman, and Saldana 2014) followed by axial coding (Strauss and Corbin 1998), which entailed grouping first-cycle codes into a smaller number of categories by searching for correlations between first-order codes. During this phase, the focus shifted from understanding informant terms to deriving second-order theoretical themes that could describe and explain the phenomena being observed. The next phase of analysis involved a complex process of matching between emerging, second-order data themes and existing conceptualisations of innovativeness (see Table 3).

Table 3. Data Coding Summary.

Born Global USOs	Aggregate Dimension 1: Innovative Proclivity		Non-Born Global USOs
First-Cycle Codes	Second-Cycle Codes	Second-Cycle Codes	First-Cycle Codes
Specific skills: USOs marketed a specific innovative output (prototype) derived from academic research activities.	<i>Specific innovative competencies</i>	<i>Generic innovative competencies</i>	Generic skills: USO originated from innovative competencies developed by academics over their careers in a broad research field.
Innovative approach: From the outset, USOs showed strong willingness to depart from existing scientific and technological practices.	<i>High willingness to innovate</i>	<i>Low willingness to innovate</i>	Conservative approach: USOs employed a conservative approach reflected in highly incremental practices.
Aggregate Dimension 2: Firm Innovativeness			
Low breadth: Single (or few) offering(s) with specific market application introduced at foundation.	<i>Narrow breadth of offerings</i>	<i>Broad scope of offerings</i>	Broad set of skills: USOs introduced a wide range of offerings within the same or a variety of industries.
Increased over time: USOs increased the range of offerings on the market as they aged.			Unchanged over time: As they aged, USOs continued to offer a wide range of market offerings within the same or a variety of industries.
Aggregate Dimension 3: Nature of Innovation			
Physical good: USOs tended to market a physical good.	<i>Product offering</i>	<i>Service offering</i>	Intangible service: USOs tended to market an intangible service.
Standardisation: USOs were founded once they had developed a largely standardised or modular offering, i.e. all buyers accessed the same item, or customisation was achieved through the modulation of standardised parts.			Customisation: USOs sold fully customised offerings, which resulted in the development process beginning after confirmed commission. This delayed entry.
Really new innovations: The novelty of the innovation tended to be high.	<i>High product newness</i>	<i>Low service newness</i>	Incremental innovation: The novelty of the innovation tended to be low.
Development speed: USOs underwent long pre-foundation technology development processes to reach foundation with a finished, standardised and replicable product.	<i>Pre-foundation innovation development</i>	<i>Post-foundation innovation development</i>	Development speed: USOs had short pre-foundation period and engaged in long, post-foundation customised technology development processes where production and consumption were closely intertwined.
Short time-to-market: USOs were able to enter the market shortly after foundation by offering a ready, standardised and replicable product. USOs also identified initial buyers prior to firm foundation.			Long time-to-market: USOs marketed customised, incrementally innovative offerings, which resulted in long customer persuasion efforts being needed prior to sale. Upon commission receipt, USOs had to then engage in technology construction, which delayed market entry.

4. Discussion of findings

The findings identified that there are varying dimensions of innovativeness developed during a USO's pre-foundation phase which influenced the internationalisation process. An overview of our data is provided in Figure 1, and our findings are discussed in accordance with the three key themes emerging from the findings, namely *innovative proclivity*, *firm innovativeness* and the *nature of innovation*. Prior research exploring internationalisation and firm innovativeness has largely used either a single indicator such as proclivity (Zahra and Neubaum 1998; Joshi, Das, and Mouri 2015) or a combination of two indicators. However, our findings illustrate that in a USO pre-foundational context, a single or two indicators do not appropriately capture the complex factors impacting the pace of USO market entry (Saridakis et al. 2019; Azar and Ciabuschi 2017). Therefore, our findings identify complexities of these factors in a USO context. These three themes will now be discussed with the use of power quotes (Pratt 2009) to illustrate compelling evidence and interpret findings based on prior literature.

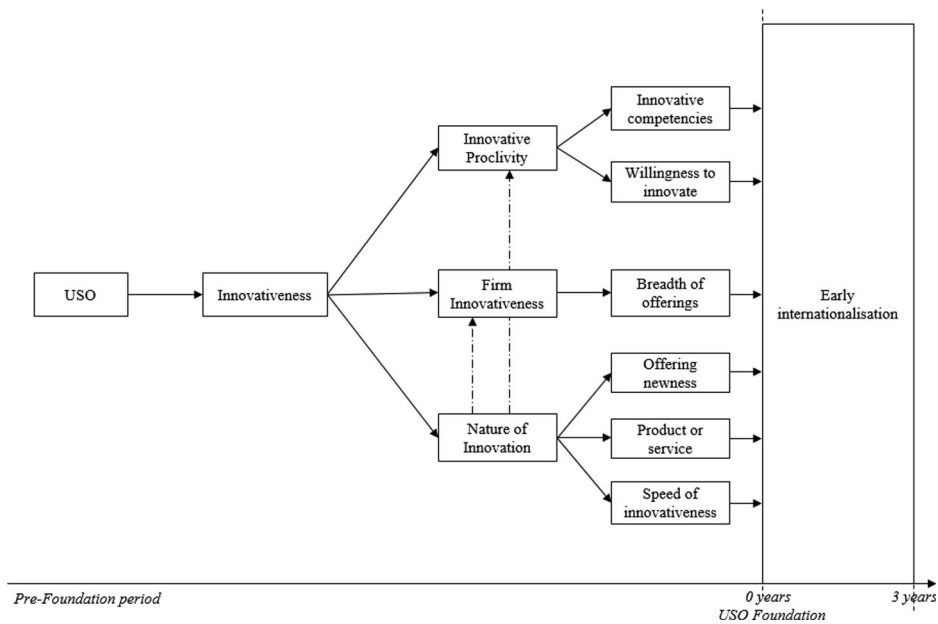


Figure 1. Innovativeness and USO pace of internationalisation Data Structure.

4.1. Innovative proclivity

Innovative proclivity can be understood as an antecedent which affects a firm's innovative practices (Gupta and Wales 2017). Our findings illustrated two dimensions which influence USOs' innovative proclivity, their *willingness* to innovate; and their *capability* to innovate through the possession of the necessary competencies. Differentiating patterns emerged during the pre-foundation period that distinguished BG from NBG USOs: the nature of their innovative competencies, and their willingness to depart from existing practices.

In relation to innovative competencies, the vast majority of BG USOs emerged from research activities that resulted in the development of a specific invention. For example, case BG:7 stated that '*We had developed an algorithm that enabled us to analyse radar-satellite images in a novel way to detect any movement of objects or soils*'. Accordingly, BG USOs' innovative competencies

were based on a narrow field with a targeted innovative outcome. This aligns with prior BG research that suggests that early internationalisation requires a strong capability or a 'firm-specific idiosyncrasy' (Jones and Coviello 2005), where the USOs' expertise resulted in them having idiosyncratic knowledge which had a specific market application. Knight and Cavusgil (2004) identify that BGs' idiosyncratic knowledge enables them to generate competitive advantages which can rival larger firms in international markets. By contrast, it was found that the majority of NBG USOs originated from innovative competencies developed by the academic founders throughout their research careers, which had a broad scope of application but lacked a specific idiosyncrasy in a specific market sector. This is illustrated by case NBG:5 who stated that '*the research lab was working with some proteins that can be functionalised in a number of applications. The same material can be used for many different applications, and we wanted to focus our attention on all these activities*'. The lack of a specific market focus in NBG USOs prior to market entry resulted in these firms facing limited market demand in their initial years of development, a factor that delayed their internationalisation.

The findings suggested that BG USOs were predominantly characterised by novelty from the outset, manifesting a strong willingness to depart from existing academic scientific and technological practices, even during their academic research activities.

As university researchers, we were working on projects that centred on e-bikes. Through these activities, we developed various technologies, including a disruptive technology which was an e-bike motor. [...] This was something completely new back then. (BG:9)

They identified that they had a strong desire to prioritise their entrepreneurial efforts over their academic activities and to enter international markets from the outset. In contrast, the majority of NBG USOs employed a more conservative approach by complying with incremental innovation practices, which meant they did not have clear novel value propositions. For example, NBG10's founder admitted to being uncertain about the value of their offering, which led them to initially test the invention within the domestic market, postponing international activity.

4.2. Firm innovativeness

The second theme emerging from the findings was firm innovativeness, which reflects the number of offerings the firms introduced on the market over time (Felzensztein et al. 2015). Prior research operationalises firm innovativeness as the number of innovations introduced by the firm over the last 5 years or through capturing their R&D spending (Felzensztein et al. 2015). Since we are focusing on the pre-foundational period of USOs, where the parent university and other support mechanisms often subsidise R&D costs, traditional measures of firm innovativeness are not suitable. Therefore, we instead focused on the number of products and/or services being offered at the time of firm foundation. The majority of BG USOs offered a very low number of products and/or services at or shortly after foundation, often focusing on a single offering. In contrast, most NBG USOs offered a wide range of products and/or services within the same application sector or in a variety of industries. Most BG USOs gradually increased the variety of offerings on the market as they aged. This suggests that USOs who internationalised early, despite starting their journey with a narrow focus, tended to increase their firm innovativeness over time. This contrasts with NBG USOs, who showed a limited change in their behaviour.

Prior research investigating how internationalisation impacts the innovation of firms has produced mixed findings (Bahl, Lahiri, and Mukherjee 2021). Contextual factors such as firm size, export country characteristics, and the nature of the original firm innovation (e.g. product versus service) underpin variances in findings across studies, with some reporting a positive relationship (e.g. Golovko and Valentini 2011; Hitt, Hoskisson, and Kim 1997) and others identifying a non-significant or negative relationship (Bahl, Lahiri, and Mukherjee 2021; Saridakis et al. 2019). Our findings illustrate that in a BG USO context, firms tend to develop their firm innovativeness after market

entry. This can be explained through the ‘learning-by-exporting’ concept (Golovko and Valentini 2011), where USOs were able to accelerate their capability development by operating and acquiring new knowledge and self-learning in international markets. This enhanced their ability to innovate to meet new and evolving market needs, and to further internationalise (Puthussery et al. 2020). NBG USOs offered a wide range of offerings from foundation and, despite internationalising after 3 years, showed limited enhancement in their organisational innovative capability. This can be explained through prior research suggesting that focusing on vaguely defined innovation projects can cause firms to spread their resources too thinly across various innovative efforts (Tan, Brewer, and Liesch 2007; Kessler and Chakrabarti 1996), leaving limited resources for knowledge absorption, learning and capability development. These patterns emerged as being closely linked to a third theme, the *nature* of the offering, which interjects with the first two themes and helps to further understand the variances in the USO timings of internationalisation and innovative behaviours. This will now be discussed.

4.3. The nature of innovation

Product and/or service innovativeness reflects the nature of the offering and its relative newness compared to existing market offerings. Saridakis et al. (2019) identify that much remains unknown on the relationship between novelty levels and firm’s internationalisation behaviours. The typologies of innovations proposed by Garcia and Calantone (2002) were employed to classify newness: *Radical Innovations*, *Really New Innovations*, and *Incremental Innovations* (see Table 4).

Overall, the findings identify that the relative newness of the USO offering (newness to the market) influenced the pace of international expansion. However, none of the offerings introduced by the USOs met the criteria of radical innovation. The majority of BG USOs offered really new innovations, introducing new technologies in existing markets (BG4, BG6, BG7, BG9, and BG11) or existing technologies in new markets (BG2, BG3 and BG7). One founder emphasised that early internationalisation was due to ‘*pushing the boundaries of what could be technologically achieved*’ (BG4). However, it was also identified that older technologies could be perceived as being new when applied in novel ways. USO Founder BG2 identified that ‘*on the market, commercial systems were already available, so it’s not like we invented a technology ex novo. [...] We went back to an ‘old’ technology [...] and we added an additional hardware component that we derived from our own experience*’. This finding expands prior research (e.g. Love, Roper, and Zhou 2016; Saridakis et al. 2019) by illustrating that it is not just the degree of novelty which is important, but the novelty in the application of an existing innovation that can support a firm to internationalise early. In contrast, as noted earlier, NBG USOs largely marketed incremental innovations with ambiguous value propositions and unclear market applications. Many NBG USOs were not able to attract the support they needed for a long time, as their technologies merely reflected speculative potential rather than a known return. This led to slow market entry, which in turn enhanced issues relating to their perceived credibility and legitimacy with investors and customers (François and Philippart 2019), leading to a perpetuating effect. Our findings expand current SME internationalisation and BG research by providing novel knowledge illustrating that USO technology development and growth are slowed down when there is

Table 4. Typologies of Innovation.

Innovation Type	Description
Radical Innovation	- New technology in a new market - Creation of a new market or a new industry
Really New	- New technology in an existing market or existing technology in a new market - Generating a market discontinuity or technological discontinuity (but not both)
Incremental Innovation	- New benefits, features or improvements to existing technologies within existing markets - Does not generate discontinuities in markets/technologies
Non Innovative	- No newness

Adapted from Garcia and Calantone (2002)

both market and technology uncertainty (Golovko and Valentini 2011). However, further analysis identified two subthemes relating to the nature of the offering that helped to generate a more comprehensive picture of the USOs' pace of internationalisation: whether the offering was composed of a product or a service; and the speed with which the offering was developed.

4.3.1. Products versus services

Most BG USOs marketed a physical product. The majority of NBG USOs marketed an intangible service. It must be noted, however, that the distinction between products and services is not always clear-cut, therefore we drew on categorisations by Zeithaml, Parasuraman, and Berry (1985) to place USO offerings on a continuum, see Figure 2.

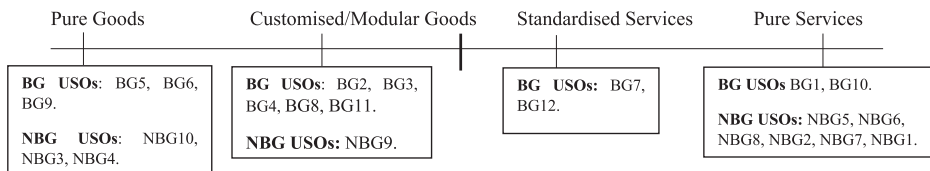


Figure 2. USO Good-Service Continuum.

Analysis of USO offerings was performed through four key dimensions of products and services: tangibility/intangibility; separability/inseparability of production and consumption; standardisation/customisation; stockability/perishability (Zeithaml, Parasuraman, and Berry 1985). Based on these characteristics, USO offerings were categorised as pure (standardised) goods, pure (customised) services, customised goods, and standardised services. In the context of physical goods, BG5, BG6 and BG9 marketed a tangible, standardised product that could be produced in advance of firm foundation and be delivered immediately, accelerating both domestic and international market entry. By contrast, NBG10, NBG3 and NBG4 also marketed a tangible, standardised product; however, they were not able to internationalise early, as they finalised development and production post-foundation, delaying market entry. Other BG USOs offered customised goods which were largely based on modular designs, enabling them to standardise, produce and stock modular parts of the offerings in advance of market entry, and rapidly assemble them in a customised manner upon receipt of orders. In a similar fashion to pure goods, this accelerated order delivery and facilitated early international market entry, as illustrated by case BG:2.

'We have developed hardware that is as standardised as possible ... The only thing we need to do is to adapt its software on the basis of the customer's requirements, as this is the component that is the easiest and cheapest thing to modify, rather than having to re-design everything.'

Most of the development activities associated with pure services took place after the firm's foundation, as orders were received. This prevented early internationalisation. However, when services were standardised (e.g. BG7 and BG12), such as algorithm and software-based services, offerings were developed in advance of firm foundation, enabling USOs' accelerated post-foundation market entry. From the findings, two product/service dimensions emerged as important in influencing the pace of USO internationalisation: the degree of offering standardisation versus customisation, and the degree of separability of production and consumption. Authors such as Saridakis et al. (2019) and Azar and Ciabuschi (2017) stress the need to consider the combined impact of innovation type and novelty on pace of internationalisation. Our findings provide nascent insights into these dimensions in a USO context, where technology type and separability versus inseparability of production and consumption were found to be key explanatory characteristics of a BG versus NBG USO. These dimensions have not been explored in the USO literature to date and, together, they bore critical implications for the overall speed of innovation, which will now be explored.

4.3.2. The speed of innovation

The speed of innovation is a concept that has largely been neglected in the USO literature (Guo et al. 2020). It has been conceptualised as time-to-market (see. Vesey 1991) and/or development speed, (see Harter, Krishnan, and Slaughter 2000). We considered both factors.

It was found that the vast majority of BG USOs went through a long pre-foundation research phase which lasted several years and was completed before the firm's foundation. Once founded, they were ready to offer their product/service to the market, reducing time-to-market and enabling early internationalisation. NBG USOs' firm foundation was also preceded by a long research phase; however, as noted, this resulted in the development of a wide spectrum of competencies, and not a specific market offering. The majority of NBG USOs' technology development phase was completed post-foundation. These findings concur with prior research (see Messina, Miller, and Hewitt-Dundas 2022; Furlan 2019) which suggests that USOs' pre-foundation capabilities are among the most critical determinants of USOs' growth trajectories. However, we also provide novel knowledge demonstrating that an extended innovation process pre-foundation can help USOs to ensure they have an innovative and market-ready product/service upon formation, which may accelerate the pace of market entry and internationalisation.

4.4. The innovation process of early versus NBG USOs

To help draw out key conclusions, Figure 3 illustrates the innovation process followed by BG USOs and Figure 4 illustrates the innovation process of NBG USOs. Furthermore, Table 5 provides a summary of BG and NBG USO characteristics.

As seen in Figure 3 and Table 5, BGs are characterised by a lengthy *research phase*. In most BG USOs, the long research phase overlapped with the first round of product/service development. This is followed by the commercialisation of the idea and the second round of product/service development, which also lasted several years in some cases. For example, BG2 founders spent three years transforming the prototype into a product that they felt comfortable commercialising. This phase frequently involved several processes that founders deployed to prepare for market entry. The next phase involved the attraction of market attention. Many BG USOs reported that they secured their first orders before firm foundation, which inevitably accelerated market entry post-foundation. Most BG USOs reported introducing their offerings into the market as soon as the firm was founded, resulting in a very short market-entry phase and allowing accelerated internationalisation.

In contrast, Figure 4 and Table 5 demonstrates that NBG USOs had a short pre-foundation period. They went through several post-foundation phases. Given their incremental innovativeness or non-innovative nature of offerings, most NBG USOs struggled to gain market acceptance due to a lack of

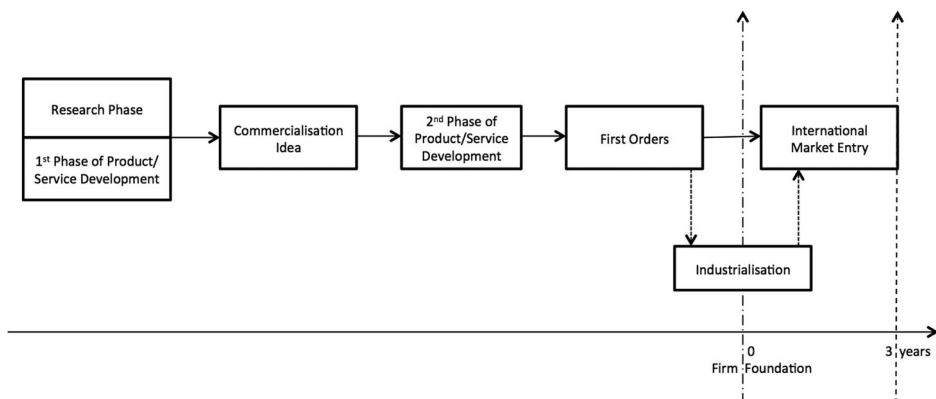


Figure 3. The Innovation Process of Born Global USOs.

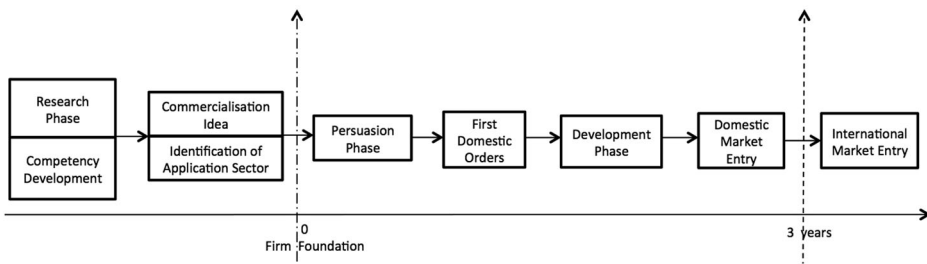


Figure 4. The Innovation Process of non-Born Global USOs.

Table 5. Summary of differences between BG and NBG USOs.

	BG USOs	Non-BG USOs
Innovative skills	Specific, niche	Generic, broad spectrum
Innovative proclivity	High willingness to innovate	Low willingness to innovate
Firm innovativeness	One or few offerings at foundation, increased over time	Wide range of offerings at foundation, unchanged over time
Type of Innovation	Product, physical good	Service, intangible good
Innovation newness	High product newness, really new innovations	Low product newness, incremental innovations
Pre-foundation length	Long pre-foundation	Short pre-foundation
Innovation development process	Long pre-foundation technology development and short post-foundation time-to-market	Long post-foundation technology development which concurred with long time-to-market

newness and high ambiguity of the value propositions. This led to lengthy phases of customer persuasion. Due to the breadth of competencies being offered by NBG USOs, most chose to exclusively focus on the domestic market during the initial years of activity, as it was perceived as being less challenging than the international domain and allowed them to prove the value of their offering. Upon completion of the persuasion phase, they were able to secure their first orders. The receipt of customer orders subsequently initiated the development phase (or construction), which involved the development of the service or product based on customer needs and demands. Given the entirely customised nature of this process, the development phase lasted several months, delaying internationalisation. Finally, after completing the development phase, NBG USOs were able to enter the market by delivering their offering to customers.

5. Conclusions and contributions

Whilst much research has explored the key factors that influence the internationalisation of firms, few studies provide an in-depth analysis of how the innovativeness of the firms’ technological offerings can influence the development of BGs (Saridakis et al. 2019; Kriz and Welch 2018). This is despite studies highlighting that innovation plays a key role in the internationalisation of firms (Caputo et al. 2022; Henley and Song 2020) by supporting differentiation efforts and increasing firm responsiveness to rapidly evolving markets (Azar and Ciabuschi 2017). By exploring our research question, we fill gaps in current literature by demonstrating how innovativeness is nurtured and cumulatively developed during pre-foundation. Further, we provide empirical insights which provide explanatory power to understand the variances between BG and NBG USOs. Accordingly, our study makes five key contributions to the USO internationalisation literature in particular, and to the BG literature more generally.

To date, limited research has explored the internationalisation process of USOs (Messina and Hewitt-Dundas 2021) or employed a process-based approach to investigate how the pre-foundation period has implications for the post-foundation internationalisation behaviour of USO firms (Miller,

Cunningham, and Lehmann 2021; Zahra 2005). We contribute to this body of research by providing micro-level insights into how USO development trajectories may affect USOs' pace of internationalisation, determining whether they will be a BG or NBG and graphically illustrating the variances in the innovation processes of BG and NBG USOs (see Figures 3 and 4). By identifying and classifying key micro-level dimensions of BG and NBG USOs, their pre-foundation period, and their innovativeness, our study provided novel empirical insights into the technological trajectories of USOs that succeed in entering international markets early.

Second, we make a contribution to knowledge by giving an enhanced understanding of the importance of USOs being founded with clear value propositions based on idiosyncratic knowledge in order to accelerate internationalisation. Our findings build on and add to research within the general SME internationalisation literature (see Knight and Cavusgil 2004; Oviatt and McDougall 2005) which highlights the importance of having a clear competitive advantage to succeed in international markets. We illustrate how NBG USOs' broad scope of application required them to prove themselves in domestic markets prior to acceptance in international markets.

Third, our findings contribute novel insights into how technology newness can impact USO technological development and the speed of USO internationalisation. Existing research has suggested that newer innovations, particularly new to the world innovations, involve higher complexity, uncertainty and, at times, longer development timelines (Kriz and Welch 2018). We find that, on the whole, BG USOs' technologies are developed from novel expertise which is deemed to be 'really new'. Therefore, their pre-foundation period is often longer than NBG USOs. However, after this lengthy pre-foundation period, BG USOs experienced a shorter time-to-market compared to NBG USOs. This was largely due to the nature of their technologies, which mostly involved physical and standardised products which enabled them to deliver the same or similar offerings to several customers simultaneously and in various international markets. Our findings expand research by Dutton and Duncan (1987) and Wang, Dacko, and Gad (2008) who identify that newer innovations often experience shorter time-to-market, due to their typically higher market attractiveness and perceived benefits. We do so by providing new empirical findings within a USO context, where we identify that internationalisation speed can partly be explained through longer pre-foundation periods to incubate 'really new' technologies until they are ready for market.

Fourth, building on this, the majority of BG studies to date ignore how the characteristics of the technology and its development process influence internationalisation timing, largely assuming that firm offerings are ready to be sold (Kriz and Welch 2018). Therefore, most studies ignore the possibility that the technology might still be in development as the firm tries to internationalise. Kriz and Welch (2018) label this assumption the technology 'exploitation' perspective, which takes technology for granted as opposed to accounting for it theoretically. In this regard, our findings provide nascent knowledge on the role of technology type and the separability versus inseparability of production and consumption as key explanatory characteristics of BG versus NBG USOs. We illustrate the implications that USOs' technological maturity upon foundation has on internationalisation timing, an underexplored topic in the USO literature (Messina and Hewitt-Dundas 2021). We identify that BG USOs reached foundation after long and resource-intensive pre-foundation processes of technology development that resulted in a physical good that was ready for market. NBGs, on the other hand, were founded while technology development processes were still ongoing and were concurrently shaped by interactions with customers, often involving post-foundation customisation and persuasion processes for each customer order that was received. By unlocking these insights, the study generates an important theoretical explanation for the timing of firm internationalisation. It achieves this, first, by making technology development central to empirical enquiry and by providing a more nuanced reflection of the role of innovation and technology type in this context (Kriz and Welch 2018); second, by bringing into question whether firm foundation is an accurate and appropriate reflection of a firm's true age when capturing the timing of firm internationalisation (Messina and Hewitt-Dundas 2021).

Lastly, this study also makes important contributions to BG literature in general. The findings provide new insights into the interdependency of the strategic activities of innovation and internationalisation (Saridakis et al. 2019), whereby small firms can overcome their liability of foreignness in international markets by investing in innovative efforts (Henley and Song 2020). Indeed, we respond to calls in the international entrepreneurship literature for studies to explore how both innovation type and novelty interact to influence internationalisation (see Saridakis et al. 2019; Azar and Ciabuschi 2017). Our findings identify that firms should look at their innovativeness from multiple dimensions, particularly in relation to innovation newness (Love, Roper, and Zhou 2016). We provide new insights into how increased newness enabled USOs to differentiate their offering, gain competitive advantages vis-à-vis rivals (Paul and Rosado-Serrano 2019) and internationalise earlier (Chetty and Stangl 2010).

5.1. Practical and policy implications

Understanding how to accelerate the internationalisation of USOs is imperative in supporting universities to achieve their third mission and increase their contribution to regional economic development (Soetanto and van Geenhuizen 2019). Therefore our findings have practical implications for TTO and university managers by illustrating the need for universities to have clear institutional strategies and entrepreneurial architecture that can support USOs during pre-foundation, particularly in terms of increasing their innovativeness with the aim of accelerating their internationalisation (Cunningham, Lehmann, and Menter 2022). Our findings identify that universities need to support USO academic founders in the identification of clear points of competitive differentiation and idiosyncratic knowledge to accelerate their pace of market entry and support their internationalisation efforts.

Our study is also of value to policy-makers by further defining the key characteristics of BG and NBG USOs, and the unique challenges each category faces, which can be employed to develop tailored policy instruments to support USO early internationalisation, particularly during the pre-foundation period.

5.2. Limitations and areas for future research

This research has some limitations which open avenues for future research. Our findings are context-bound to Italy, which may have different institutional environmental factors impacting the internationalisation behaviour of USOs compared to other countries. Therefore, further research should explore USOs in other country contexts in order to generalise the findings. Our sample comprised of USOs who all did, eventually, internationalise, despite some having done so later than others. Therefore, future research could compare internationalising and non-internationalising firms to explore the differences in their characteristics and pre-foundation periods. Lastly, it could be suggested that USOs may be more internationally-oriented due to the inherently international nature of academic research and staff. This study did not explore founding team characteristics, therefore future research could take a quantitative approach to explore relationships between team characteristics, USO development and internationalisation patterns.

Disclosure statement

No potential conflict of interest was reported by the author(s).

References

Azar, G., and F. Ciabuschi. 2017. "Organizational Innovation, Technological Innovation, and Export Performance: The Effects of Innovation Radicalness and Extensiveness." *International Business Review* 26: 324–336.

- Bahl, M., S. Lahiri, and D. Mukherjee. 2021. "Managing Internationalization and Innovation Tradeoffs in Entrepreneurial Firms: Evidence from Transition Economies." *Journal of World Business* 56 (1): 101150.
- Baier-Fuentes, H., M. Guerrero, and J. Ernesto Amoros. 2021. "Does Triple Helix Collaboration Matter for the Early Internationalisation of Technology-Based Firms in Emerging Economies?" *Technological Forecasting and Social Change* 163: 120439.
- Caputo, A., M. M. Pelligrini, M. Dabic, and L.-P. Dana. 2022. *The International Dimension of Entrepreneurial Decision-Making. Cultures, Contexts and Behaviours*. Cham: Springer.
- Cavusgil, S. T., and G. Knight. 2015. "The Born Global Firm: An Entrepreneurial and Capabilities Perspective on Early and Rapid Internationalization." *Journal of International Business Studies* 46 (1): 3–16.
- Chetty, S. K., and L. M. Stangl. 2010. "Internationalization and Innovation in a Network Relationship Context." *European Journal of Marketing* 44 (11/12): 1725–1743.
- Cunningham, J. A., M. Guerrero, and D. Urbano. 2017. "Entrepreneurial Universities– Overview, Reflections and Future Research Agendas". In *The World Scientific Reference on Entrepreneurship*, edited by D. Siegel, 3–19. New Jersey: World Scientific Publishing.
- Cunningham, J. A., E. E. Lehmann, and M. Menter. 2022. "The Organizational Architecture of Entrepreneurial Universities Across the Stages of Entrepreneurship: A Conceptual Framework." *Small Business Economics* 59 (1): 11–27.
- Dutton, I. E., and R. B. Duncan. 1987. "The Influence of the Strategic Planning Process on Strategic Change." *Strategic Management Journal* 8 (2): 103–116.
- Efrat, K., and A. Shoham. 2012. "Born Global Firms: The Differences Between Their Short- and Long-Term Performance Drivers." *Journal of World Business* 47 (4): 675–685.
- Evers, N., J. A. Cunningham, and T. Hoholm. 2016. "International Entrepreneurship in Universities: Context, Emergence and Actors." *Journal of International Entrepreneurship* 14: 285–295.
- Felzensztein, C., L. Ciravegna, P. Robson, and J. Amorós. 2015. "Networks, Entrepreneurial Orientation, and Internationalization Scope: Evidence from Chilean Small and Medium Enterprises." *Journal of Small Business Management* 53: 145–160.
- François, V., and P. Philippart. 2019. "A University Spin-off Launch Failure: Explanation by the Legitimation Process." *The Journal of Technology Transfer* 44 (4): 1188–1215.
- Furlan, A. 2019. "Startup Size and Pre-Entry Experience: New Evidence from Italian New Manufacturing Ventures*." *Journal of Small Business Management* 57 (2): 679–692.
- Gabrielsson, M., V. H. M. Kirpalani, P. Dimitratos, C. A. Solberg, and A. Zucchella. 2008. "Born Globals: Propositions to Help Advance the Theory." *International Business Review* 17 (4): 385–401.
- Garcia, R., and R. Calantone. 2002. "A Critical Look at Technological Innovation Typology and Innovativeness Terminology: A Literature Review." *Journal of Product Innovation Management* 19 (2): 110–132.
- Golovko, E., and G. Valentini. 2011. "Exploring the Complementarity Between Innovation and Export for SMEs' Growth." *Journal of International Business Studies* 42 (3): 362–380.
- Grimaldi, R., M. Kenney, D. S. Siegel, and M. Wright. 2011. "30 Years After Bayh–Dole: Reassessing Academic Entrepreneurship." *Research Policy* 40 (8): 1045–1057.
- Guo, F., A. Bo, Z. Tong, and Z. Zhang. 2020. "A Paradoxical View of Speed and Quality on Operational Outcome: An Empirical Investigation of Innovation in High-Tech Small and Medium-Sized Enterprises." *International Journal of Production Economics* 229: 107780.
- Gupta, V. K., and W. J. Wales. 2017. "Assessing Organisational Performance Within Entrepreneurial Orientation Research: Where Have we Been and Where Can we go from Here?" *The Journal of Entrepreneurship* 26 (1): 51–76.
- Harter, D. E., M. S. Krishnan, and S. A. Slaughter. 2000. "Effects of Process Maturity on Quality, Cycle Time, and Effort in Software Product Development." *Management Science* 46 (4): 451–466.
- Henley, A., and M. Song. 2020. "Innovation, Internationalisation and the Performance of Microbusinesses." *International Small Business Journal: Researching Entrepreneurship* 38 (4): 337–364.
- Hitt, M. A., R. E. Hoskisson, and H. Kim. 1997. "International Diversification: Effects on Innovation and Firm Performance in Product-Diversified Firms." *The Academy of Management Journal* 40 (4): 767–798.
- Jones, M. V., and N. E. Coviello. 2005. "Internationalisation: Conceptualising an Entrepreneurial Process of Behaviour in Time." *Journal of International Business Studies* 36 (3): 284–303.
- Joshi, M. P., S. R. Das, and N. Mouri. 2015. "Antecedents of Innovativeness in Technology-Based Services (TBS): Peering Into the Black Box of Entrepreneurial Orientation." *Decision Sciences* 46 (2): 367–402.
- Kessler, E. H., and A. K. Chakrabarti. 1996. "Innovation Speed: A Conceptual Model of Context, Antecedents, and Outcomes." *Academy of Management Review* 21 (4): 1143–1191.
- Knight, G. A., and S. T. Cavusgil. 1996. "The Born Global Firm: A Challenge to Traditional Internationalization Theory." *Advances in International Marketing* 8 (1): 11–26.
- Knight, G. A., and S. T. Cavusgil. 2004. "Innovation, Organizational Capabilities, and the Born-Global Firm." *Journal of International Business Studies* 35 (2): 124–141.
- Knight, G. A., and P. Liesch. 2016. "Internationalization: From Incremental to Born Global." *Journal of World Business* 51 (1): 93–102.

- Kriz, A., and C. Welch. 2018. "Innovation and Internationalisation Processes of Firms with new-to-the-World Technologies." *Journal of International Business Studies* 49: 496–522.
- Lamotte, O., and A. Colovic. 2015. "Early Internationalization of new Ventures from Emerging Countries: The Case of Transition Economies." *Management* 18 (1): 8–30.
- Lockett, A., and M. Wright. 2005. "Resources, Capabilities, Risk Capital and the Creation of University Spin-out Companies." *Research Policy* 34 (7): 1043–1057.
- Love, J., S. Roper, and Y. Zhou. 2016. "Experience, age and Exporting Performance in UK SMEs." *International Business Review* 25 (4): 806–819.
- Magistretti, S., C. Dell'Era, and R. Verganti. 2020. "Searching for the Right Application: A Technology Development Review and Research Agenda." *Technological Forecasting and Social Change* 151: 119879.
- Mathisen, M. T., and E. Rasmussen. 2019. "The Development, Growth and Performance of University Spin-Offs: A Critical Review." *The Journal of Technology Transfer* 44: 1891–1938.
- Messina, L., and N. Hewitt-Dundas. 2021. "The pre-Foundation Evolution of Proactiveness in Born Globals and non-Born Global USOs." *Journal of Small Business Management*, 1–36.
- Messina, L., K. Miller, B. Galbraith, and N. Hewitt-Dundas. 2022. "A Recipe for USO Success? Unravelling the Micro-Foundations of Dynamic Capability Building to Overcome Critical Junctures." *Technological Forecasting and Social Change* 174: 121257.
- Messina, L., K. Miller, and N. Hewitt-Dundas. 2022. "USO Imprinting and Market Entry Timing: Exploring the Influence of University Ecosystems." *IEEE Transactions on Engineering Management* 69 (4): 1–16.
- Meoli, M., and S. Vismara. 2016. "University Support and the Creation of Technology and Non-Technology Academic Spin-Offs." *Small Business Economics* 47: 345–362.
- Miles, M. B., A. M. Huberman, and J. Saldana. 2014. *Qualitative Data Analysis: A Method Sourcebook*. 3rd edn. Thousand Oaks, CA: Sage.
- Miller, K., J. A. Cunningham, and E. Lehmann. 2021. "Extending the University Mission and Business Model: Influences and Implications." *Studies in Higher Education* 46 (5): 915–925.
- Miller, K., R. McAdam, S. Moffett, A. Alexander, and P. Puthussery. 2016. "Knowledge Transfer in University Quadruple Helix Ecosystems: An Absorptive Capacity Perspective." *R&D Management* 46 (2): 383–399.
- NETVAL. 2020. *Ricerca, Valorizzazione dei Risultati e Impatto*. Pavia: Netval - Network per la Valorizzazione della Ricerca Universitaria.
- Neves, M., and M. Franco. 2018. "Academic Spin-off Creation: Barriers and how to Overcome Them." *R&D Management* 48 (5): 505–518.
- Nguyen, Q. A., and M. G. Sullivan. 2021. "Conceptualising Organisational-Level and Microfoundational Capabilities: An Integrated View of Born-Globals' Internationalisation." *International Entrepreneurship and Management Journal* 17 (4): 1781–1803.
- O'Casey, A., and J. Weerawardena. 2009. "Examining the Role of International Entrepreneurship, Innovation and International Market Performance in SME Internationalisation." *European Journal of Marketing* 43 (1/2): 1325–1348.
- Oviatt, B. M., and P. P. McDougall. 2005. "The Internationalization of Entrepreneurship." *Journal of International Business Studies* 36 (1): 2–8.
- Patton, M. Q. 2002. *Qualitative Research and Evaluation Methods*. 3rd ed. Thousand Oaks, CA: Sage.
- Paul, J., and A. Rosado-Serrano. 2019. "Gradual Internationalization vs Born-Global/International new Venture Models." *International Marketing Review* 36 (6): 830–858.
- Plakoyiannak, E., and P. Budhwar. 2021. "From Convention to Alternatives: Rethinking Qualitative Research in Management Scholarship." *British Journal of Management* 32: 3–6.
- Pratt, M. G. 2009. "From the Editors: For the Lack of a Boilerplate: Tips on Writing Up (and Reviewing) Qualitative Research." *Academy of Management Journal* 52 (5): 856–862.
- Puthussery, P., Z. Khan, G. Knight, and K. Miller. 2020. "How Do Rapidly Internationalizing SMEs Learn? Exploring the Link Between Network Relationships, Learning Approaches and Post-Entry Growth of Rapidly Internationalizing SMEs from Emerging Markets." *Management International Review* 60: 515–542.
- QS World University Rankings. 2022. Retrieved May 25, 2022, from <https://www.topuniversities.com/university-rankings>.
- Saridakis, G., B. Idrisa, J. M. Hansenb, and L. P. Danc. 2019. "SMES Internationalisation: When Does Innovation Matter?" *Journal of Business Research* 96: 250–263.
- Soetanto, D., and M. van Geenhuizen. 2019. "Life After Incubation: The Impact of Entrepreneurial Universities on the Long-Term Performance of Their Spin-Offs." *Technological Forecasting and Social Change* 141: 263–276.
- Strauss, A., and J. Corbin. 1998. *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*. 2nd ed. Thousand Oaks, CA: Sage.
- Taheri, M., and M. van Geenhuizen. 2019. "Knowledge Relationships of University Spin-off Firms: Contrasting Dynamics in Global Reach." *Technological Forecasting and Social Change* 144: 193–204.
- Tan, A., P. Brewer, and P. W. Liesch. 2007. "Before the First Export Decision: Internationalisation Readiness in the Pre-Export Phase." *International Business Review* 16 (3): 294–309.
- Vesey, J. T. 1991. "The new Competitors: They Think in Terms of Speed-to-Market." *Academy of Management Executive* 5 (2): 23–33.

- Vohora, A., M. Wright, and A. Lockett. 2004. "Critical Junctures in the Development of University High-Tech Spinout Companies." *Research Policy* 33 (1): 147–175.
- Wang, Q., S. Dacko, and M. Gad. 2008. "Factors Influencing Consumers' Evaluation and Adoption Intention of Really-new Products or Services: Prior Knowledge, Innovativeness and Timing of Product Evaluation." *Advances in Consumer Research* 35: 416–422.
- Weerawardena, J., G. Sullivan, P. W. Liesch, and G. Knight. 2007. "Conceptualizing Accelerated Internationalization in the Born Global Firm: A Dynamic Capabilities Perspective." *Journal of World Business* 42 (3): 294–306.
- Yin, R. K. 2018. *Case Study Research: Design and Methods*. Thousand Oaks, CA: Sage.
- Zahra, S. A. 2005. "A Theory of International new Ventures: A Decade of Research." *Journal of International Business Studies* 36 (1): 20–28.
- Zahra, S. A., and D. O. Neubaum. 1998. "Environmental Adversity and the Entrepreneurial Activities of new Ventures." *Journal of Developmental Entrepreneurship* 3 (2): 123–140.
- Zeithaml, V., A. Parasuraman, and L. Berry. 1985. "Problems and Strategies in Services Marketing." *Journal of Marketing* 49(2): 33–46.