

# The Hybrid Identities of Academic Entrepreneurs

Doctor of Philosophy

2023

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## Declaration

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## Acknowledgement

I would like to acknowledge and thank all of those who have supported me throughout the journey which has led to the completion of my PhD Firstly, I would like to thank Professor Paul Ryan whose support and guidance have been invaluable to me every step of the way. I would also like to thank the team within the Business School at Trinity, everyone has been generous of their time and expertise and a wonderful support to me on my journey.

I thank all of the participants who made this study possible and gave so freely of their time and expertise. To my fellow students in Trinity Business School, I thank you all for your support and words of kindness particularly in those early and uncertain days of the PhD.

A special word of thanks to my family and friends, your support means much more than you will ever know. Finally, to my dad and son, two incredibly important people in life who I wish had the opportunity to spend more time together than they did, I thank you both. My dad for his unwavering belief in me and my abilities and his unconditional love and support and my son, Paul for taking over that role when dad left us too soon.

## Abstract

Academic Entrepreneurs continuously face identity paradoxes. Drawing on theories from role identity and entrepreneurial orientation literature, this study investigate how academic entrepreneurs manage their hybrid role identity in a mature entrepreneurial university environment. This study conducted an empirical investigation of 31 academic entrepreneurs in a single site case study based in a University in Ireland.

Theoretically, the study introduces new insights into the paradox of academic entrepreneurs and their role identity. The study considers the perceptions and understanding of academic entrepreneurship. It extends the knowledge base on role hybridisation and academic entrepreneurship. Hybridisation is explored through the lens of role salience and role centrality.

The study introduces new insights into the broadly encompassing title of 'Academic Entrepreneur'. Three typologies of Academic Entrepreneur are developed, the 'Resourceful' Academic Entrepreneur, the 'Readymade' Academic Entrepreneur and the 'Reluctant' Academic Entrepreneur. Additionally, it also enriches the extant literature on role identity and also has important implications for policymakers and universities supporting academic entrepreneurs.

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## Chapter One - Introduction

### 1.1 Introduction

Understanding the micro-foundations of academic entrepreneurship is becoming increasingly popular (Louis *et al.*, 1989; Shane. 2004, Jain *et al.*, 2009; O'Kane *et al.*, 2020; Shi *et al.*, 2020). This interest stems from policymakers increasingly recognising universities as engines of innovation within the entrepreneurial ecosystem (Guerrero *et al.*, 2016), as well as universities' response to this transformation of their core mission. Beyond teaching and research, the core mission now includes the third mission of technology transfer (Etzkowitz *et al.*, 2000).

The proclivity of universities to commercialise has shifted dramatically over the last decade (Lam, 2010; Meek and Wood, 2016; Bosco *et al.*, 2019; Skute 2019; Shi *et al.*, 2020). Institutions are becoming more proactive in assisting research to move from bench to market. This is supported by a plethora of studies that have investigated these phenomena at various levels of analysis, including Dasgupta and David (1994), George (2005), Thursby and Thursby (2002), Miner *et al.*, (2001), Chang *et al.*, (2016), Cunningham *et al.*, (2016), and Shi *et al.*,(2020).

A deeper understanding of the primary agent driving transformation, the academic entrepreneur, is missing from much of the rhetoric and analysis. The

academic entrepreneur's participation is essential to the third mission of the University, yet little is known about their cognitive and social psychological selves, as well as how they shape or reshape their role identity in response to the call to commercialise. This study seeks to explore these concepts through the lens of role identity theory in order to provide valuable insights into the evolving role of the academic entrepreneur.

## 1.2 Research Focus and Rationale

In the 1990s, the development of Ireland's National Innovation System called for universities to play a central role in fostering economic growth. Investment from agencies such as Enterprise Ireland helps to establish a technology transfer footprint in Universities, exemplifying the transformation of Ireland's universities from academic institutions to knowledge capitalists. As a result, at this point in time, the study is not just a nice-to-have exploration, but a necessary-to-have study in order to maximise our national potential in commercialisation and have impacts that provide a return on investment for the 30 million euro invested in technology transfer supports and structures in Ireland since 2007 (Inventions and Innovation, 2012; p. 11). Increasingly, reports have focused on academics driving the entrepreneurship agenda. These include 'Promoting Enterprise-Higher Education Relationships' (Forfás 2007), Innovation 2020 (Department of Enterprise, Trade and Employment, 2015), and Supporting Entrepreneurship and Innovation in Higher Education in Ireland (OECD, 2017), all of which have driven the policy agenda to sharpen the focus

on innovation and entrepreneurship, and the role of the University in economic development.

Universities are under increasing pressure to contribute to economic development and competitiveness (Feller, 1990). Beyond Ireland, policymakers around the world encourage such development by encouraging collaboration between universities and industry (Mowery and Sampat, 2005) to contribute to their respective countries' economic growth, job creation, and innovation index. Policymakers have created funding models and initiatives aimed at increasing the rate of commercialisation of university technology; furthermore, governments in some countries (for example, the Bayh Dole Act in the US) are providing commercialisation incentives to universities by granting them ownership of intellectual rights arising from their research (Mowery and Sampat, 2005; Valentin and Jensen, 2007).

Several studies have been conducted to investigate the maturing entrepreneurial University (Philpott *et al.*, 2011), universities that recognise their role in the triple helix model. Etzkowitz *et al.*, (2000) define an entrepreneurial university as “any university that undertakes entrepreneurial activities with the objective of improving regional or national economic performance as well as the University's financial advantage and that of its faculty” (p.13). An entrepreneurial university's activities range from soft to hard initiatives; these initiatives link academic activities to the entrepreneurial paradigm (Philpott *et al.*, 2011). At the early stages of maturity, the

entrepreneurial university will typically create a portfolio of softer entrepreneurial activities that will skew towards harder activities once the institution and academics have reframed their attitudes and abilities towards the entrepreneurial paradigm (Sanders and Miller, 2010). Many studies have focused on industry and university engagement as factors that contribute to academic entrepreneurship, which is more aligned with the academic than the entrepreneurial paradigm. As a result, there has been much discussion about unpacking the entrepreneurial university ideal (Philpott *et al.*, 2011; Klofsten and Jones-Evans, 2000; Louis *et al.*, 1989).

It is difficult to overestimate the importance of universities and the academic entrepreneurs who populate them. In terms of the individual's role within the entrepreneurial paradigm, the academic entrepreneur is perpetually confronted with an identity conflict, with lines being framed and reframed in relation to their roles and identities within their institutions (Shi *et al.*, 2020). Indeed, academic institutions have been drastically re-conceptualised as a significant engine for economic growth and innovation within knowledge-intensive economies (Etzkowitz and Leydesdorff 2000). Policymakers and researchers alike have emphasised the importance of the National System of Innovation (NSI) in creating the conditions for sustained economic progress now and in the future (Cunningham and Harney 2006).

It is critical to focus on the individual in order to gain a better appreciation and understanding of the changes being experienced by academia in relation to 'academic entrepreneurship'. The work of Zucker and Darby (1996) on the star scientist demonstrated that academic entrepreneurs played a disproportionately significant role in the commercialisation of scientific invention. Furthermore, Lockett *et al.*, (2005) highlight the importance of the academic scientist in the process of opportunity search and technology transfer within universities. Such activities are essential to the emergence of the knowledge-intensive economy. Nonetheless, surprisingly little is known about both the cognitive, social, and psychological processes associated with academics reshaping their career paths and engaging in entrepreneurial activities (Erdem and Audretsch, 2004). Why do these individuals undertake commercialisation endeavours, how do they perceive such participation as impacting their professional development and careers, how do they manage their work priorities within this increasingly shifting landscape, and how does the University weigh this contribution in relation to academic performance?

With changes in the literature and the recognition that 'entrepreneurship is individually driven, you cannot force people to be entrepreneurial...or entrepreneurship is a result of the individual efforts of people who want to do it rather than a top-down push of university policy' (Philpott *et al.*, 2011, p. 166), a better understanding of the key actor is necessary.

Prodan and Slavec (2012), Lam (2010), and Balven *et al.*, (2018) all acknowledge that the role of the academic entrepreneur has been extensively researched in light of phenomena such as the triple helix, the shift in government funding models (Etzkowitz, 1983) in Europe, and the increasingly public debates on the roles of Universities in Society, all contributing to a dearth of knowledge on the entrepreneurial University. However, reiterating institutional and broader societal perspectives on the entrepreneurial University loses sight of the academic entrepreneur and treats them as a single type without understanding the complexities that exist within their roles from both a centrality and salience perspective (Stryker and Serpe, 1994).

'Although the evolution of academia has been widely explored, different periods defined, and the related changes explained, little research has focused on the crucial actor - the academic entrepreneur' (Prodan and Slavec, 2012, p. 10). The study adds to the literature by elucidating how academic entrepreneurs manage their dual role identity and what factors contribute to the academic entrepreneur's readiness to modify their role identity as part of their involvement with entrepreneurial activity. Merton (1957) defines role identity as "social positions that carry with them certain expectations for behaviour and obligations towards other actions" (p.657).

The behaviours of academic entrepreneurs are fundamentally dominated by their set of values and beliefs, which are shared within their scientific

community to create both individual and group identities (Merton, 1973). Contextual factors such as scientific fields, organisation settings, and time periods (Chubin and Hackett, 1990) all greatly influence such community practices. In the 1950s, there was a split in scientific research into basic and applied, with basic science focusing on scientific discovery and applied science having a more practical application in society.

The distinct orientations of both types of research sparked a significant debate about the role of academia and the divide between the sciences. Basic science supporters believed that applied science would jeopardise pure science (Perkmann *et al.*, 2013), whereas others believe that both sciences are compatible (Etzkowitz, 1983). This new evolution of scientific research, in conjunction with the introduction of academic capitalism in the 1980s, resulted in the emergence of a new type of academic with newly emerging norms and identities. This study seeks to explore this under-researched topic specifically from the perspective of the academic entrepreneur.

Hoang and Gimeno (2005) suggest that “because there has been little theoretical work at the cross section of identity, careers, and entrepreneurship, there is no explicit account of the relevant dimensions attached to entrepreneurial role identity” (p. 9). Furthermore, Zucker and Darby (1996) suggest that: “To gain a better appreciation of the changes being experienced by academic entrepreneurship, it is critical to focus on the scientist” (p. 275).

Whilst Balven *et al.*, (2018) states that: “Many scholars have examined academic entrepreneurship at the individual level, they have yet to investigate the psychological processes that may be critical drivers of the individuals' decisions related to academic entrepreneurship” (p. 4).

Understanding the concept of role identity can lead to a deeper understanding of and the development of predictive modelling of the conditions under which successful entrepreneurial behaviours are likely to occur (Hoang and Gimeno, 2005). By actively participating in technology development, both the individual and the University demonstrate ambidexterity in their dexterity towards producing scientific knowledge in addition to innovative or entrepreneurial outputs (Ambos *et al.*, 2008). Star scientists, for example, excel as both academic researchers and academic entrepreneurs in rapidly developing fields such as biotechnology (Zucker and Darby, 1996). How academics manage the duality of these distinctly different activities will allow University management to make more informed decisions about levels of academic entrepreneurial engagement. This is evident primarily through EU and national funding models, as well as a greater reliance on industry partners as commercialisation vehicles.

According to Owen-Smith and Powell's (2003) research, convergence toward a hybrid system linking scientific and entrepreneurial success is starting to emerge. Academic success, according to the authors, drives technological innovation, whereas organisational learning relating to procedures and

organisational arrangements in relation to identifying opportunities and managing IP drives advantages in technological innovation. With time, a hybrid order emerges in which the best academic institutions perform at both scientific research and technology commercialisation. This viewpoint is not without detractors, who point out the potentially negative effects of entrepreneurial or applied science on long-term basic science production, expressing concerns that academic science is now being instrumentalised and manipulated by industry, and thus the ethos of science (Merton, 1973) no longer applies (Noble, 1977; Slaughter and Leslie, 1997; Van Looy *et al.*, 2005). A lack of academic autonomy, lower levels of productivity, and a slowing down of open science diffusion and knowledge sharing are all risk of such a shift (D'este and Perkmann, 2011).

The hybridisation does not stop at the institutional level. A hybridisation of the academic entrepreneur's role identity also occurs. The concepts of salience and centrality can help you understand the identity work that academics do to maintain their hybrid role identity (Stryker and Serpe, 1982). Role salience refers to an individual's commitment to an identity, whereas centrality refers to the relative importance of the focal identity in one's own self (Stryker and Serpe, 1994). Varying commitments to various aspects of the role, as well as which role is viewed as more important, help shape the academic entrepreneur's overall identity (Callero, 1985). Jain *et al.*, (2009) posits that the entrepreneurial scientist will often view their hybrid role identity for both the focal academic and secondary commercial self. Participation in the

commercialisation activities represents either the primary or the secondary role, with the core academic role being the most commonly identified.

According to Stephan (1996), Siegel *et al.*, (2003), Djokovic and Souitaris (2008), Audretsch *et al.*, (2002), Bozeman (2000), Feldman and Francis (2002), Link *et al.*, (2007) and Shi *et al.*, (2020), in recent years, there has been increasing interest in academic entrepreneurship. Finally, if institutions do not understand the individual, they will be unable to fully utilise their innovation capacity to create organisation structures to support their identities. This is a fundamental requirement for assessing the organisation and societal implications of the 'entrepreneurial university' (D'Este and Perkmann, 2011). Several scholars have investigated both the causes and effects of academic entrepreneurship using data at various levels of analysis and for various jurisdictions (Miller *et al.*, 2018).

The findings are dependent on time periods, location, jurisdiction, and the details of the underlying data. However, almost invariably, the broader concept of academic entrepreneurship has been considered, however in many instances, it is its subset – the academic entrepreneur – that must be examined, because not all academic entrepreneurs are equally created.

### 1.3 Research Question and Research Objectives

The purpose of this research is to learn how academic entrepreneurs deal with the paradoxes and complexities of their role identity. The research study is carried out through three research objectives, each of which contributes to answering the overall research question.

The first research objective, derived from a review of the literature, was to investigate the perceptions and understanding of academic entrepreneurship by academic entrepreneurs. Such perceptions are rooted in the context of the mature entrepreneurial university and contribute to the role identity of the academic entrepreneur. The role identity lens explores the cognitive and social-psychological processes associated with academics as they shape or reshape their careers towards entrepreneurial paths (Erdem and Audretsch, 2004; Balven *et al.*, 2018). Roles define an individual's behavioural boundaries, whereas frame refers to the legitimacy of that behaviour within the context of their environment. Academic role frames have an impact on their values, interactions, and practices related to their entrepreneurial activities (Thornton and Ocasio, 2008). This is a key point of intersection between role identity theory and the study of the mature entrepreneurial University, because academics may be perpetually confronted with an identity conflict, with lines being drawn and redrawn in relation to their roles and identities within their institutions (Jain *et al.*, 2009; Sanders and Miller 2010; Lam 2010; Shi *et al.*, 2020).

The second research objective explores how the entrepreneurial orientation and role identity of entrepreneurial academics is perceived. There is a gap in the literature that this study seeks to understand and fill. By pursuing this objective, the study aimed to address the recognised lack of understanding of the University-based entrepreneurship literature, which occurs when academics engage in entrepreneurial behaviour (Jain *et al.*, 2009). The proliferation of studies within the field that draw attention to the importance of the reconceptualisation of entrepreneurial behaviours and attitudes will ultimately highlight the importance of this phenomenon, as our understanding of the individual academic entrepreneur is, at best, incomplete in terms of knowledge transfer with academia (Owen-Smith and Powell 2001; Mosey and Wright 2007; Jain *et al.*, 2009).

This study introduces the concept of role hybridisation in order to fully understand the role identity of academic entrepreneurs. The concepts of salience and centrality are central to the concept of role hybridisation (Stryker and Serpe, 1982). Salience can be determined by the commitment of the individual to an identity (Stryker and Serpe, 1994). Role centrality reflects the relative importance of the individual's focal identity. Prior research has suggested that there are differences in the commitment and centrality that individuals have to different aspects of their hybrid identity (Callero, 1985), and that some role identity facets are more central to one's identity than others.

Jain *et al.*, (2009) asserts that the entrepreneurial scientist will often view their hybrid role identity for both a focal and secondary self-perspective. Participation in commercialisation activities is either the primary or secondary role, with the core academic role taking either the former or latter position depending on the academic entrepreneur in question. An increase in the study of hybrid identities (Jain *et al.*, 2009) has evolved through the writings of York *et al.*, (2016), Del Bosco *et al.*, (2019) and Shi *et al.*, (2020); however, a common problem persists in that the conflict that leads to the need for identity adaptability and modification has yet to be researched and understood (Skute, 2019). This study aims to contribute to the body of knowledge on role hybridisation.

The final research objective of this study is to consider how different typologies of academic entrepreneurs manifest within the mature university setting. It considers the implications faced by academics attempting to manage their hybrid role in their institutional setting through the development of the hybrid typologies of academic entrepreneurs. A substantial body of research has examined identity implications and conflict from various perspectives; however, the paradoxical relationship of academic entrepreneurs remains unexplored (Del Bosco *et al.*, 2019). Empirical research lags behind the delineation of linkages that exist between the dynamic drivers of identity and identity modification and hybridisation (Barkat, 2019). This study introduces three typologies to support academic entrepreneurship role identity research

and explores these identities, linkages, and the implications faced in managing their complexity. According to the three typologies, academic entrepreneurs can identify as a 'Resourceful' Academic Entrepreneur, who is equally committed to their role as an academic and an entrepreneur and brings maturity, leadership, and quasi-firm to the fore (Etzkowitz, 2002). The second typology is 'Readymade'. This academic entrepreneur has been academically 'born' into an environment where entrepreneurship is a vital dimension of the role frame or context.

The final typology, the 'Reluctant' Academic entrepreneur(Ae), saw entrepreneurship as something that inhibited careers (due to publishing restrictions), distracted them from their core role, and engaged in entrepreneurship due to push factors such as lack of funding in their research domain or student- driven requests.

| Research Questions        |   |
|---------------------------|---|
| Primary Research Question | How do academic entrepreneurs manage their hybrid role identity in a mature entrepreneurial university environment? |
| Sub Question One          | What are the perceptions and understanding of academic entrepreneurship by academic entrepreneurs?                  |
| Sub Question Two          | How are the entrepreneurial orientation and role identity of the academic entrepreneur perceived?                   |
| Sub Question Three        | How do the typologies of Hybrid Academic Entrepreneur manifest in a mature entrepreneurial university setting       |

Table 1.1: Research Question and Sub Questions

1.4 Theoretical Contribution

This study has made several contributions to the theoretical investigation of

the research topic. In summary, these contributions are as follows:

#### Summary of Theoretical Contributions

1. The academic entrepreneur and their role identity are poorly understood. The development of a more comprehensive understanding of the context and perspectives of the academic entrepreneur is thus an important goal within academia (Bercovitz and Feldman, 2008; Greenwood *et al.*, 2008). Through the exploration of the national innovation systems, the external environment, the entrepreneurial University, and more specifically, the case site has sought to address this gap from a theoretical and empirical perspective.
2. Much of the discussion lacks a more in-depth understanding of the role of the academic entrepreneur (Jain *et al.*, 2009; Lam, 2010). The purpose of this research was to gain a better understanding of the academic entrepreneur's role, orientation, and identity within the context of the entrepreneurial university. This study incrementally and progressively (Kaplan, 1964) expands our knowledge of the role identity of the academic entrepreneur through a deeper understanding of how entrepreneurship fits within their roles using role identity theory (Merton, 1957), how they modify their roles since securing entrepreneurial funding, and their strategies for overcoming and managing entrepreneurship within their domains. This study introduces the sense making activities that individuals undertake to manage the duality of being both an academic and an entrepreneur, as well as how

they manage their roles and duties within this every changing environment.

3. This study expands academic entrepreneurship research by investigating the academic entrepreneur through identity centrality and salience. Although a large body of research focuses on psychological perspectives of individual academic scientists, including topics such as motivations (Hayter 2015; Lam 2010), cognition styles and passions (Huyghe *et al.*, 2016), attitudes and belief (Urban and Chantson 2019), few studies provide empirical evidence at the micro level on the effects of identity centrality and salience in supporting or inhibiting entrepreneurial activities, such as spin-of creation, patenting, and licenses. Through the development and introduction of 'academic entrepreneur typologies', the three typologies clearly delineate that academic entrepreneurs can be identified as a 'Resourceful' Academic Entrepreneur who is equally committed to their role as an academic and an entrepreneur, and brings maturity, leadership and quasi-firm (Etzkowitz, 2002) attributes to the fore. The second typology is 'Readymade'. This academic entrepreneur has been academically 'born' into an environment where entrepreneurship is a vital dimension of the role frame or context. The final typology, the 'Reluctant' Academic entrepreneur(Ae), saw entrepreneurship as something that inhibited careers (due to publishing restrictions), distracted them from their core role, and engaged in entrepreneurship due to push factors such as a lack of funding in their

research domain or student-driven requests.

4. The interaction of the typologies introduced in point three resulted in an exciting dynamic between the 'Resourceful' and 'Readymade' academic entrepreneur that aligned with the quasi-firm literature (Etzkowitz, 2002). This literature suggests that within each academic entrepreneurial team, a quasi-firm develops with roles and network effect building capacity. Another gap in the literature is that no studies have been conducted to investigate how micro-social processes occurring within these environments shape individual attitudes (Bercovitz and Feldman, 2008; Organ, 2013)
5. This study has wholly focused on the 'Academic Entrepreneur' who has utilised Enterprise Ireland commercial funding to develop new technologies to licence, patent, or spin out, rather than the broader or more informal and all-encompassing gamut of activities described in the academic entrepreneur continuum by Miller *et al.*, 2018 (see chapter 2). The study has demonstrated that some role identity facets are more central to oneself than others (Callero, 1985)
6. Furthermore, this study has contributed to the body of knowledge that we have developed in relation to our understanding of the Mature Entrepreneurial University (Klofsten and Jones-Evans, 2000; Philpott *et al.*, 2011). These activities, which include licenses, patenting, and spin-off formation, are at a perceived level of entrepreneurial sophistication for academic entrepreneurs to engage in and are generally regarded as more

tangible outputs of the mature entrepreneurial University (Rasmussen *et al.*, 2006; Klofsten and Jones-Evans, 2000; Philpott *et al.*, 2011). It improves on previous research that looked at AE in the context of university-industry relationships (Owen-Smith and Powell, 2006).

## 1.5 Methodological Contribution

This study has made several contributions in its approach to the empirical investigation of the research topic. In summary, these contributions are as follows:

### Summary of Methodological Contributions

1. Much of the analysis of the academic entrepreneurs to date has been based on a high level of aggregation and generalisation of the entrepreneurial University rather than the academic entrepreneur (Lam, 2010). This approach may obscure the complexity and diversity of the academic entrepreneur (Tuunainen, 2005) and gives no insight into their role frame or role identity at the micro-level. This study addresses this theoretical gap (Lam, 2010).
2. This study contributes to what Battilana *et al.*, (2009) describe as much needed research within the field, taking an exploratory approach to understanding the nature of entrepreneurship in a specific social context within which actors are embedded and spanning the macro (institution) and individual levels (micro).

3. This study builds on the empirical work of Bozeman (2000), Rothaermel *et al.*, (2007), Bozeman *et al.*, (2013), and Wright (2014) to increase research studies in the more formalised academic entrepreneurship domains, spanning knowledge transfer activities such as licences, patents, and spin-out companies. Given the ambiguity surrounding the terms "academic entrepreneurs" and "entrepreneurial academics," this study places the academic entrepreneur at the center of the entrepreneurial University.

## 1.6 Research Methodology and Design

This study's research strategy is qualitative and inductive, with semi-structured phenomenological interviews used to investigate academic entrepreneurs 'lived experiences' in a single site case study. The case was coded using Nvivo, and the interpretation of the coding resulted in the final assessment of how entrepreneurial academics manage their role identities. This pluralistic approach to the research study strikes a balance between critical realism, human agency, and existing social structures. The purpose of this research is to provide a feasible and credible explanation of the typologies of academic entrepreneurs in a mature university setting.

The study necessitated a pluralist approach that provides a high level of contextualisation without sacrificing causal explanation. This entailed evaluating and adhering to the theories described earlier in this thesis,

evaluating segments of coding for a specific proximity objective in a single case, but also re-examining the content of all of these segments in order to arrive at a final qualitative interpretation of the case's proximity to the overarching research question. Cross-case analysis is used to compare findings across units of analysis as part of this step.

### 1.7 Limitations of the Study

The first limitation is one of generalisation. Despite the fact that the study had 31 participants, it was conducted at a single location. The specific case site was chosen because its organisation structure resembled that of a traditional university in the mature stages of its entrepreneurial trajectory. Given the phenomenon's complexity and how easily observed it was, a large sample size was deemed appropriate (Pettigrew, 1990).

The investigation was also exploratory in nature. While it is acknowledged that academic entrepreneurship is thriving. There is little known about the academic from the standpoint of role identity, as well as the paradoxes and tensions that exist in navigating their entrepreneurial terrain (George *et al.*, 2005; Lam 2010; Shi *et al.*, 2020).

The risk of bias is a second limitation of this study. First, the bias associated with the methodological framework of choice must be considered. The

researcher has compiled a body of evidence to support the study's research design, with studies noting that "very little is known about the cognitive and social psychological processes associated with scientists reshaping their career trajectories and pursuing entrepreneurial paths" (Jain *et al.*, 2009, p.922), and academic entrepreneurship discussions lack a deeper understanding of the involvement of the key actor in the academic entrepreneurship debate (Audretsch and Erdem, 2004). The single case study provides a rich source of insight for both theory development and identifying potential avenues for future work in the field (Eisenhardt, 1989).

The final limitation is related to the researcher and their own attitude toward participants at within the academic institution. The researcher is a full-time member of staff at the academic institution. Their beliefs, values, and assumptions may adversely affect the investigation of important issues and unduly influence the analysis of the empirical data (Miles and Huberman, 1994). Because the researcher is a critical research instrument in the process, these factors are inextricably linked to it. These issues and concerns were addressed in the research by taking their impact into account throughout the process and employing a systematic protocol described in the research methods chapter. It is important to note that given the methodology used, bias cannot be completely eliminated, and this limitation should be considered.

## 1.8 Conclusion

Chapter one has introduced the research focus and rationale for this study. It has established the theoretical and methodological contributions of this study. It outlines the research methodology and strategy that has informed this study and presents the limitations of the study.

The next chapter introduces the theoretical background relevant to the objectives of this research by reviewing the literature on the triple helix and the entrepreneurial University. The chapter introduces literature relating to the entrepreneurial academic, their role identity, and how their role develops or changes. The chapter discusses entrepreneurial orientation and the emergence of an entrepreneurial academic identity.

## Chapter Two - Literature Review

### 2.1 Introduction

This chapter aims to provide a theoretical background relevant to the objectives of this research by reviewing the literature on the triple helix and the entrepreneurial University. Following that, it delves into the entrepreneurial academic, their role identity, and how their role develops or changes. The chapter discusses relevant literature to their entrepreneurial orientation and the emergence of an entrepreneurial academic identity. Finally, the chapter concludes with the introduction of paradox theory, a theory that 'denotes contradictory yet interrelated elements' (Lewis, 2000) as a lens through the dual identity of academic entrepreneurs in the institutional setting is viewed.

Throughout the chapter, emphasis is placed on identifying discernible literature gaps concerning academic entrepreneurs' identity, orientation, and the tensions and paradoxes encountered when managing these roles in a mature university setting. These theoretical gaps are discussed in detail near the end of the chapter.

### 2.2 The Triple Helix

The Bayh-Dole Act of 1980 ushered in a new era of intellectual property legislation and ownership. The act granted broad permission for government-funded research to register patents based on research findings and grant licenses to third parties (Mowery, 2011). This coincided with a reduction in

state funding for academic institutions, laying the groundwork for a new environment of innovation in which universities, governments, and knowledge-producing enterprises played a more prominent role. The triple helix model of innovation was born (Etzkowitz, 1996).

To develop and support this model of interaction between institutions, enterprise and government innovation spaces such as Technology Transfer Offices were introduced to manage relationships between the actors within the Triple Helix (Etzkowitz and Dzisah, 2008). Government structures were altered in order to maximise the strategic potential of interactions and ensure that the spill over of knowledge from research and development promoted economic and regional development and growth (Ranga and Etzkowitz, 2012).

The triple helix also carved new paths for academics interested in commercialisation. Traditionally, academics interested in commercialisation could follow one of two paths: one within the higher education institution, pursuing an academic research career, focussed on teaching and research, or one outside academia, pursuing a career realising the impact of their research. While these paths continue to exist, a new one has emerged academic entrepreneurship. This path allows academics to investigate the entrepreneurial potential of their research, taking into account not only the expansion of knowledge but also the research impact, implementation, and bottom line (Guo *et al.*, 2019).

In recent years, there has been a greater emphasis on this new pathway at both the national and institutional levels, with academics working more closely with industry and business stakeholders, resulting in activities that are more commercial and an identity paradox for the academic involved.

As the focus shifts, scientists, particularly those in larger laboratories, engage in a number of activities that are typical of the modern entrepreneur (Heaton, 2019). They establish quasi-firms or complex organisation structures and provide adequate funding, human and physical capital to them. These scientists serve as intermediaries, cultivating relationships with external funding agencies, sponsors, and policymakers in order to secure political and financial support for their research agenda.

Scientists in charge of large laboratories within or outside of the University engage in a variety of activities typical of the modern entrepreneur. From an academic perspective, the essays of Robert Merton (1973) serve as a starting point for painting a portrait of the academic entrepreneur. While the pursuits of the academic entrepreneur can undoubtedly be traced back much further than 1973, it was around this time that scientific discoveries in academia were recognised, as well as the recognition and acknowledgment of a broader role in academia for scientists. The work of Akrich *et al.*, (2002) and Latour (1989) demonstrates a different perspective on how scientists manage their careers

base on entrepreneurial activity. These authors suggest that, in addition to creating something new and novel (winning the priority race), academics have a vested interest in obtaining social consensus regarding their discovery, its legitimacy, and experimentation in relation to innovative discovery. This agreement validates academics within their academic sphere, as well as industry and government. This validation is demonstrated in academia by citing related journal articles, in industry by funding and ethical validation, and in government by involvement in policy formulation, evaluation, and implementation. From this vantage point, the academic entrepreneur's activities are not merely alternative sources of income and opportunity, but also necessary steps to support a modern academic's career trajectory.

#### 2.2.1 *The Entrepreneurial University*

While universities are professional bureaucratic institutions whose members are relatively free to pursue activities they believe will benefit the organisations overall interests, the organisation is increasingly determining how and with whom academia should engage in terms of funding and collaboration. Many universities have formal policies in place to encourage academic staff to seek industry assignments for a certain share or proportion of their time (Perkmann and Walsh, 2008; Guo *et al.*, 2019). Policy incentives for research and subsequent participation of scientific entrepreneurs in product development efforts can be an appealing proposition (Lowe and Gonzalez-Brambila, 2007; Miller *et al.*, 2018).

However, the implementation of these incentivised mechanisms requires academic researchers to respond to financial incentives linked to the successful commercialisation of their entrepreneurial ideas (Jensen and Thursby, 2001). This logic is implicit in life cycle theories. Such theories contend that junior academic staff are focussed on establishing their academic reputation, whereas later in their careers, the emphasis shifts to capitalising on their expertise (Stephan and Levin, 1992). Recent studies reflect a change in this mind-set, owing to a more modern view of academia and their involvement in entrepreneurship (Guo *et al.*, 2019).

Attitudes toward academic entrepreneurship research provide a different picture of academic motivations and participation in technology transfer activities (Markman *et al.*, 2005). According to research from US universities, most academics, particularly those in science and engineering, are keen on technology transfer activities but less interested in overly commercial schemes such as start-up companies and equity investments (Mansfield and Lee, 1996; Miller *et al.*, 2018).

Despite significant changes in the structure and bureaucracy of universities, teaching and research remain central pillars of a university system. Engaging in commercialisation activities is still considered discretionary behaviour in academia by many (Tartari *et al.*, 2014). Many universities have formal policies in place regarding incentive mechanisms relating to time, intellectual property

rights, invention disclosures, and spin-out opportunities in the industry (Lowe, 2006). The implementation of these incentive mechanisms assumes that academic scientists will respond to financial incentives tied to successful commercialisation of their ideas (Jensen and Thursby, 2001).

According to some studies (Owen-Smith and Powell, 2001; Bercovitz and Feldman, 2008), working with industry is profit-motivated, whereas others claim that entrepreneurial activities are symbolic. Academics engage in substantial entrepreneurial behaviour rather than what is considered superficial compliance only when entrepreneurial norms are present in academic institutions. Further research in the domains of applied science and engineering, particularly in the US, demonstrates that scientists are enthusiastic about technology transfer activities (Bercovitz and Feldman, 2008). Interestingly, academics at higher-ranked institutions are less supportive of academic entrepreneurship than those at lower-ranked institutions; this could be attributed to a deeply embedded role identity, particularly for higher-ranked institutions, where the legitimacy of their position is a significant indicator of their academic position. According to Lee's (1996) study, academics are concerned about how industry involvement may limit their academic freedom and autonomy. According to a meta-study (Glaser and Bero, 2005) academic researchers' attitudes toward financial ties with industry partners are primarily positive, particularly when funding is indirectly related to the core research area, and thus their core identity is not threatened in any

way. Meyer-Krahmer and Schmoch (1998) studied German academics across four disciplines and found that funding and learning from industry constitute the main motives for engaging with industry. The motivations for engaging with industry differ; some academics maximise commercial behaviour to support their research, whereas others collaborate with industry to develop the commercialisation potential of products and services. It is likely that both viewpoints are correct and that the accepted norms and levels of engagement vary depending on both the Institution and the individual (Boehm and Hogan, 2012; Alexander *et al.*, 2015)

### 2.2.2 *Shifting University-Industry Boundaries*

The ongoing expansion of higher education and industry ties has contributed towards profound organisation change that has shaped the work experiences of academics over the past three decades. According to some authors, academic science is transforming in response to the growth of entrepreneurial academic paradigms' that stress knowledge capitalisation (Clark, 1998; Etzkowitz *et al.*, 2000). Since the early 1990s, the UK government's policy for science and technology has called on universities to be more involved in supporting economic growth, and it has introduced a portfolio of policies to promote knowledge transfer with industry. During the same time period, some universities recognised the opportunities to commercialise research and actively sought out industry partners to generate revenue and take a more competitive approach to applied research (Henkel, 2007; Slaughter and Leslie, 1997). As a result, there has been an increase in collaboration between the

university and industry, as well as an increased emphasis from the university's perspective on using intellectual property commercialisation to generate revenue (D'Este and Patel, 2007; Siegel *et al.*, 2007).

These developments have sparked heated debates about the relationship between academic scientists and the marketplace, as well as how these relationships have evolved. These shifts have consequences particularly in terms of the increasingly blurred boundaries between science and business, and the impact this has on the norms and practices of academic scientific work (Owen-Smith and Powell, 2001; Trowler, 2001; Vallas and Lee Kleinman, 2008). Some academics see the institutional transformation favourably and applaud the growing convergence of industry and academia this shift in academic role frame has resulted in new structures for the institution to consider (Thornton and Ocasio, 2008, Kodieh and Greenwood, 2014).

Emerging structures such as 'new modes of knowledge production and engagement' demonstrate the role frame (Gibbons *et al.*, 1994). These structures bring together universities, industry, and government in a mutually beneficial relationship. Authors in this field are excited about the arrival of a new type of 'entrepreneurial scientist,' one who can combine academic research with commercial opportunities Other researchers, on the other hand, are deeply critical of universities' close ties with industry and express their concerns about the normative and institutional risks associated with academic

entrepreneurialism (Beck and Young, 2005; Hackett, 2001). Terms including 'academic capitalism' (Slaughter and Leslie, 1997) are used to describe the introduction of a profit motive into academia (Slaughter and Leslie, 1997; Slaughter and Rhoades, 2004). These critics emphasise a crisis academic scientists' role identities, a conflict of values, and the erosion of the autonomy of academics.

Despite the ongoing debate, our understanding of this "new capitalist knowledge regime" and its long-term impact on academics' scientific work has been limited by the narrow focus from an empirical perspective which has contributed toward an oversimplification of the theoretical assumptions about the change processes underlying the approach. From an empirical standpoint, much of the research has concentrated on the intellectual property regimes rather than the cognitive aspects that underpin these arrangements.

Theoretically, authors tend to see the blurring of academic and entrepreneurial boundaries as an assault on academic science, adopting an 'old institution' perspective (Beck and Young, 2005; Hackett, 2001), a perspective that will eventually be replaced by a new era of entrepreneurship within the academy (Etzkowitz *et al.*, 2000). The perspectives of 'new knowledge production' and 'academic capitalism' are both based on the assumed inevitability of the entrepreneurial university. Their analysis, on the other hand, is done at a high level of generalisation and aggregation. This approach has the potential to

obscure the complexity and the diversity of the work of the academic (Tuunainen, 2005). It also obscures the complexity of the dynamics of organisational change that enable the manifestation of contradictory institutional logics (Murray and Blackman, 2006; Smith-Doerr, 2005; Vallas and Lee Kleinman, 2008). More importantly, it fails to consider the strategic role of actors, specifically the academic entrepreneur in interpreting and shaping change.

Institutional change and reproduction are a dynamic and ongoing process in which actors and institutions interact (Barley and Tolbert, 1997, Oliver, 1991). According to Oliver (1991), individuals and organisations do not conform to institutional pressures, but rather respond positively. Oliver (1991) proposes five types of strategic responses to institutional processes, ranging from passivity to increasingly active resistance: acquiescence, compromise, avoidance, defiance, and manipulation. Institutions may also vary in their effect on behaviour, depending on how widely and deeply institutions are accepted by collective members (Tolbert and *et al.*, 1996). Furthermore, actors can adopt a variety of perspectives on the social structures in which they find themselves, as well as engage in a variety of engagement models (Hayter, 2015; Duberley *et al.*, 2006; Mouzelis, 1989).

Institutions can also change their formal policies without concomitant changes in cultural norms at the individual and organisational levels. Aldrich and Fiol (1994) distinguish between socio-political legitimacy, in which the state approves or mandates practices or rules, and cultural-cognitive legitimacy, in

which ideas are more subject to actor interpretation. Furthermore, these two component parts do not have to be congruent, as we frequently assume. A study on the focussing on academic entrepreneurship and institutionalisation in the United States by Owen-Smith and Powell (2006) found that new practices can be more or less legitimatised, and they may fail to become profoundly embedded within the organisation or the individual despite apparent formal compliance. Furthermore, the newly legitimised practices can be transformed as academics interpret and label them with new meanings based on the institutional logic of their specific schools and disciplines. According to DiMaggio (1997, p.265), institutions or cultures are "complex rule-like structures that constitute resources that can be strategically used." Murray (2006) shares an interesting example of how geneticists working in the United States resisted taking part in the institutional 'patenting' processes and, by doing this they created their own new meaning of the word to patent'. They then used their own 'patenting' approach to enhance their reputation and leveraged it further as a means to exclude unwanted commercial attention (Azoulay *et al.*, 2007). As a result, academic scientists have the ability and flexibility to resist, transform, or incorporate new practices by leveraging existing relationships and understandings (McLoughlin *et al.*, 2005).

Merton developed a set of basic science norms in 1975, which were distinguished by universalism, communism, and disinterestedness. Once socialised in peer-reviewed journals, some members of the scientific

community criticised Merton's' (1975) work for ignoring both the practical realities of scientific work and the day-to-day negotiation that occurs among scientists to secure resources to complete their work (Latour and Woolgar, 1979; Mitroff, 1974). In later research (Merton and Barber, 1963; Merton, 1976) he introduced the concept of 'sociological ambivalence,' which when is combined with Mitroff's (1974) concept of 'counter-norms,' suggests that the role of academic entrepreneur reflects a dynamic interaction between opposing orientations to dominant norms and subsidiary counter-norms. In practice, this could manifest with a scientists portraying their scientific work as applied or basic with the lines between producing and exploiting knowledge blurring depending upon the situation the academic is in. The 'sociological ambivalence' being experienced by the academic may generate internal tensions and conflicts (Hackett, 2005). However, it also serves as a valuable social device for the academic to enable them to develop for contingencies and coping strategies that they may need to fulfil their various functions. According to Mulkay (1980), sociological ambivalence provides scientists with alternative cultural resources that they can use to legitimise work boundaries and defend their positions in various contexts.

The term 'boundary work' was coined by Gieryn (1983; 1999). The term denotes the active role of academic in drawing and redrawing the boundaries of their work in order to protect and defend their autonomy and support their resource requirements to enable them to achieve their professional goals and ambitions. Gieryn (1999) emphasises the importance of scientists'

interpretative strategies in constructing a space for science in terms of preserving autonomy and increasing research resources. This exemplified the distinction between basic and applied research. The boundary was established 'when the scientific community sought to protect their academic autonomy and thus ensure that basic research remained free from government interference'. Gieryn (1983, p.789) refers to 'boundary work as an ideological style found in scientists' attempt to present their social and collective image to the external world in their struggle for autonomy and public support'.

The strategic responses of academic entrepreneurs to their changing work environment are rooted in sociology literature. This approach highlights how the academic may exploit the 'sociological ambivalence' (Merton and Barber, 1963) of their 'boundary work' (Gieryn, 1983; 1999) to negotiate and defend their roles, while at the same time seeking out the critical resources needed to achieve their objectives and goals. Ultimately, these academic entrepreneurs are active agents who seek to shape their boundaries between entrepreneurship and academia, and they have the ability to adapt to different methods of engagement spanning knowledge regimes, similar to how chameleons act in nature. While some adhere to the 'traditional' norms of basic science and resist the encroachment of commercial practices, others exhibit an 'entrepreneurial orientation' and partake in the worlds of entrepreneurship and science. Most people fall somewhere between the two polar positions of 'old' and 'new,' displaying a 'hybrid orientation,' an orientation that maps out

their strategic needs across the fuzzy boundaries of entrepreneurship and science.

### 2.2.3 *Quasi Firm*

A critical cohort is frequently overlooked as we distill the view from the Institution to the individual. The overall complexity of research teams in terms of size, skillsets, and funding is an integral part of the emerging identity of the academic entrepreneur (Adams *et al.*, 2005). Etzkowitz (1983) defines this cohort as the formation of a quasi-firm, the expansion and survival of which is primarily dependent on a senior academic or Principal investigator (PI) to coordinate research applications, recruit and build experience in the research team, manage funds, deliver research results, and develop a research group trajectory in order to create a sustainable and driven research group. The PI, as the leader of these quasi firms, demonstrates the necessary entrepreneurial skills in exchange for a larger piece of the research pie in terms of credit for the group's success (Stephan, 2008).

While the PI is considered the individual entrepreneur, their research group has several staff members who hold identifiable business-type roles. Schumpeter (1949, p 255) advises that 'the entrepreneurial function need not be embodied in a physical person and in particular in a single physical person'. This internal organisation of the research group as a research resource generates a credibility cycle (Latour and Woolgar, 1979), in which a research group works under the expertise of their research group leader to translate a desk or lab-based

innovation into an economic good, service, or process. As a result of this, the group transitions from a purely dependent to a partially self-generating group.

### 2.3 The Academic Entrepreneur

Entrepreneurship research has a tendency to focus on complex constructs such as technology commercialisation, opportunity exploitation, internationalisation, and capability development without carefully examining their micro-foundations. These micro-foundations refer to the individual attitudes, beliefs, cognitions, motivations, and behaviours that create and influence upon the macro structures and other social-economic activities of the organisation (Abell *et al.*, 2008).

If the academic is, in fact, the central actor, we must better understand the beliefs, orientations, and motivations that underpin his or her actions. The study of these micro foundations is based on the idea that economic actions emerge from entrepreneurial situations and conditions as expressions of their beliefs (Haynie *et al.*, 2010). Linking motives to actions can help us better examine why some entrepreneurs persist in their search for opportunities and ways to profit from them.

‘However, very little is known about the cognitive and social psychological processes associated with scientists reshaping their career trajectories and pursuing entrepreneurial path's (Erdem and Audretsch, 2004). According to Owen-Smith and Powell (2004), the distinction between science and

entrepreneurship is becoming increasingly blurred. According to scientists, commercial involvement has progressed from opposition to assent (Jain *et al.*, 2009).

A deeper understanding of the involvement of a key actor in the academic entrepreneurship debate—the university scientist—is missing from the majority of the conversation on academic entrepreneurship (Jain *et al.*, 2009). There has been little research on the critical actor—the academic scientist or entrepreneur. To gain a comprehensive and in-depth understanding and appreciation of the changes and challenges confronting academic entrepreneurship, the research agenda in this area must centre on the individual scientist

An understanding of the drawing and redrawing of the academic boundaries of their roles and work, an exploration of why academics engage in commercialisation activities, how they consider these to impact upon their career, and how they manage their workload, are all critical questions that underpin the entire concept of the modern entrepreneurial University. This present research intends to address this gap.

### 2.3.1 *Entrepreneurial Gestation in Academics*

Only in the last decade have academics attempted to systematically investigate the concept of entrepreneurial gestation. Using the objective and subjective dichotomy that has organised research on careers, research on entrepreneurial activity has been primarily influenced by objective factors influencing entrepreneurship (Aldrich, 1999). The objective stream focuses on the observable activities and the environmental factors that serve as a selection mechanism (Aldrich, 1999). The concept of subjectivity focuses on the factors that impact upon an individual's perceptions, attitudes, and motivations toward entrepreneurial activity. Individuals' perceptions, attitudes and motivations contain subjectivity as well as a source of regularity in behaviour that can be explained (Aldrich, 1999). Earlier research focused on identifying distinct psychological traits unique to a specific group of individuals (such as entrepreneurs); however, efforts to identify a psychological profile that would predispose or predetermine an individual to a specific activity have been fraught with inconsistent findings (Gartner, 1989). Another issue with using traits to predict entrepreneurial activity is that they are static, providing no insight into the transition processes that an individual may go through; this is especially problematic when considering the transition from academic scientist to entrepreneur. As a result, the construct of identity, and more specifically role identity, was regarded as a mechanism for investigating the academic entrepreneur (Hoang and Gimeno, 2005). As the academic assumes the role of the inventive entrepreneur within their institutional setting (Mosey and Wright,

2007), a dichotomised role identity emerges that essentially contradicts both the role of the academic and the role of the entrepreneur, such as whether they are an entrepreneurial academic or an academic entrepreneur, and what are their motivations and challenges.

### 2.3.2 *Entrepreneurial Academic or Academic Entrepreneur*

Much of the previous literature has concentrated on industry engagement as a mechanism for developing the entrepreneurial university. However, the academic is central to the changes required to be recognised as an Entrepreneurial University, and his or her role as a key actor invariably determines the University's success as an "entrepreneurial" entity (Guerrero *et al.*, 2015). From a historical standpoint, the term academic entrepreneurship has been used to encompass a diverse range of knowledge transfer activities spanning applied research to technology commercialisation (Slaughter and Leslie, 1997). The majority of the literature focused on more formalised academic entrepreneurship activities such as exploring spin-out companies, licenses, and joint ventures (Bozeman *et al.*, 2013; Miller *et al.*, 2018); however, it is becoming increasingly clear that informal knowledge transfer activities such as secondments, training, and continuing professional development can generate significant economic and societal value for academics and partners (Abreu and Grinevich, 2013; Miller *et al.*, 2018).

Miller *et al.*, 2018 identified a significant shift in academic entrepreneurial activity, with those engaging in less formal collaborative knowledge transfer

activities referred to as 'entrepreneurial academics,' and those engaging in more formal knowledge transfer activities referred to as academic entrepreneurs (Alexander *et al.*, 2015).

To improve the lucidity of research within the field, Miller *et al.*, (2018) define an entrepreneurial academic as 'an academic faculty member who adopts an entrepreneurial outlook through seeking opportunities to support their research and teaching by engaging with commercial partners in a range of collaborative and less formal models of engagements' (p.12). The authors define an academic entrepreneur 'as an academic faculty member who undertakes technology commercialisation, using formal models of engagement that capitalise on specific market opportunities' (p. 12). This study is situated in the academic entrepreneur's domain (see figure 2.1)


| CHANNELS OF KNOWLEDGE TRANSFER (C.F. ALEXANDER & CHILDE, 2013)  |                           |                           |                   |                        |            |                     |   |                             |                   |               |                   |                       |
|---|---------------------------|---------------------------|-------------------|------------------------|------------|---------------------|---|-----------------------------|-------------------|---------------|-------------------|-----------------------|
| NETWORKING  | JOINT INDUSTRY CONFERENCE | JOINT JOURNAL PUBLICATION | JOINT SUPERVISION | GRAD./STUDENT PROJECTS | SECONDMENT | EXECUTIVE EDUCATION | COLLABORATIVE RESEARCH  | CONTRACT RES. & CONSULTANCY | SHARED FACILITIES | JOINT VENTURE | PATENT & LICENSES | SPIN-OUTS & START-UPS |
| INFORMAL <span style="float: right;">DEGREE OF FORMALITY</span> FORMAL<br>  |                           |                           |                   |                        |            |                     |   |                             |                   |               |                   |                       |
| SOFTER, MORE INFORMAL, RELATIONAL, PARTNERING-STYLE ENGAGEMENT UTILISED BY<br><b>ENTREPRENEURIAL ACADEMICS</b>  |                           |                           |                   |                        |            |                     | HARDER, MORE FORMAL, TRANSACTIONAL, CONTRACTING-STYLE ENGAGEMENT UTILISED BY<br><b>ACADEMIC ENTREPRENEURS</b>   |                             |                   |               |                   |                       |
| <b>Networking</b> – groups of professionals and/or academics come together and meet face-to-face under a banner of common interest or subject discipline<br><b>Joint Conference</b> – audience of company employees and academics. Speakers are taken from both groups.<br><b>Joint Journal Publications</b> – academics and professionals develop a paper together into professional journals.<br><b>Joint Supervision</b> – academics and industrialists come together to supervise a piece of research.<br><b>Student Placements / Graduate Employment</b> - transfer of a graduate into a company partner.<br><b>Secondment</b> – member of staff is present for a period of time in another organisation.<br><b>Executive Education</b> - commercial partners keep their professional knowledge up to date with new developments delivered by academics.<br><b>Collaborative Research</b> – commercial and academic partners agree to work together to discover new knowledge or to propose solutions solving a problem. |                           |                           |                   |                        |            |                     | <b>Contract Research &amp; Consultancy</b> – a company has a problem and wishes for either: a “known” solution to be applied to their problem (consultancy); an unknown solution to be researched and then presented to the company<br><b>Shared Facilities</b> – a university and a commercial partner join together to invest in the development and operation of a facility or piece of equipment.<br><b>Joint Ventures</b> – rely on a set of legal agreements that ties a company partner and an academic with a common purpose without creating a new legal entity.<br><b>Patents and Licenses</b> – a particular piece of knowledge or know-how is protected by either an academic partner or a commercial partner.<br><b>Spin-outs</b> – University personnel join together with commercial partners to create a company. |                             |                   |               |                   |                       |

Figure 2.1: Channels of Knowledge Transfer (Miller, *et al.*, 2018)

### 2.3.3 The Motivation of Academic Entrepreneurs to Engage in Knowledge Transfer

Few studies have looked into what motivates individual academics to participate in knowledge transfer activities (Cunningham *et al.*, 2016). Given the central role that the Academic Entrepreneur holds, this is a surprising finding. Studies (Chang *et al.*, 2009; Ding and Choi, 2011) have researched individual motivations on patenting, licensing, and spin-outs, and according to the study by Lam (2010), there is a spectrum of motivating factors including

financial rewards (labelled as Gold in the study), reputational and career recognition (labelled as ribbon), and intrinsic satisfaction (labelled as puzzle in the study). According to the study, reputational and intrinsic rewards were the most important factors for engagement, with financial rewards playing a minor role. This contrasts with the findings of Perkmann *et al.*, (2013)'s study, which determined that academics engage in start-up activities for monetary gain, but it is consistent with the findings of Cunningham *et al.*, (2015)'s study of Irish Scientists, which found no evidence of motivation for pecuniary or financial gain.

Personal financial reward was discovered to be an important motivator for academic entrepreneurs once again in a study conducted by Perkmann and Walsh (2007). There is a lack of understanding of the motivations for academics to become entrepreneurs, and it is reasonable to say that as the field grows, so should our understanding of academics engaged in entrepreneurial activities. As we delve deeper into the academic entrepreneur, a consideration of their role and role identity shapes the study and the Academic Entrepreneur as a unit analysis.

## 2.4 Entrepreneurial Orientation

Many alternative perspectives of entrepreneurship have been developed by entrepreneurship scholars (Cooper and Dunkelberg, 1986; Schollhammer, 1982; Webster, 1977), which depict the differences in entrepreneurship taking factors at the individual, organisation, and environmental levels into account.

These factors have an impact on both the how and why of entrepreneurship. They are unable to reach an agreement on developing and testing entrepreneurship theories. In 1996 through the seminal work of Lumpkin and Dess, a distinction between the concept of entrepreneurship and entrepreneurial orientation was introduced. According to Lumpkin and Dess (1996), the essential act of entrepreneurship is new entry, whereas entrepreneurial orientation refers to the 'processes, practices, and decision-making activities that lead to new entry'. Such activities are central to the identity of the academic entrepreneur, they are 'purposeful enactment' (Van de Ven and Poole, 1995). A limitation of the Entrepreneurial Orientation (EO) literature lies in the level of analysis. EO is considered at the firm level and linked to organisation purpose, vision, and competitive advantage; it is also a topic that remains underexplored in public settings such as universities (Klein *et al.*, 2013; Morris *et al.*, 2011). Given the increasingly important role that universities play as knowledge producers and disseminators, examining the EO of universities is critical, especially as they seek to fulfil multiple missions of teaching, research, and entrepreneurial activities (Guerrero *et al.*, 2015) while also serving societal needs (Morris *et al.*, 2011).

#### *2.4.1 Dimensions of Entrepreneurial Orientation*

To consider the dimensions of Entrepreneurial Orientation, the study looks to Millers (1983) work. Miller posits that entrepreneurs 'engage in product marketing innovation, undertakes somewhat risky ventures, and are the first to develop proactive innovations, beating competitions to the punch' (1983,

p.771). He used the dimensions of innovativeness, risk-taking, and proactiveness to characterise and test entrepreneurship through the study. Since then, his method has been widely used (e.g., Covin and Slevin, 1989; Ginsberg, 1985; Naman and Slevin, 1993; Balasubramanian *et al.*, 2020).

Since Miller's seminal work, two additional dimensions have received attention from developing theory and empirical development: autonomous action and competitive aggression (Lumpkin and Dess, 1996). The first refers to self-determination, independence, and the freedom to exercise creativity, while the second refers to the intensity and posturing to compete with rivals and forge ahead toward commercialisation of an idea or invention.

#### 2.4.2 *Autonomy*

Autonomy, the freedom granted to individuals and organisations to exercise their creativity and champion ideas, is a common dimension spanning entrepreneurial orientation and academic entrepreneurship literature. Autonomy is a necessary impetus for an individual or a team to develop and support the creation of a new venture. The literature emphasises autonomous behaviours in two distinct contexts (Mintzberg, 1973), in the strategy-making process, where an organisational leader encourages entrepreneurship and action is taken at the leadership level and in the Irish context, this autocratic approach (Shrivastava and Grant, 1985) is becoming more visible.

In contrast, Harts (1992) generative model or the Crescive model proposed by Bourgeois and Brodwin is more central to this study and its micro lens approach to academic entrepreneurship (1984). Individual entrepreneurial activities generate ideas that are passed to other organisation levels to generate innovative outputs in the generative model. Individuals initiate entrepreneurial strategy in the Cresive model, and the impetus for new ventures occurs at the 'lower levels of the organise' (Bower, 1970). All models necessitate the ability to act independently, which is regarded as a critical aspect of entrepreneurial orientation.

#### 2.4.3 *Innovativeness*

Innovativeness is the ability to “engage in and support new ideas, novelty, experimentation and creative processes that may result in new products, services or technological processes” (Lumpkin and Dess, 1996, p.141). Individual, firm, sector, and county-level measures of innovativeness are available. According to Hage (1980), Miller and Friesen (1982), and Balasubramania *et al.*, (2020), the more professionals and specialists a firm has in engineering and science, the higher the propensity is to innovate.

#### 2.4.4 *Risk-Taking*

Entrepreneurship literature is replete with 'risk taking' as one of the main factors we associate with the term. Cantillon (1734), the founding father of entrepreneurship, argued that the deciding factor separating entrepreneurs from hired employees was the uncertainty and risk associated with

entrepreneurship (Brewer, 2002). The term "risk-taking" is synonymous with "entrepreneurship" (Adler, 2005).

It could be stated that all firms or business ventures involve some degree of risk-taking; thus, considering this orientation, we consider the degree of risk-taking from the negligible to high risk. From the perspective of an academic entrepreneur, risk-taking is still largely under-researched in the literature.

#### 2.4.5 *Pro-activeness*

Pro-activeness may be essential to entrepreneurial orientation because it implies a forward-thinking perspective accompanied by innovation (Lumpkin and Dess, 1996). Pro-activeness implies a focus on initiative activities; it is closely related to innovativeness, which was discussed earlier in this section. To better understand pro-activeness as its factor, we look to Miles and Snow (1978) and the synergies between a prospector and a pro-activeness agent. The authors state that "the prospector prime capability is that of finding and exploiting new products or market opportunities.... prospectors are frequently the creators of change in their respective industry" (Miles and Snow, 1978, p.552). Similar studies by Zahra and Pearce (1990) and Conant *et al.*, (1990) also clearly delineate the differences between these closely related factors.

#### 2.4.6 *Competitive Aggression*

Finally, when discussing EO, we talk about competitive aggression. With the risk of newness that young or new businesses face, they must take steps to

establish legitimacy, which comes from an academic institution. This liability of newness (Stinchcombe, 1965) can result in a competitive stance that is critical to the survival and success of the new entrants (Porter, 1985). Competitive aggression refers to the firm's propensity to directly and intensely challenge competitors to achieve entry. It also reflects the firm's willingness to be unconventional rather than relying solely on more traditional channels. It is an important aspect of entrepreneurial orientation because it underpins the EO of both the firm and the team driving the innovation forward.

## 2.5 Role Identity

The concept of role identity offers one approach to investigating the academic entrepreneur and the blurring of these work boundaries, including commercialisation activity. Common tenets of identity are that it is polymorphic, dynamic, influenced by many different aspects of life, and that individuals may hold multiple identities relating to different groups (Edwards and Muir, 2012, Curtin *et al.*, 2006). Central to most definitions of identity is how it is related to and similar to self and individual subjectivity (Elliott, 2009; Guo *et al.*, 2019). Identity is demonstrated as an individual's construct that changes over time; the process of change is influenced by socialisation and social experience (Ibarra, 1999; Kenney, 2017). Taking a psychological perspective, it is widely accepted that self-identity is a central component in an individual's development of intention, which leads to certain types of behaviours (Terry *et al.*, 1999). Identity allows people to orient themselves in their surroundings; it gives meaning to a person's experiences and provides

guidelines for action (Gecas, 1982). In their construction of a theory of entrepreneurial identity, Hoang and Gimeno (2005) propose that as individuals develop their identity, they take on the role associated with that identification. Jain *et al.*, (2009) define roles as social positions that carry expectations for behaviour and obligations to other actors (p. 923). The combination of these concepts emphasises the close relationship between the socially defined elements that underpin a role and an individual's interpretation of the role (McCall and Simmons, 1978). As a result, role identity as a concept can be defined as “the juxtaposition of an individual’s unique understanding of the role and the socially constructed elements that describe the role” was developed (Edwards and Muir, 2012, p. 281).

Roles guide actions in a broad sense, but they take on greater significance when they are personalised (Ibarra, 1999). As the role becomes intertwined with the individual identity, the individual's behaviour aligns itself with the role identity. Mead (1934), Hughes (1958) and Barley (1989) all recognise the relationship between role and identity constructs and have emphasised the social nature of the formation of identity and its roots in a broader societal structure (Gecas, 1982; Abreu and Grinevich, 2013).

Identity theorists have expanded on the relationship that exists between roles and identity, a crucial organising feature of society and organisations, based on this perspective (Burke and Tully, 1977). As a result, the concept of role identity

was created to reflect the interconnected relationship between the social factors that underpin a position and an individual's unique interpretations of the role (McCall and Simmons, 1966). Pratt et al (2006) investigated how individuals in the medical and banking professions often adapt to more senior roles by testing specific actions and activities to help develop their future role identities. The study also emphasises the importance of the concept of role identity in how an individual acts, behaves, and interprets their work situation. As a result, a cognitive focus on what constitutes appropriate and acceptable behaviour within one's chosen professional track is provided.

Furthermore, Pratt *et al.*, (2006) examine the formative stages of individuals and how they construct their role identity during this early stage of development. Other studies suggest that an individual's career transitions increase self-awareness, interests, and beliefs, which lead to identity changes to meet the demands of their new role (Van Maanen and Schein, 1979). These career transitions involve varying degrees of personal development in which people change their values or other aspects of their identity (Jain *et al.*, 2009; Huyghe *et al.*, 2016).

There was scepticism amongst the scientific community of this blurring of the boundary between academia and science. This was anchored in the widely accepted beliefs about what the appropriate role behaviours of academic entrepreneurs would look like, which were largely rooted in conceptions that are norms within the scientific field. Merton (1968) describes four norms that

constitute the ethos of science: universalism, communism, disinterestedness, and organised scepticism. In academia, a priority based credit system recognised scientific contributions, which further reinforced these norms. According to Social science literature (Stuart and Ding, 2006), this self-regulating community employed its own governance, and scientific norms were refined by individuals and the Institution.

In the late 1960s and '70s, as the incentive and control systems began to emerge in science (Merton, 1963; Cole and Cole, 1973; Mitroff, 1974; Latour and Woolgar, 1979), full compliance with the norms began to wane, the painful contrast between the understood norms and the actual behaviour of scientists was documented, and prior to the discovery of science and increased desire for recognition of their work inside and outside academic spheres, it was discovered that scientists could no longer be considered as uninterested participants in the research process. Following this assertion Merton (1963) spent a decade researching in the sociology of science and documented a myriad of discrepancies between actual behaviour and the idealistic norms that formed the ethos of scientific advancement.

When academic scientists began to form companies and commercialise their research, the communality aspect of Merton's norms was called into question even more. The concept of communality holds that scientific advances are the rightful property of the scientific community and are entirely opposed to property rights on scientific discovery (Merton, 1968). Merton considered this irreconcilable, he stated in response to a scientist claiming intellectual property

that “secrecy is the antithesis of this norm of full, and open communication is its enactment” Merton, 1968, p.611). Bok (1982, p.150) further supports this discourse on the subject by stating that “commercial motives can introduce a threatening form of secrecy. In order to maintain a competitive lead that could be worth large sums of money, scientists who engage in business may be tempted to withhold information until their discoveries can be further developed to a patentable state”. He further states “technology transfer is disturbing not only because it threatens the central values and ideals of academic science” (Bok, 1982, p. 142). During the 1970s, scientist disinterest was a topic of significant interest, owing to two seminal discoveries that are widely credited with launching the field of biotechnology - DNA joining and replicating (Cohen *et al.*, 1973) and antibody technologies (Kohler and Milstein, 1976). Interestingly, Stanley Cohen granted the University permission to patent his rDNA despite the strong urgings of Stanford's TTO head (Hughes, 2001).

### 2.5.1 *Constructing an Entrepreneurial Identity*

Whilst interest in the academics entrepreneurial role identity has increased in recent years (Baser and Pema, 2003; Coupè, 2004; Jain *et al.*, 2009; Sutter and Stough, 2009; Grimpe and Fier, 2010; Shi *et al.*, 2020), the critical role of the individual academic is still largely under-researched. The areas of cognitive and social-psychological processes that established academics use to reshape their careers toward entrepreneurial paths (Erdem and Audretsch, 2004; Balven *et al.*, 2018) is largely under researched. While most identity research acknowledges that role identities can change, few studies provide insight into

the individual-level forces that shape role identity development (Jain *et al.*, 2009; Pratt *et al.*, 2006; Shi *et al.*, 2020). This study provides unique insights at the individual level, as well as consider what the academic believes are the implications of managing this dual identity within their institution.

For scientists, pursuing an academic career typically entails significant investment in their specific area of research, in addition to the social and normative system that Universities have historically engaged in. Merton (1957; 1968; 1973) defines the ethos of science as an individual's immersion in such a normative system. This system is comprised of four facets, the first of which is universalism, which states that scientific observation should be independent of the observer and verifiable.

Communism, which implies that scientists disseminate their knowledge within their community for the common good. Disinterestedness refers to the fact that scientists have no ties to their work, financial or emotional, whereas organised scepticism refers to the fact that scientists must wait until all facts are known before passing judgment on a theory or concept. Those trained as university scientists typically undergo a distinct set of experiences related to the aforementioned norms, which become inextricably intertwined with their role identity, with expected outcomes including peer reviewed publications, citations, and status (Latour and Woolgar, 1979).

### 2.5.2 *Identity Roles and Values*

Participation of University scientists in commercialisation activities typically involves an evaluation of the entrepreneurial role identity and an attempt to incorporate this into their existing role identity. Given the entrenchment of the existing role identity as well as the fact that these role identities are antipodal, this is a highly complex task. Merton's work (1968, p. 273) states that 'the communism of the scientific ethos is abstractly incompatible with the definition of technology as private property in a society that is capitalist'. Similarly, the idea of passion within the role identity of the entrepreneur is primarily disassociated with the academic ideal of disinterestedness (Baum and Locke, 2004). Passion is widely regarded as the most visible and important aspect of the entrepreneurial process (Smilor, 1997). Similarly, the opposing concepts of optimism and scepticism are fundamentally opposed but must be reconciled within the entrepreneurial scientist. Furthermore, the entrepreneur strives for uniqueness, for the development of distinctive competencies, whereas the norm in academia is for universalism and the sharing of ideas and research for the good of society.

These normative inconsistencies are also evident in the processes and outcomes of both role identities. Entrepreneurs are prone to intense single-mindedness over a short period of time; such efforts usually result in the development of products and services, and ultimately profit. As stated earlier, for academic scientists, the focus is on experimentation and proofing out ideas

and theories over the longer term, such efforts are usually the result of working within a small team whose primary focus is on the expected academic outputs of academic journals, dissemination of research at conferences, and peer acceptance. Given the changing academic landscape, the shift in research funding models toward a more commercialised track, and the need to supplement central funding sources, academic scientist must reconcile some, if not all, of these inconsistencies in order to survive in the modern academic environment. While the prospect of assuming this role identity is almost necessary for the academic, it must be considered in relation to sacrificing an existing role identity that is respected, stable, and significantly different from the new one(Jain *et al.* 2009).

|           | Entrepreneurial  | Academic   |
|-----------|--|--|
| Norms     | <ul style="list-style-type: none"> <li>• Individualism</li> <li>• Private Property</li> <li>• Passion</li> <li>• Optimistic</li> </ul> | <ul style="list-style-type: none"> <li>• Universalism</li> <li>• Communism</li> <li>• Skepticism</li> <li>• Disinterestedness</li> </ul> |
| Processes | <ul style="list-style-type: none"> <li>• Focus</li> <li>• Short Term Orientation</li> <li>• Team Management</li> </ul>                 | <ul style="list-style-type: none"> <li>• Experimentation</li> <li>• Long Term Orientation</li> <li>• Individual/Small Group</li> </ul>   |
| Outputs   | <ul style="list-style-type: none"> <li>• Products</li> <li>• Services</li> <li>• Processes</li> <li>• Profit</li> </ul>                | <ul style="list-style-type: none"> <li>• Journal Papers</li> <li>• Citations</li> <li>• Peer Recognition</li> </ul>                      |

**Table 2.1: Mertonian Norms (Merton, 1973)**

Given the polarity of the norms, processes, and outputs, how does the academic reconcile their new role identity and what identity work do they engage in to embrace commercialisation activities?

What is overlooked in the concept of academic entrepreneurship is the scientist's ability to provide a valuable pool of innovation opportunities to market investors and the role of the knowledge entrepreneur in pursuing market opportunities. Rather, the focus is shifted toward the alignment of scientist's objectives with the goals of a profit-seeking firm, where the expected gains of a scientific entrepreneur are seen not only as profits in the case of firm success, but also as increased availability of funds for complementary research.

'There is a thought process that goes into a patentable discovery and it is different from making a scientific discovery ... so you think through: so I have this compound. Can I deliver it in a practical way, and what can it be used for - discovery must be taken beyond simple discovery - you must understand the use of products in order to protect the users from abuse, and also to return products back to the production stage where they were produced for further work to be done on them' (Jain *et al.*, 2009, p.927). This quotation highlights the hybridisation of the role identity that manifests inside the minds of the entrepreneurial scientist as their role modifies (West, 1987). This is demonstrated by the work of Owen-Smith and Powell (2004), as well as the work of Jain *et al* (2009). These role identities can be displayed along a continuum from a scientist in the purest sense to an entrepreneur in the purest sense (Lam, 2010). This continuum is defined by two polarised identities, which largely represent old school traditionalists and new school entrepreneurs, with

varying degrees of hybridisation represented along the continuum. Lam (2010) offers a multidimensional contrast upon which several indicators were used to determine the scientist's orientation towards entrepreneurial activity.

Traditionalists, according to Lam (2010), are delineated by a strong belief in academia and a primary focus on traditional academic-related activities and outputs. Collaboration with industry is primarily concerned with collaborative activities, research student sponsorships, and access to other resources to support their primary focus- academic research. Directly contrasting with this classification is the entrepreneurial typology, this academic scientist considers the boundaries between industry and academia as highly permeable.

This cohort believe in the importance of academic-industry collaboration for knowledge application and exploitation. Lam (2010) discovered that 17% of those sampled were classified as ' traditionalists,' while 11% were classified as entrepreneurs. The remaining 72%, or nearly three-quarters of the sample, belonged to a hybrid classification with varying degrees of dominance in terms of their science-entrepreneurial persuasion. The complexity of a university setting, discipline norms, the history of industry engagement within the Institution, and divergent pressures for research commercialisation within the discipline and the broader Institution are all reflected in these findings. The findings of the Lam (2010) study offer a valuable insight into the concept of hybrids, mainly as they are now the dominant category of academics within universities regardless of discipline. Understanding the identity work that the

academic entrepreneur engages in is critical, as they must also manage and sustain this hybrid role identity (Stryker and Serpe, 1982).

|                                  | Beliefs about academia and Industry Boundary  | Extent and modes of engagement with industry   | Main Motivating factors  | Perceived legitimacy of commercialization   | Boundary work strategies and role identities   |
|----------------------------------|---|--|--|---|--|
| Type I- Traditional              | Believes academia and industry should be distinct and pursues success strictly in the academic arena                  | Some collaborative links but of an intermittent nature   | Mainly to obtain funding for research  | <ul style="list-style-type: none"> <li>Resistance</li> <li>An assault on academic ethos and autonomy</li> </ul>                                       | <ul style="list-style-type: none"> <li>Boundary separation and expulsion</li> <li>Retain academic role identity</li> </ul>     |
| Type II- Traditional Hybrid      | Believes academic and industry should be distinct, but also recognizes the need to collaborate                        | Mainly collaborative links with intermittent involvement in some commercial activities                           | Funding for research most important  | <ul style="list-style-type: none"> <li>Accommodation</li> <li>Not desirable but an inevitable development</li> </ul>                                  | <ul style="list-style-type: none"> <li>Boundary testing and maintenance</li> <li>Protect dominant academic identity</li> </ul> |
| Type III- Entrepreneurial Hybrid | Believes in the fundamental importance of science-business collaboration but recognizes the need to maintain boundary | Continuous engagement in a range of collaborative and commercial activities                                      | Funding for research most important<br>Application of research, knowledge exchange and networking also important | <ul style="list-style-type: none"> <li>Incorporation and co-optation</li> <li>Pursue commercialization but not all its associated meanings</li> </ul> | Boundary negotiation and expansion<br>Hybrid roles but retain focal academic identity  |
| Type IV- Entrepreneurial         | Believes in the fundamental importance of science-business collaboration  | Continuous engagement in a range of collaborative and commercial activities<br>Strong commercial ties with firms | Continuous engagement in a range of collaborative activities<br>Strong commercial ties with firms                | <ul style="list-style-type: none"> <li>Acceptance and veneration</li> <li>Commercial practice embedded in work routines</li> </ul>                    | Boundary inclusion and fusion<br>Fuse dual role identities   |

Table 2.2 Classification of Academic Entrepreneurs (Lam, 2010)

### 2.5.3 Role Salience and Centrality (Role Hybridisation)

More recent studies on academic entrepreneurship have introduced the concept of identity to investigate the underlying mechanism of academic

entrepreneurship (Falck et al. 2012; Fenters et al. 2017; Jain et al. 2009). Identity theory suggests that a person's self-concept is organised into a hierarchy of role identities that correspond to their perceived position within their social structure (Fenters et al. 2017). In practice, individuals develop a collection of identities that reflect their role. Researchers including Stryker and Serpe (1994) and Murnieks et al. (2013) are increasingly recognising that the identification of individual's roles and understanding the context and sense of experience affects behaviours (Gecas, 1982, Wang et al., 2022). The concepts of role salience and centrality are separate but significant predictors of behaviour.

Identity salience focuses on the individual's readiness to act out on an identity (Gecas 1982; Stryker and Serpe 1994). The location of an identity in the salience hierarchy relative to the individual depends on the prominence of the identity, its need for support, the person's need or desire for intrinsic and extrinsic gratifications gained via its performance, and the perceived opportunities garnered from enacting the identity (Stryker and Serpe, 1994). The theory is rooted in the work of James (1890) which recognises that we have multiple selves and places a varying degree of value on each (Hoelter, 1983). Salience focuses on the probability of invocation (Stryker, 1980), which in the instance of the academic entrepreneur, is the calling forward of the entrepreneurial identity and academic entrepreneur taking deliberate action.

A contribution of Stryker (1968) found that salience of a role increases as commitment to the role which gave rise to the identity increase. Therefore, considering the academic entrepreneur as their role commitment towards entrepreneur's increases they make a decision in terms of their role identity to either commit further toward entrepreneurial activity or reduce their commitment and therefore their salience towards being entrepreneurial in a prominent manner.

The concept of identity centrality reflects the relative importance of the focal identity in one's own self. It is associated with autonomous behavioural decisions (Murnieks, Mosakowski, and Cardon, 2014). Prior research in this area suggests that individuals' commitment and centrality to different aspects of their hybrid identity vary (Callero, 1985), with some role identity facets being more central to oneself than are others. According to Jain et al., (2009), the entrepreneurial scientist will often view their hybrid role identity for both a focal academic and secondary commercial self- in essence they identify more with being an academic than being an entrepreneur. Participation in commercialisation activities represents an overlay or secondary role, with the core academic role being the role they most identified with.

The key distinction between centrality and salience is that centrality reflects the relative importance of the focal identity in one's own self-concept, which is more likely associated with autonomous decision making (Murnieks, Mosakowski, and Cardon 2014), while identity salience is the extent of an

individual's readiness to act out a target identity (Gecas 1982; Stryker and Serpe 1994). Both centrality and salience are therefore factors that activate entrepreneurial behaviour (Wang, et al. 2022).

The work of Etzkowitz et al. (2000) and Wang et al 2022 posit that academics with entrepreneurial identity centrality are more inclined to commercialise their research and attempt to acquire idiosyncratic knowledge that better enables them to recognise opportunities. Similar to the entrepreneurial identity centrality focussing on commercialisation, those with a scientific identity centrality refers to the perceptions of academic scientists in mirroring the behaviour of scientists. Thus far, the literature remains inconclusive on how academic scientists deal with both identity centralities (Mangematin et al. 2014). A scientific mind-set is often deemed incompatible with an entrepreneurial mind-set (Jain et al. 2009). The academic scientist may struggle with the decision to pursue research or the commercial pathway (Bartunek and Rynes 2014).

Furthermore, the academic scientist is enabled by the importance of technology transfers as a buffer or delegate (see Jain and George, 2007). Technology transfer offices enhance and complement the business related skills of the scientist; this delegation further enables the scientist to remain true to their focal identity while enlisting the commercial persona to counterbalance an overreliance on their entrepreneurial self. The role of the technology transfer office is to facilitate commercial knowledge through licensing inventions or other forms of intellectual property resulting from University

Research to industry (Siegel *et al.*, 2004). A strong TTO (Siegel *et al.*, 2003) acts as a boundary spanner between the University and Industry, it can also act as an identity spanner in relation to supporting the academic in maintaining a comfortable level of role identity hybridisation. Furthermore, Jain *et al.*, (2009) introduce the concept of buffering to protect and maintain their role identity. There are a variety of mechanisms that scientists use to protect their academic role identity, such as prioritising their academic work, which results in commercialisation being the last thing on their agenda. Some reduce lab time for commercial activities, while others support the right for students to publish and present their work without consideration for 'commercial gain'- this is referred to as publish or perish mind-set of academia.

The perspectives of Ebaugh (1988), Hoang and Gimeno (2005) on role identity and, more specifically, role modification differ from much of the discourse of Jain *et al.*, (2009), Siegel *et al.*, (2009). These authors suggest that instead of a modification or morphing role identity, there is a switch-like shift from one role identity to another. The focus of Jain *et al.*, (2009) preserves the past role identity while also recognising that it is future-oriented, both of which are important characteristics of the entrepreneurial scientist's role.

The concept of delegating and buffering the level of academic activity a scientist engages in represents 'proactive brakes that individuals deploy to prevent untrammelled change in their personas and reflect the nuanced and deliberate

effort that they undertake as a part of modifying their role identity' (Jain *et al.*, 2009, p. 931).

Several studies have focused on the involvement of academic scientists in commercialisation, and have evidenced that there is an increasing blurring between entrepreneurship and academic work (Owen-Smith and Powell, 2005). The role identity of an academic previously sticky by nature is changing, adapting and evolving. This is supported by Etzkowitz's (2002) work, which acknowledges that the scientist's attitude toward commercialisation has progressed from opposition to one of acceptance. The involvement of academia in any form of technology transfer activity that has the potential for commercialisation benefit (Jain *et al.*, 2009) is an essential recognition for government, particularly agencies that fund research activities.

The work of Jain *et al.*, (2009), further developed by Guo *et al.*, (2019), presents some interesting findings concerning the desire of academics to enter the entrepreneurship arena. The desire to keep their ideas and innovations alive, as well as the desire to make a larger societal impact, were critical factors shaping scientists' willingness to initiate commercialisation activities. Significantly, becoming involved in entrepreneurial activities was associated with a lack of other options rather than a desire to commercialise. The study found that a knowledgeable outsider could also make scientists aware of the commercialisation potential, providing a fortuitous path to technology transfer in this instance.

According to Jain *et al.*, (2009), university scientists are increasingly turning toward commercialisation activities for a variety of reasons, including economic, social, and fortuitous reluctant embracement, all of which suggest that their existing role identity plays a key role in framing their rationale for such participation. According to the findings of the study, non-pecuniary factors resonated with the traditional academic role identity. Such rationalisation allows these academic scientists to minimise the cognitive dissonance caused by being labelled with a role identity that is inconsistent with the identity they currently have. Being congruent in relation to the 'new role identity' suggests that a new identity is layered onto their existing one rather than a complete change in direction or abandonment of the cherished role identity of being an academic. As individuals merged their existing academic identity with their new entrepreneurial role identity (Jain *et al.*, 2009), a hybrid role emerged with the potential for further investigation.

#### 2.5.4 *Role Context and Boundary*

Gieryn (1983; 1999) coined the term boundary work to describe scientists' roles in defining and redefining the boundaries of their work. The boundaries that exist between industry and academia are markers of two distinct domains. The boundaries in both fields enable the relevant institutional member to protect their fundamental values and norms within their Institution. From the perspective of the academic scientists (or other professions), this allows them defend their autonomy as well as the security of their physical, capital, and human resources in order to pursue their professional goals. In such

circumstances, more traditional academics use the concept of basic research as a protective mechanism which preserved their 'identity; and supported their self-justification (Waterton, 2005). The purest view of academia essentially reinforces academic science's institutional logic and integrity while also retaining a strong primary role identity (Lam, 2010). Gieryn (1983) defines boundary work as the active role of the academic in drawing and redrawing the boundaries of their work. This enables them to defend their autonomy and to secure the resources they need to pursue their professional goals. This concept has been widely used (Lamont and Molnar, 2002) to examine professional demarcation problems as well as the strategies used to defend their academic work within their institutional setting.

Several studies have focused on the external socio-economic implications of the shift in boundary work, but it also has an inner cognitive dimension that relates to professional role identities (Lam, 2010). Beck and Young (2005) argue that this transformation in the relationship between academia, industry, and the state poses a significant challenge to the external conditions of the academic work as well as the core elements of the academics' professional identity. A scientist's decision to penetrate the world of entrepreneurship can challenge the comfort of these boundaries and potentially involve a role modification and inner sense-making process which can support the academic in managing multiple role identities (Pratt and Foreman, 2000; Elstak *et al.*, 2015). Furthermore, existing along a continuum where a scientist has some

entrepreneurial traits can create an ambivalent self-protection strategy (Kosmala and Herrbach, 2006) where the boundary lines are blurred and the academic scientists create a free space for autonomy. While the boundary-blurring is ongoing, marginal entrepreneurial activities allow the academic to create a provisional self (Ibarra, 1999).

Stuart and Ding (2006) focus on four determinants of individual academic scientists transitions to commercial science with contextual connotations; socialisation in graduate school, peer influence exerted across social network ties, spatial clustering of transitions driven by the presence of pro-entrepreneurship colleagues in the sciences workplace, and the differential access to social resources that facilitate entrepreneurial behaviour. In order to uncover underlying mechanisms, the authors also investigate how measures of social proximity interact with other aspects of a scientist's work context and the broader institutional environment to influence the likelihood that a scientist will become an entrepreneur (Stuart and Ding, 2006). The pathways of peer influence determines an exciting interplay between opportunity side factors and social context as two core determinates of commercial activity within the academic entrepreneur. Linking identity as a reflective journey with entrepreneurship is a complex process and connects with communities of practice and social norms. According to Warren (2004, p.25), this “provides a powerful means of exploring the dynamics of entrepreneurial transition.”

### 2.5.5 *Role Ambiguity*

Where there are ardent supporters of the Entrepreneurial University, the boundaries are no longer blurred; they are mostly invisible to the academic entrepreneur (Clark, 1998). In contrast to the traditional scientist, who defends the concept of disinterested research in order to protect and defend the boundary of the academic scientist, the academic entrepreneur develops their boundary in order to challenge institutional norms and values of academia (Guo *et al.*, 2019). Research that has no practical application or relevance is less valuable to this type of academic. The removal of the academic/entrepreneurial boundaries may also prioritise patenting over publication and financial gain, whether personal or resource based.

Studies have established that personal evaluative judgments can be different than what an individual's believes to be the broader societies' view of role identity (Sellers *et al.*, 1998). The evolutions that an individual believes society holds regarding the entrepreneurial role are referred to as public. Private regard refers to one's own positive and negative feelings about entrepreneurship. Such opinions are predominately shaped by personal experience, personal and social relationships, and awareness of the broader political and economic environment (Dutton *et al.*, 1994). Distinguishing between perceived the private and public academic can provide valuable insights as there are behavioural implications for the academic in relation to their private opinions as an entrepreneur that may not align with public opinion.

Universities' attitudes toward entrepreneurial science have shown significant variation (Louis *et al.*, 1989). According to Kenney and Goe's (2004) study of university cultures, universities such as Stanford, and the University of California, Berkeley, operate in a supportive environment for entrepreneurial scientific activity. As a result, where there is a supportive environment for entrepreneurship and existing successful entrepreneurs within a university, there is a propensity to continue this trend and commercialise. This is consistent with the adage "it is easier to follow a path than to break one". When a colleague transitions to commercial science, they can provide practical assistance, such as navigating TTO (Nathanson and Becker, 1981). Scientists' attitudes toward the practice will be influenced by their physical proximity to those who use a hybrid approach to commercialisation and science. Similar to the often-replicated study of Asch (1951), groups established a reluctance toward individuals standing against group opinion of a group even when no sanctions are imposed for those who deviate from the group consensus. Asch (1951) discovered that a small number of nonconformists from the majority greatly facilitated nonconforming behaviour. Similarly, for a scientist who is intrigued by the prospect of commercialisation but is concerned about how his or her peers will react, the presence of one or two academic entrepreneurs may alleviate concerns about the social consequences. Being proximal to academic entrepreneurs further facilitates reference group performance, resulting in individual legitimacy for the academic entrepreneur.

## 2.6 Entrepreneurial Role Identity

### 2.6.1 *Entrepreneurial Identity*

Entrepreneurial identity is defined as the individual-level identity content and structure of a person who creates a new venture (Wagenschwanz, 2020, p.64). The concept of 'who one is' helps us understand why and how individuals establish new ventures. An identity perspective is especially important in entrepreneurship because it moves us beyond rationality and towards people acting in ways that they deem appropriate for themselves. Similar to the literature on academic entrepreneurship, there are numerous inconsistencies that have impacted the field's coherence. However, it is agreed that little attention has been paid to the assumptions of identity theory, leaving ambiguity for individual agency.

Given the field's scattered approach from a theoretical and terminology standpoint, a constructive and consolidated approach to identity work would be beneficial. A common understanding of how entrepreneurs' identities can be defined, operationalised, and optimised could have implications for venture creation both inside and outside the ivory tower.

### 2.6.2 *Academic Entrepreneurial Identity*

Prior studies of academic entrepreneurs have predominately focused on entrepreneurial attributes including risk-taking, social ties, and competency development as antecedents to entrepreneurship. The psychological aspects

of academic entrepreneurship specifically how the academic entrepreneur's self-concept emerges and influences their intention to pursue entrepreneurship, remain underdeveloped (O'Kane *et al.*, 2019). The relationship between the academic entrepreneur's identity and their intention bridges the gap between conscious and actual behaviour and predicts future behaviour (Jain *et al.*, 2009, Aizen, 1991). Being an entrepreneur in any environment necessitates an entrepreneurial mind-set in order to recognise opportunities, organise and manage their resources, and create potential venture opportunities (Mangematin *et al.*, 2014, O'Kane *et al.*, 2019).

As we enter a new era of academic entrepreneurship, academics must develop their entrepreneurial identity alongside their scientific identity. This may cause conflict; being an entrepreneur and a scientist at the same time may bolster one identity at the expense of the other (Fisher, 1990, Kumar, 2010). Until now, studies have been unable to determine whether a scientist's initial identity bolsters or impedes their participation in entrepreneurship (O'Kane *et al.*, 2019; Perkmann *et al.*, 2011). While many studies highlight the role of the 'Star Scientist' in the entrepreneurial process, little is known about their conflict or paradox and how it affects their entrepreneurial engagement.

### 2.6.3 *Academic Entrepreneurial Identity Centrality and Salience*

Identity centrality (Stryker and Serpe 1994) and identity salience (Murnieks *et al.*, 2011), two concepts introduced earlier in this chapter, must also be considered when extending identity theory into the domain of academic entrepreneurship. Stryker and Serpe's 1994 study demonstrates the differences between identity salience and centrality and how they affect behaviour. Academic Entrepreneurs' identity centrality is the relative importance of the individuals primary identity in and can be associated with autonomy (Murnieks, *et.al.* 2014), whereas identity salience is the individuals readiness to act out a selected identity (Gecas 1982, Stryker and Serpe 1994). When considering the academic entrepreneur's identity, identity salience could provide a compelling explanation for why academics commercialise by developing opportunity recognition skills (Etzkowitz *et al.*, 2000, Rasmussen *et al.*, 2006). However, the literature on how academic entrepreneurs manage the duality of a scientific and entrepreneurial mind-set remains inconclusive thus far (Mangematin *et al.*, 2014; Jain *et al.*, 2009).

As such, the academic entrepreneur faces the quandary of whether to remain in academia or become an entrepreneur (Holley and Watson 2017). If one was to ask the individual to describe what defines them as a scientist or an entrepreneur, or what is most important to them, they may struggle to respond. This is due to the fact that both identity centralities and salience are highly relevant at the same time (Wang *et al.*, 2021).

## 2.7 The Paradox Frame

While there is evidence in the literature of the intertwining nature of role identity and orientation, there has also been an increase in the emphasis on the paradox frame (Waldman et al., 2019). From the perspective of academic entrepreneurs, they must maintain closeness while maintaining distance, ensure decision control while allowing for autonomy, and serve the needs of the knowledge society while considering the commercialisation secrecy required to bring a product to market.

The concept, paradox, or duality 'denotes contradictory yet interrelated elements' (Lewis, 2000; p. 760). The concept of paradox offers a framework for understanding and explaining the impact of plurality and change (Hatch and Ehrlich, 1993). A 'paradox' can denote a wide variety of contradictory yet interwoven elements including interests, practices and identities that exist simultaneous and persist over time (Lewis, 2000, Smith and Lewis 2011). Paradoxes are constructed in so far that attempts are made to sense make around intricate, ambiguous and complex worlds in which these interrelationships happen and finally paradoxes become apparent through reflection or interaction which reveal the coexistence of opposites (Westenholz, 1993, Farjorn, 2010). The underlying source of any paradox is tension; the existence of polarities. As environments become more fast paced, competitive and internationalised, and as internal organisational processes

become more complex, such contradictory demands become increasingly salient and persistent (Lewis, 2000).

As we shift focus to the individual, complexity and plurality drive belonging paradoxes, or tensions of identity. These tensions arise between the individual and the collective, as individuals (Brewer, 1991; Kreiner, Hollensbe, & Sheep, 2006) and groups seek both homogeneity and distinction. The next section of this chapter will explore how the paradox lens can be used to explore identity and orientation of the academic entrepreneur.

## 2.8 Using the Paradox Frame to consider identity and orientation

The paradox lens therefore creates a view that helps us understand the tensions across levels and phenomena. The view focuses on demands that are both contradictory and interdependent. The nature of academic entrepreneurship and the paradox of the norms, processes, and outputs (Merton, 1973) is an ideal phenomenon for more micro-level research on paradoxes in action at the level of the individual. Indeed, individuals with a paradox mind-set seek broad solutions to problems, demonstrate increased cognitive complexity, and are open to ambiguity and multiple experiences (Markus and Kitayama, 1991; Miron-Spektor et al., 2018), which are consistent with the Merton norms and the broader literature base on academic entrepreneurship. From a hybridisation standpoint, the phenomenon may contribute to a better understanding of the academic entrepreneur and their

role. This may be especially useful when considering the role of 'Professorial privilege'.

## 2.9 Conclusion

A micro-level perspective on what has primarily been considered an institutional or macro-level area of study aids in better adjudicating the competing claims and paradoxical position that exists for universities focusing on research commercialisation. These studies aid in understanding the changes occurring in the worlds of science and entrepreneurship as they collide and co-mingle within the role frame or context setting for the academic entrepreneur.

With shifts in literature and the acknowledgment that 'entrepreneurship is individually driven, you cannot force people to be entrepreneurial...or entrepreneurship results from the individual efforts of people who are keen to do it rather than a top-down push of university policy' (Philpott *et al.*, 2011, p. 166). There is a clear and urgent need to understand the individual and their central role to success in the 'Entrepreneurial University'.

Prodan and Slavec (2012), Lam (2010) and Balven *et al.*, (2018) all acknowledge that the role of the academic entrepreneur has been widely researched, with phenomena such as the triple helix, shifts in government funding models (Etzkowitz, 1983, Klofsten and Jones-Evans, 2000) in Europe, and increasingly public debates on the roles of Universities in society all contributing to a dearth

of knowledge on the entrepreneurial University. The reiteration of the institutional and broader societal perspectives on the entrepreneurial University, on the other hand, loses sight of the entrepreneurial academic, their perceptions on their institution, and their role as a catalyst for innovation.

‘Although the evolution of academia has been widely explored, different periods defined, and the related changes explained, little research has focused on the crucial actor - the academic entrepreneur (Prodan and Slavec, 2012, p. 10).

The literature review investigated the contentious concept of the entrepreneurial University by shedding light on some of its macro and micro-foundations (Jain *et al.*, 2009; Siegel *et al.*, 2009; Guo *et al.*, 2019). All of these factors result in a deeper understanding of the academic entrepreneur. Understanding the individual role identity of the academic scientist, how they manage and reconcile these vastly different role identities, and the role of the University in enabling the academic entrepreneur to engage in entrepreneurial activities are critical for understanding the organisation and societal implications of the entrepreneurial University (Siegel *et al.*, 2007).

The use of concepts spanning role identity and entrepreneurial orientation allows for a more complete and grounded understanding of the integral factor contributing to the phenomenon of the identity academic entrepreneurship. It enables us to understand the boundaries they have established to protect their

existing identity, as well as their role salience and role centrality (Stryker and Serpe, 1994), all of which contribute to who they are.

Previous studies have sought to find individual personality traits and other dispositional measures that may cultivate or predispose an individual to be more entrepreneurial, this has been largely unsuccessful (Gartner, 1989). A more promising avenue for theory development lies in explicating the role identity of the academic and its transition towards the role identity of an entrepreneur, while incorporating dynamics on sociological and external factors. Such a focus can broaden our understanding of the academic scientist and shed light on transitions typified by Jain *et al.*, (2009) and Lam (2010). Identity provides us with a dynamic construct that is inextricably linked to processes such as socialisation because it is conceptualised as a structure of meanings relating to the self and how the self-changes over times as a result of successive roles that the individual may hold (Ibarra, 1999).

This central theme of this thesis is to better understand how individuals adapt and manage transitions in a given context while taking socio and external factors into account. The study seeks to provide a deeper understanding of academic entrepreneurs' subjective experiences and related identity work in their entrepreneurial endeavors. As suggested by Etzkowitz (1989) in his studies, which primarily focus on the early 1980s, mid 1980s, and early 1990s, scientific attitudes and norms had shifted for some, which is primarily supported by the high incidence of for-profit science observed at the time of his studies. 'When I first came here, the thought of a professor trying to make

money was anathema. *Really bad form....* That changed when biotech happened' (Etzkowitz, 1998, p.829). The reshaping of science with entrepreneurial interests was established.

The next chapter introduce the context of this research study. It discusses the policies and institutional context. It frames how the research context has been shaped by the development of entrepreneurial pathways for academic entrepreneurs in addition to introducing the key agents and actors who support the entrepreneurial mission of higher educational institutions. It also introduces the case site in detail with insights provided on its staffing and technology transfer activities and outputs.

## Chapter Three – Context of the Research Study

### 3.1 Introduction

This chapter introduces the policy and institutional context of this study. It outlines the policy context of the research by giving an overview of the policies that have shaped the development of entrepreneurial pathways in Ireland and encouraged University staff to be entrepreneurial. The analysis has been sourced from reports from the government and its departments who were responsible for implementing and monitoring government initiatives shaping the islands innovation agenda. The second objective is to introduce the case of the study. By providing the study's contextual background, the 'scene is set' for what follows in subsequent chapters of the thesis.

### 3.2 The External Environment

The external environment in which the academic entrepreneurs is discussed under the following headings, the political agenda, policy initiatives, critical political stakeholders, the economic environment and funding challenges.

#### 3.2.1 *The Political Agenda*

Europe crafted an ambitious strategy to become "the most competitive and dynamic knowledge-based economy in the world" was defined in the Lisbon European Council of 2000; this strategy emphasized the need to create a supportive environment for innovation and entrepreneurship. Perhaps one of the most visible transformations is the increasing collaborations and alliances between universities and innovation actors; and thus the sharpened focus on

commercialisation and entrepreneurship (OECD 2002). The Lisbon Council and the communication of the European Commission "Innovation in a Knowledge-driven Economy" highlight the relevance of entrepreneurial and innovation activity in Europe mainly through EU Framework and Horizon 2020 Research projects.

Despite enthusiasm and increase in academic entrepreneurship activity (OECD, 2002), governments and academic institutions in some aspects still lacked the specific information needed to understand, harness and monitor entrepreneurship, specifically at the level of the individual (Wright *et al.*, 2004; HEFCE, 2004). This lack of specific information made it difficult to evaluate, analyse and learn from others in the search for what ultimately becomes best practice. From the perspective of the 'Policymaker' their interest lies in revenue generated from publicly funded intellectual property rights. This 'return on investment' approach has resulted in many countries overhauling their intellectual property policies and processes by enhancing technology transfer systems and investing in academic entrepreneurship infrastructure. In addition, anticipating the 'return on investment' to these newly generated intellectual property portfolios would be very useful for both universities and governments (OECD, 2003).

In Ireland, the government was instrumental in encouraging universities to develop their entrepreneurial capability. As part of the EU Lisbon Strategy, the

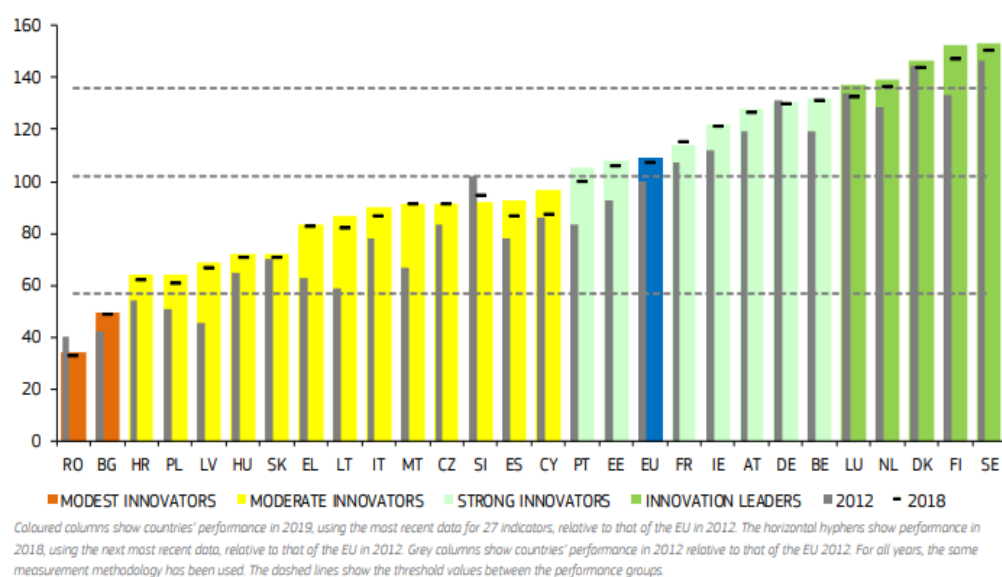
government of Ireland set a target of increasing research and development spending to 2.5% of GNP by 2013. Up until this point, overall investment in R and D had been 1.6% of GNP, which was in comparison to other countries relatively low. This shift in spend yielded positive returns and as a request Ireland became one of the top R and D growth performing countries in the OECD. The European Commission and the OECD use a suite of indicators to measure a countries performance towards building a knowledge economy, one of the most important is the R and D expenditure intensity (Department of Enterprise, Trade and Employment, 2019). This is defined as the ratio of total R and D expenditure incurred in all R and D performing sectors of the economy to overall economic activity, as measured by GNP or GDP. In 2019, Gross Expenditure on R and D (GERD) increased to an estimated €4,027m, which is its highest level in the 11 years of this time series and represents a 47.2% increase over the 2009 figure of €2,736m (Department of Enterprise, Trade and Employment, 2019).



Government Sector R&D amounted to €129.7m in 2019, a 5% increase on the previous year.

**Figure 3.1: The Research and Development Budget (R and D) 2019-2020, Department of Enterprise, Trade and Employment. (2019)**

A second key metric in determining the innovation activity of the country is patent count. The World Intellectual Property Organisation (WIPO) in their 2019 report of World Intellectual Property Indicators ranks Ireland as 29<sup>th</sup> for patents, 54<sup>th</sup> for trademarks and 51<sup>st</sup> for design intellectual property (WIPO, 2020). At the time of data collection, the EU Innovation Scorecard (2019) categorised Ireland as a 'Strong Innovator'. It ranked 10th place overall just behind 'Innovation Leaders', including Sweden, Germany, and Belgium. Ireland has a score of 122 compared to an EU average of 112. The EU report states that Ireland's strongest innovation dimensions are employment impacts, human resources and attractive research systems. Intellectual assets finance and linkages are Ireland's weakest innovation dimensions (EU Innovation Scorecard, 2019).



**Figure 3.2: Performance of EU Member States' innovation systems, Source European Innovation Scorecard 2020.**

In summary, this section has provided the underlying context for the study. Ireland as a country has focussed strategically on improving their R and D expenditure to drive innovation outputs. The following section discusses in detail the government's policy efforts to scaffold growth in innovation and entrepreneurial outputs through Higher Education Institutes.

### *3.2.2 National Policy*

Numerous reports have promoted closer links between industry and higher education institutions. These include 'Promoting Enterprise-Higher Education Relationships' (Forfás 2007), The National Strategy for Higher Education (2011) Innovation 2020 (Department of Enterprise, Trade and Employment, 2015) and Supporting Entrepreneurship and Innovation in Higher Education in Ireland (OECD, 2017). These policies all play a role in sharpening the focus on innovation and entrepreneurship and the role of the University in economic development. More recent policy directives are underpinned by decisions made because of the National Development Plan for 2000-2006, which has had a profound positive effect on public investment in science, technology and innovation and specifically the development of the Technology Transfer Initiative (TTSI) in Ireland.

### *3.2.3 Technology Transfer Strengthening Initiatives*

Prior to the year 2000 public investment in science, technology, and innovation (STI) was extremely limited, with the government spending only €500 million in this sector in a five year window from 1994-1999. Reports from the government

increasingly called for more investment focused on building the country's innovative capacity, which was eventually achieved through the National Development Plan for 2000-2006. An investment of €2.5 Billion was made to STI spending. This began the transformation of the research and innovation infrastructure in Ireland including the formation of Science Foundation Ireland (SFI), the Irish Research Council for Humanities and Social Sciences (IRCHSS), and the Irish Research Council for Science, Engineering, and Technology (IRCSET), which later merged to the Irish Research Council (IRC). At this time the stronger linkages between industry and higher education institutes (HEI's) emerged through policy as drivers of economic and competitive growth in Ireland.

Three significant reports were driving this, the Enterprise Strategy Group Report 'Ahead of the Curve' (2004) which sharpened our national focus on technology transfer, commercialisation and the cultivation of entrepreneurial culture. Again, in 2004, we saw the 'Building Ireland Economy' report published which focused on research funding as a mechanism to generate an economic return. The outcome of both reports was the launch of the Strategy for Science, Technology and Innovation in 2006, which committed €8.2 billion on Science, Technology and Innovation activity. This investment was heavily focussed on strengthening of the University's third mission activity with the view that "Ireland by 2013 will be internationally renowned for the excellence of its

research, and will be to the forefront in generating and using new knowledge for economic and social progress, within an innovation-driven culture."

The purpose of the TTSI investment was to increase the rate of commercialisation in the Irish University System. TTSI focused on developing the capability of Technology Transfer Offices, under TTSI 1(2007-2012) a budget of €30 Million was allocated to this with TTSI 2 announced in 2013 with a budget of 22.6 Million for the period 2013-2016 and TTSI 3 was announced in 2017 with a budget of €34.5 million for the period of 5 years (2021).

*At the launch of TTSI 2 John Halligan the then Minister for State at the Department of Business, Enterprise and Innovation remarked that "Innovation activities –turning good ideas into innovative products and services and ultimately jobs. This investment in the technology transfer system under the next phase of the TTSI programme will serve this objective by making it easier for companies to access the knowledge and expertise available within our research performing organisations. Today's announcement is also further evidence of the government's commitment to meet ambitious targets set in Innovation 2020, our strategy for research, development, science and technology. We want to become a global innovation leader and with the highest number in the world per capita of globally accredited Registered Technology Transfer Professionals (RTTPs) in our RPOs, we are making great progress to achieve this objective."*

During this period Enterprise Ireland, one of the main government actors in the commercialisation of research from HEI's, launched support funds for technology development, innovation partnerships, innovation vouchers, feasibility studies and commercialisation grants. In 2010, Irelands Innovation Taskforce recognising the return on investment of STI noted, "The entrepreneur and enterprise must be at the centre of our efforts...we must sharpen the focus of our national research system to target areas of potential strategic and economic advantage for Ireland". The report also recommended that the government continue to invest in creating excellent research infrastructure, which was realised in 2012 by creating the SFI Research Centres Programme. This build on previous investment in CSETS and SRC is in Ireland, and focused on making large-scale investments in crucial research priority areas, which consolidated research activities across higher education institutions. This created a critical mass of internationally leading talent in research priority areas spanning strategic locations or clusters across Ireland, which become positioned Ireland as an attractive country for industry to location and formed the building blocks for developing and nurturing productive relationships and partnerships between universities and innovation actors.

Performance data is regularly collected and compared with international trends and the initiative has been deemed a success because of the increase in invention disclosures, patent applications, licences, assignments and spin-outs.

Approximately 32% of licences from Universities went to spin-outs of HEI's, with 29% going to Irish SMEs and the balance to multinationals, showing a clear appetite of the academic entrepreneur to spin out companies through the funding instruments and supports available. During TTSI 2 critical lessons from TTSI 1 was introduced including a more efficient and flexible response to IP and more focus on regional clusters. These aspects were further enhanced during TTSI 3 with the launch of KTI Ireland (Knowledge Transfer Ireland). The mission of KTI is to support business and the research base to maximise innovation from State funded research by getting technology, ideas and expertise into the hands of industry, swiftly and efficiently for the benefit of the public and the economy and creating a national IP protocol (KTI, 2020). The protocol provides for best practice, which guides the norms for those engaging in research related activities, be they innovation actors, state research performing organisations (RPO's) or forming spin-out companies from State research. In addition to growing capacity within organisations through the TTO, this national group ensures a national approach to engagement and IP to maximise opportunities for economic growth and outputs.

The Irish Technology Transfer system has been extensively reviewed (2007-2012 and 2013-2016) in addition to an international review from 2014-2017. Across Europe, the concept of knowledge transfer has evolved from the more traditional towards a more rounded approach. Originally, knowledge transfer was considered in respect of developing an idea and monetising it. Now,

knowledge transfer involves more sophisticated concepts including co-creation, joint dissemination of research results and third party engagement from beyond the institution. There is heterogeneity in terms of the frameworks supporting national policy, legal and regulatory requirements, resources, public support, organisation and syndication of Knowledge transfer stakeholders (KTI, 2020). Ireland is likely to form part of a European response to knowledge transfer with calls in late 2019 for a European focus on knowledge transfer and indicators. However given the contextual nature of knowledge transfer within Ireland, a holistic approach will need to be taken that moves beyond the simple "benchmarking" of outputs, which could be precarious. As a country, Ireland needs due care and attention to better understand how its performance has risen in relation to innovation.

It can be summarised that Irish policy has positioned universities as engines of innovation and they are becoming increasingly critical in the nation's ability to remain competitive.

#### *3.2.4 Political Actors*

Within the Irish ecosystem, there are several statutory bodies and institutions that play significant roles within the Irish National System of Innovation. The most significant entities are the Industrial Development Authority (IDA), Enterprise Ireland, Irish Research Council, Science Foundation Ireland, Knowledge Transfer Ireland (KTI) and the Higher Education Authority.

## The Industrial Development Authority (IDA)

The Industrial Development Authority was formed in 1949 as part of the Department of Industry and Commerce and supported throughout its 70-year history by successive governments. IDA Ireland's main objective is to encourage investment into Ireland by foreign owned companies. It works as a strategic partner and provides consultancy and support services free of charge to help organisations set up and grow. Its success is measured by the impact of Foreign Direct Investment (FDI) and IDA-supported companies on the Irish economy (IDA, 2020)

## Science Foundation Ireland (SFI)

As Ireland continued to focus on commercialization and innovation, the Technology Foresight Fund was established with a budget of €646 million. Science Foundation Ireland was then established as a sub board of Forfás to provide oversight and administrative support to the fund. As an agency, SFI promotes and supports the development and competitiveness of industry, enterprise and employment in Ireland (SFI, 2020). It funds orientated basic research, research that is conducted with the expectation of the production of knowledge that can be transformed to either the background of a solution for a known problem or has potential to be useful to future problems.

It also supports applied research, which is an original investigation undertaken to acquire new knowledge and is directed primarily towards a specific practical aim or objective. The results of applied research are predominantly intended to

be valid for a single or limited number of products, operations, methods, or systems.

#### Irish Research Council (IRC)

The Irish Research Council invests in the people, skills and ideas, across all disciplines to deliver new possibilities for the future, within Ireland and beyond (IRC, 2020).

The IRC is an associate agency of the Department of Education and Skills, working under the direction of the Higher Education Authority (HEA), and has the following mandate:

- To fund excellent research within, and between, all disciplines, and in doing so to enhance Ireland's international reputation as a centre for research and learning
- To support the education and skills development of excellent individual early-stage researchers and to cultivate agile independent researchers and thinkers while offering a range of opportunities that support diverse career paths
- To enrich the pool of knowledge and expertise available for addressing Ireland's current and future needs, whether societal, cultural or economic, and to deliver for citizens through collaboration and enabling knowledge exchange with Government departments and agencies, enterprise and civic society

- To provide policy advice on postgraduate education and more general research matters to the HEA and other national and international bodies. In giving us this role, the government requested that particular attention be given to the Arts, Humanities and Social Sciences.

(Irish Research Council, 2020)

#### Enterprise Ireland (EI)

Enterprise Ireland is a governmental agency with responsibility for the development and growth of Irish firms in global markets. They collaborate and support Irish firms to grow, to innovation and to increase global and export sales for the firms. They have a suite of supports specifically for Higher Education Institutes to engage in innovation activities these span research commercialisation supports, technology transfers support systems, spin out supports, collaboration with industry and connectivity to EU programmes and Networks.

#### Knowledge Transfer Ireland (KTI)

Knowledge Transfer Ireland (KTI) is the national office that helps businesses to benefit from access to Irish expertise and technology by making it simple to connect and engage with the research base in Ireland. (KTI, 2020)

The organisations is focused on harnessing regional perspectives to create a single national perspective on the knowledge transfer for Ireland. KTI works with businesses, investors, universities, Institutes of Technology, State research organisations, research funders and government agencies to maximise State-funded technology, ideas and expertise getting into the hands of businesses to drive innovation (KTI, 2020). The agency is based in Enterprise Ireland and co-funded by the Higher Education Authority.

#### Higher Education Authority (HEA)

The HEA leads the strategic development of the Irish higher education and research landscape. The core mission of the HEA is to create and support a coherent system of diverse academic institutions all with distinctive missions that are responsive to the cultural, social and economic developments of Ireland and its talent.

At the central government level, the HEA has statutory responsibility for regulatory and governance aspects of all higher education institutions and the higher education system (HEA, 2020). Their objectives span the enhancement of teaching and learning, the promotion of equity of access to higher education, and the enhancement of institutions' responsiveness to the needs of broader society, research capacity building, and the internationalisation of Irish higher education (HEA, 2020).

### 3.2.5 *The Triple Helix*

This section reintroduces the Triple Helix paradigm first presented in the literature review chapter. The triple helix model denotes the relationship of the University, the state and industry, and internal transformations within each of these spheres (Etzkowitz and Leydesdorff, 2000). The case site university has transformed from a teaching institution to an institution that combines teaching with research towards an institution that teaches, researches and contributes to economic development at regional and national levels. There are however still tensions between these activities, for some institutes they co-exist in a more or less compatible relationship with each other for others their academic posture lacks flexibility and their concession may simply be a ceremonial adoption of the third mission rather than a dedicated focus and engagement in innovation.

Within the helix there are four processes related to the major change in the production, exchange and use of knowledge (Etzkowitz *et al.*, 2000). The first process relates to the internal transformations that take place within each of the helices. Such transformations can be the development of ties between companies within the industry sphere of the helix. The second relates to the influence of the helices on one another. An example given by Etzkowitz *et al.*, (2000) is that of the governments in both Sweden and the US responding to suggested changes regarding intellectual property ownership so that IP rights transfer from individuals or government to the universities. The third is the

creation of trilateral linkages between the helices. This includes the development of networks and organizations, contributing to regional cohesion and the stimulation of organizational creativity and receptivity. Such interaction leads to new idea generation and joint projects, some of which may not have emerged from interaction at single helices or double helix levels.

In the Irish context knowledge has been a critical driver of economic development (Cunningham and Harney, 2006) with universities central to this evolution to the knowledge economy through their interactions within the triple helix model. Reports including the national strategy document for higher education to 2030 (the Hunt report), Innovation 2020 and earlier publications including SSTI 2006 have worked to drive the Triplex Helix agenda across Ireland and position the country as innovative, agile and entrepreneurial to Foreign Direct Investment, European Commission Funds and as a mechanism to attract and retain talent vital to further enhancing and positioning Ireland in this regard.

This section has considered the Irish Higher Education landscape and the positioning of Ireland as a country that leverages the Triple Helix Model to enhance innovation and engagement between key actors of government, academia and industry.

### 3.2.6 *The Funding Landscape*

The research and innovation funding landscape has shifted significantly since the early 2000s. Agencies including Science Foundation Ireland have sharpened their focus on innovation outputs. Perhaps the most significant call in Ireland's history 'The Disruptive Technology Fund' (DTIF) has demonstrated Ireland's commitment to innovation across higher education. The Disruptive Technologies Innovation Fund (DTIF) is a €500 million fund established under Project Ireland 2040. It is one of four funds in the National Development Plan 2018-2027(Enterprise Ireland, 2020). Its purpose is to drive collaboration between Ireland's higher education research base and industry and facilitate enterprises to compete directly for funding to support the development and deployment of disruptive and innovative technologies with a commercial focus. These technologies should alter markets, alter the way business operates and involve new products or the emergence of new business models (Enterprise Ireland, 2020).

Ireland is paving a way forward for innovation in higher education institutions, which has been discussed thus far in this chapter. The objective was to present the complex, challenging environments in which the Irish HEI and the academic entrepreneur operate.

### 3.2.7 *The Case in the Context of the Irish HEI Landscape*

Within the Irish Higher Education System, all Technology Transfer Offices have relatively homogenous structures. Each has a TTO Director and

commercialisation specialist roles, generally at senior administrative grade. The breakdown of roles is predominately in two key areas, life sciences, ICT, and informatics. Some have more specialist roles increasingly focussing on climate and the environment and the creative sectors. All HEI's have an institutional role supporting spin-outs and incubation with the majority reporting directly into the Office of the Vice President for Research (or similarly titled Vice Presidents role). Most are contractually aligned to the TTSI funding and are primarily funded by this funding instrument with supplemental funding secured through other grant income or the University. Some sites host an Enterprise Ireland staff member on their campus. The primary services offered by technology transfer offices range from soft to hard activities. Hard activities include the identification and protection of intellectual property, the commercialisation of intellectual property and technologies, negotiation of intellectual property terms in contracts(including NDA's and MTA's), working with development agencies to enhance the competitiveness of on campus companies and the provision of business expertise to on campus clients. From a soft skills perspective the offices provide support in terms of communication and collaboration with industry, provide policy advice, train and run workshops across areas including marketing, pitching and how to commercialise and support a culture of innovation.

Some Technology Transfer Offices provide additional support to Institutes of Technology within their regions. An example is Ignite West. Ignite West

Consortium is a collaboration with Universities and Institutes of Technologies in the region. Enterprise Ireland and Knowledge Transfer Ireland fund it. The National University of Ireland (NUI Galway), Galway Mayo Institute of Technology (GMIT), the Institute of Technology, Sligo (IT Sligo) and Letterkenny Institute of Technology (LIT) are partners in the Ignite West Consortium. Joint initiatives and open communication enable a better service offering to the academic community across these academic sites and allows for a more standardised approach to enterprise engagement and technology transfer.

### 3.3 The Higher Education Institute

#### 3.3.1 *Overview of the Academic Institution*

NUI Galway is the research site for this study. It is an Irish University founded in the mid-nineteenth century. It is a medium sized, multidisciplinary, strongly research oriented institution, and during the period of data collection was ranked 238 in the world by the QS university ranking system. It is a mature entrepreneurial site that has engaged in entrepreneurial activities for over 20 years. Approximately 20,000 students attend the University, and the organisation employs 2,317 staff.

| Staff By Category of Post                       |     |
|---|-----|
| Academic Staff                                  | 788 |
| Professional Services Staff                     | 765 |
| Research Staff                                  | 655 |
| Research/Specialist<br>Professional/Management* | 109 |

|   |
|---|
| * Non-core grant funded research and specialist posts. These may include posts funded from both Exchequer and Non-Exchequer resources |
|---|

**Table 3.1: University Staff FTE's HEA (2019)**

At the time of the data collection phase of this study, the University had five Colleges, the College of Arts, Social Sciences and Celtic Studies, The College of Science, The College of Engineering and Informatics, The College of Medicine, Nursing and Health Sciences and the College of Business, Public Policy and Law. The University has formal partnership agreements with Hospitals in the region in addition to industries spanning medical technologies, pharmaceuticals and the creative sectors. This sectoral mix is reflected in the University's strategic priorities, which focus on the development of the following thematic areas:

- Biomedical science and engineering
- Informatics, physical, and computational sciences
- Environment, marine, and energy
- Applied social sciences and public policy
- Humanities in context

University policy also places much emphasis on its contribution to regional development, with the 2020 Strategic plan stating that the University 'will work in partnership with business, industry and government to provide the graduates, skills, knowledge and innovation that drive entrepreneurialism, employment and growth in our region' (2020). Additionally, the University has committed to developing an innovation district within the city to act as a

primary driver of the urban regeneration of the city and county. The Strategic Plan also acknowledges the significant role of culture and creativity in the region and its role as a central actor.

The region is considered a global hub for the medical technology industry. Eight of the world's top ten med-tech companies are located there, in addition to a significant number of spin-outs and start-up companies. Within the institution approximately 400 scientists are working specifically in the area of Life Sciences supporting, nurturing and contributing to the medical technologies domain.

### 3.3.2 Unit supports and Structures

At the micro level there are 31 units of analysis within this study. All 31 are located in a unit with facilities and expertise to exploit commercial opportunities. The units of analysis span 3 Colleges, the College of Science, the College of Medicine, Nursing and Health Sciences and the College of Engineering. 25 of the academic entrepreneurs are located in or have full access to a lab facility. The labs range from wet to dry lab in terms of facilities and have co-working spaces attached.

| Academic Unit | Facilities Available  | No of Academic s | Centres of Excellence   |
|---------------|---|------------------|---|
| Engineering   | Fabrication Lab<br>Cell Culture, Biology and Histology Lab<br>Imaging Labs<br>Mechanical Testing Labs<br>Living Labs<br>Odour and Gas Labs<br>Mobile Remote and Monitoring Control Labs<br>WRF Water Labs | 16               | SFI Cúram<br>SFI Insight<br>SFI Vista Milk<br>SFI Lero<br>SFI MaREI |

|  |   |    |                       |
|--|---|----|-----------------------|
|  | Computation Labs<br>Machine Learning Labs<br>Medical Informatics Lab<br>Performance Engineering Labs<br>System Dynamics Lab<br>Prototyping Lab  |    |                       |
| Medicine,<br>Nursing<br>and Health<br>Sciences | Translational Research Lab<br>Clinical Trials Labs<br>TMD Commercial Lab<br>Medical Simulation Labs<br>Biomaterials and Drug Delivery<br>Tissue Engineering and Regenerative<br>Medicine<br>Device Design Lab | 5  | SFI Cúram             |
| Science  | Organic Lab Suite<br>Inorganic Lab Suite<br>Physical Chemistry Lab Suite<br>Photonics and Imaging Labs<br>Astronomy Lab<br>Atmospheric and Environmental Physics Lab<br>Glycoscience Lab                      | 10 | SFI Cúram<br>SFI ICRA |

**Table 3.2: Summary of Facilities by College Support Innovation**

17 of the academic entrepreneurs are currently affiliated with a Science Foundation Ireland Research Centre. Research Centres are focussed on the consolidation of research activities across higher education institutes to create a critical mass of internationally leading researchers in strategic areas, which become a key attractant to industry and lay the foundation for effective and productive academic and industrial partnerships. The centres are international beacons for attracting talent and leveraging other funding to focus on industry and society. Centres are resourced with commercial and industry liaison experts with a view to creating innovative and entrepreneurial graduates, to spin out new high-technology start-up companies that have the potential to raise external angel or venture funding and to transfer technology through licences, to Multinational Companies (MNCs) and Small and Medium Enterprises (SMEs) based in Ireland. Within 2 of the centre's staff have been

trained in the SFI I-Corps programme to support and develop innovative capacity. This is all in addition to the technology transfer supports discussed in sections 3.3.3

### 3.3.3 *The Technology Transfer Office*

In the University, setting the concept of UITT (University Industry Technology Transfer) is a process where 'technologies originate in University and are ultimately used by industry (Siegel *et al.*, 2004; p 118). Siegel contends that stakeholders within this process are: (1) university scientists who create and discover new technologies, (2) university technology transfer who liaise between industry and the university scientist, (3) industries who seek to commercialize University based discoveries and technologies and (4) the State, which contributes to or funds research projects.

The primary focus of the technology transfer office is to safeguard the University's intellectual property while marketing that intellectual property to industry. While the motives of the academics have been mentioned throughout the literature review, industry motives are far more straightforward- they seek to commercialise for financial gain and profitmaking. Diversity in the motivations, identities, and cultures of the critical stakeholders underscore the importance of technology transfer experts in building bridges between these stakeholders to overcome barriers concerning the transition from discovery to innovation. Dougherty (1992) refers to these through worlds

with different languages, organisational routines and norms all impeding technology transfer. In this regard, the boundary spanning (Katz and Tushman, 1983; Tushman, 1977) plays a critical role within the University in transmitting ideas and information to distinctly different environments. The boundary spanner is a network builder, a multi linguistic communicator who bridges the gaps between the scientist and industry to protect the University interest whilst meeting the demanding needs of industry engagement. They must possess the ability to explore internal opportunities within the University setting while exploiting external markets to create mutually beneficial alliances (Tushman, O'Reilly III, 2004).

Prior to 2005, the case site had a small Industrial Liaison Office tasked with industry engagement with two staff members. In late 2005, a Technology Transfer Office (TTO) was established; this was a direct result of the introduction of TTSL 1 through Enterprise Ireland and an internal review of intellectual property by the institution. Both resulted in the institution formally engaging in the commercialisation of research through the TTO whose mission was "To be an international leader in the commercialisation of research and other knowledge-intensive activity for the benefit of (case university), the economy, and society."

| Type of Output     | Number |
|--------------------|--------|
| Licence Agreements | 206    |
| Patents            | 111    |
| Spin Out Companies | 31     |

**Table 3.3: Summary of Technology Transfer Outputs from HEI**

This study runs through TTSI I, II and the early stages of TTSI III. A summary of Technology Transfer Outputs (2016/2020) is included at table 3.1. Spin out and licence numbers are the 2<sup>nd</sup> highest ranking in Ireland during this period. Both measures are the key performance indicators of entrepreneurial engagement by Academic Entrepreneurs. The propensity for 'spinning out' or 'licensing' to create entrepreneurial outputs is slow and deliberate. The portfolio of spin-outs and licenses is primarily in the medical devices space, which takes a minimum of 10 years to reach any level of maturity. Most do not spin-out from the University until they are at least 3-4 years post commercialisation fund.

Since 2005, Ireland has seen an intense political focus on entrepreneurship and innovation in the higher education sector, reflected in national policy documents, strategic plans of Universities, and in more recent years, the increase in funding instruments aligned to commercial and innovative outcomes from Higher Education Institutions.

In the case site, the TTO within institutions is the primary agent in supporting the delivery of the third mission of Universities. The case site TTO aims to provide a broad spectrum of supports and services to entrepreneurially oriented researchers. The TTO is located on campus and occupies a space shared with the University business incubation centre. Additionally, one Science Foundation Ireland Centre is located on campus. The Centre focuses on

medical technologies and researchers including digital research, marine renewable energy, software engineering, pharmaceuticals and the digitisation of dairy production and processing support another 8 Centres. As SFI Centres develop and mature, there has been a sharpened focus on commercialisation and increasing the technology readiness levels of projects (TRL's).

Although in recent years, a policy shift in SFI has resulted in this sharpened focus on commercialisation. Enterprise Ireland is still acknowledged as the critical funding source to support entrepreneurship for academics (Innovation Strategy, 2010). The primary funding sources offered by Enterprise Ireland are summarised below:

| Financial Supports Available For Entrepreneurship Available to HEI |   |                               |
|--|---|-------------------------------|
| Enterprise Ireland Commercialisation Fund Feasibility Award        | Commercialisation Fund Feasibility award is designed to provide researchers with the ability to validate the commercial opportunity for their technology. Researchers can access a grant to procure an independent industry expert consultant to conduct a market opportunity assessment and explore potential routes to commercialisation for their technology | €15,000                       |
| Enterprise Ireland Commercialisation Fund                          | The Commercialisation Fund award grant provides third-level researchers with the support required to transform commercially relevant research into investable high potential start-ups. Significant funding will allow researchers to develop, build and validate their technology technically and commercially using a tailored development plan.              | €80,000-€500,000(staged fund) |

**Table 3.4: Enterprise Ireland Commercialisation Funding Instruments for Higher Education institutions**

In addition to funding provided through Enterprise Ireland, the case TTO also provides access to finance through a range of networks and linkages, internal accelerator programmes, business angels, the Local Enterprise Office supports, the regional development commission, as well as private and venture capitalists.

Finally, the University has established an explicit policy framework concerning the administration of IP and associated revenues, last updated in September 2019 and due for review in September 2023. This policy was created for 'the effective management of Intellectual Property created by University Personnel, including working with any other entity' (NUI Galway, 2020). It establishes the rules that govern disclosure, ownership, protection, and commercialisation of University Intellectual Property. The policy also provides for how income will be distributed that arises from the commercialisation of IP from the University.

Universities in the Irish context represent fertile territory for the exploration of academic entrepreneurship. The case institution has for over 20 years engaged with the commercialisation of research and has a policy and practice structure in place to support its continued development.

As a phenomenon, the institution has a strong research orientation, coupling this orientation with a commercialisation focus align with the entrepreneurial paradigms put forward by authors including Etzkowitz (2011); Siegel (2007); Jain *et al.* (2009).

In addition to staff supports, the University has several student entrepreneurship supports on campus. These include curricular, co-curricular and extra-curricular initiatives spanning first year undergraduate to Ph.D. level.

The institution has been acknowledged nationally and internationally through awards including teaching awards for excellence in entrepreneurship and student entrepreneur of the year awards from Enterprise Ireland and the Ireland Funds.

This section of the chapter has introduced the case site and outlined the various supports and structures available to staff and students to support and cultivate entrepreneurship.

### 3.4 Conclusion

To conclude, this chapter has outlined the critical contextual elements that position this study's research agenda. The chapter focussed on the national landscape and the significant transformation that Ireland as a country has undertaken in relation to its innovation capacity. The analysis was sourced from government reports and policy documents.

The chapter then focussed on the research site to present a collective description of the academic units of the institution, its technology transfer activities and finally positioned the case in the context of other HEI's in Ireland. The next chapter of the study focuses on the study's research strategy and methodology that underpins the research approach of this study.

## Chapter Four – Research Strategy and Methodology

### 4.1 Introduction

This chapter introduces the research design, including the epistemological stance and ontological position of the study. The research methodology is presented with discussions regarding the research strategy utilised to conduct the study. The rationale for the research strategy and approach, the limitations associated with this approach and the consideration of other approaches are also discussed. The processes used to gather, analyse and interpret data is outlined. The chapter then outlines the ethical considerations of the research study. Finally, the chapter concludes with a chapter summary.

This chapter explains the research philosophy and its link to this study's research question and research methodology. The research presented is an ontologically interpretivist study and the research was approached with a critical realist epistemology.

The research strategy is qualitative and inductive, drawing on semi-structured phenomenological interviews to research academic entrepreneurs' lived experiences in a single site case study. The case was coded using Nvivo and the interpretation of the coding created the final assessment as to how entrepreneurial academics manage their role identity. This pluralist approach to the research study balances critical realism, human agency and existing

social structures. This study seeks to set out a credible and feasible explanation of the typologies of academic entrepreneurs in a mature university site. The study required a pluralist approach which offers a high degree of contextualisation without sacrificing causal explanation (Welch, *et al.*, 2011). This entailed evaluating and staying close to the theories described earlier in this thesis, evaluating segments of coding for a particular proximity objective in the single case-the academic entrepreneur, but also re-examining the content of all of these segments in order to arrive at a final qualitative interpretation of the extent of proximity on the case in relation to the overarching research question. As part of this step, findings across the units of analysis are compared using cross-case analysis.

#### 4.2 Ontology, Epistemology and the Paradigms

When researching the social sciences, the underlying epistemological, ontological, and methodological frameworks upon which the research study should be based need to be considered. Ontology is concerned with the nature of existence and answers whether reality exists objectively and external to perception or whether it is a phenomenon generated subjectively. Epistemology addresses the question of what can be known, how knowledge is obtained, and what the sufficient conditions of knowledge are (Saunders, 2012). From both our epistemological and ontological assumptions, methodology, or the means through which knowledge is pursued emerges. Therefore, the research design adopted to pursue a research question is underpinned by philosophical assumptions about both the nature of knowledge

and reality itself (Saunders, 2012). How one perceives the development of knowledge is ultimately reflected in the research philosophy, which guides our investigation of the world around us.

There are two dominant philosophies in the social sciences, positivist and interpretivist. The positivist paradigm is concerned with an objective reality that is measurable and external to our interpretation (Bhaskar, 2014). Positivist research therefore engages quantitative methodology, which detaches the researcher from the subject of inquiry. This philosophical stance is guided by deductive hypotheses testing. Through objective testing of these hypotheses through quantitative methods, this research philosophy seeks to discover the natural laws underpinning the known world's causal effects (Sekaran and Bougie, 2016).

The second philosophical perspective is that of the interpretivist. This study is situated in the interpretivist paradigm. Keyword associations with this philosophy are participation, collaboration and engagement (Henning *et al.*, 2004). Taking an interpretive perspective, the researcher is considered to be a participant-observer who engages in the activities and interprets the meaning of actions within a social context. Social science through the interpretive lens is driven by curiosity and exploration. This lens gives the researcher greater scope to address the issues of impact and influence. It focuses the researcher on asking questions such as 'why' and 'how' particular identities are formed,

managed and modified (Deetz, 1996). These are two aspects that are central questions for this study. Walsham (1993) asserts that the interpretive approach aims to produce a greater understanding of the context and the process whereby role identity influences and is influenced or shaped by its surroundings. As the emphasis of this study is on the socially constructed nature of reality, the environment has to be created in such a manner that there is an intimate relationship between the researcher, the unit of analysis and the context in which it is being studied (Attride-Stirling, 2001). The newly emerging role identity and academic entrepreneurship field is an excellent research 'fit' for this approach given their underdevelopment and need for further exploration and understanding.

This philosophy adopts an orientation towards meaning rather than measurement and incorporates meaning orientated methodologies, which may include interviewing or participant observation. This perspective does not predetermine variables; it focuses on the deeply complex aspects of human sense-making as situations unfold (Sandelowski, 1986) it includes the subjective thoughts and ideas that underpin human behaviour and how they must be considered (Merton, 1995) and provides the philosophical backdrop of this study.

The interpretivist paradigm, specifically looking at studies such as those of Geertz (1973), looks at a specific situation that is often changing and fluid and

looks at how humans make sense of it and understand it (Roth and Metha 2002). The essence of the interpretivist approach is that we can only know reality through the social constructs of the mind and therefore do not look towards the rules of the natural world for explanation (Eliaeson, 2002). As an interpretivist, we penetrate the 'frames of meaning used by social actors' (Blaikie, 1993, p.96).

The intellectual heritage of the interpretivist philosophy can be traced to the 19<sup>th</sup> century and include writings by Husserl and Weber (Mertens, 2005). Weber focussed on human action, or as they are more commonly known hermeneutics (Mertens, 2005). Husserl focused on the relationship between the object and the knower. Husserl's phenomenology frames reality through our lived experiences as it does not consider reality as existing separate from our lived experiences. Interpretivist enquiry underpins the phenomenological method of enquiry. It supports the existence of multiple realities which are constructed by persons lived experience (Lavery, 2003).

#### 4.3 Inductive, Abductive and Deductive Approaches

Positivism is inherently deductive. Positivism commences with the application of a theoretical statement that is then applied to a specific situation (Mertens, 2005). Deductive reasoning determines whether or not the statement is true. By contrast, inductive reasoning typically interpretivist, observations are codified and as evidence builds and patterns and relationships emerge, it can lead to generalised theories and conclusions (Huff, 2009).

Those working in the deductive research space focus on causality, whilst inductivism as evidenced through this thesis focuses on exploring new phenomena or considering different perspectives on the specific phenomenon. Eisenhardt (1989) states that inductive research builds theory from cases to produce new knowledge. Deductive theory testing completes this cycle using data to test and validate theory. Deductive therefore moves from the general to the specific, with inductive moving from the specific to the general.

This study is inductive. It focuses on development an understanding of how individuals interpret their world and context and how these are inseparable from the individual. The characteristics of inductive research as defined by Glaser, Strauss and Strutzel (1968) are that the researcher builds theory on data, continuously focusing on comparison, posing theoretical questions to challenge the data, theoretical coding and finally, theoretical development. Descriptions that are produced by inductive research are limited in time and space. They are neither universal or generalisable (Mertens, 2005; Blaikie, 2015). Therefore, as discussed later in this study, this bears the responsibility of discussing the limits of generalisability (Whetten, 1989).

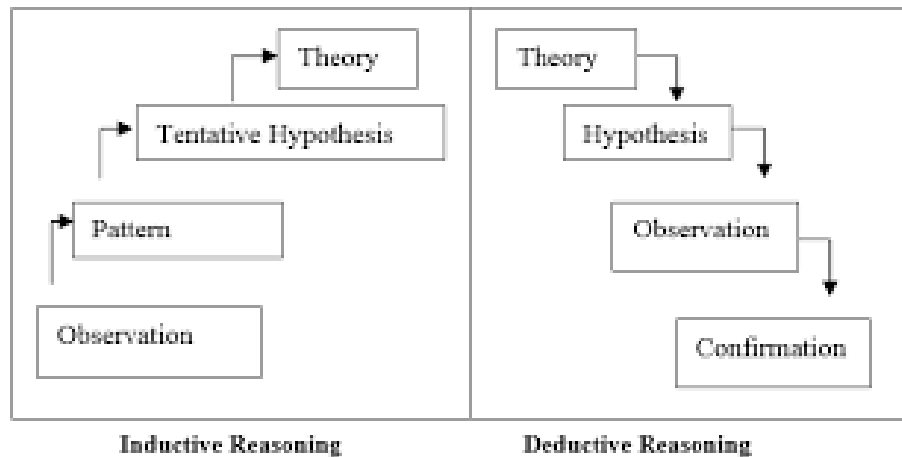


Figure 4.1: Induction and Deductive Reasoning, Bell, Bryman and Harley (2018)

Abductive research takes both an inductive and deductive approach to research enquiry. However, unlike the inductive and deductive approaches, Abductive research can explain, develop or change the theoretical framework at any stage of the research process. It is considered to offer a pragmatic approach to advancing social sciences research.

Unlike inductive and deductive reasoning, abductive research can explain, develop or change the theoretical framework before, during or after the research process. Accordingly, abductive reasoning consists of a pragmatic approach to advancing the social sciences through a process of "systematic combining" in academic research.

#### 4.4 Critical Realism

Critical realism is described by Mingers (2006, p.203) as "a sophisticated philosophical position that aims to develop a middle way between empiricism, which defines science very narrowly in terms of empirically observable and

measurable events, and the many forms of conventionalism or interpretivist which highlight the limitations on our knowledge of the world and then thereby to diminish the reality of the world itself". The philosophical position asserts the existence of a real-world, which is considered to be independent of our knowledge of it. Reality is considered to be "stratified into three domains; the real, the actual and the empirical". (Mingers, 2006, p.205).

The real is consisted of structures of behaviours and objects which are labelled as mechanisms (Mingers, 2006). These mechanisms have causal tendencies and the interplay of mechanisms can lead to the presence or absence of events, referred to as the actual (Bhaskar, 1979, Mingers, 2006). The empirical realm is where the events are either not observable or observable (Dobson 2001; Sayer 2008). As the research area put forward in this study is underdeveloped, there is a degree of logic in adopting 'a middle way' to investigate this phenomenon (Mingers, 2006). A critical realist-based research project can bring a new perspective to explore the link between academic entrepreneurship and role identity as it considers both the empirical and qualitative investigative positions. Critical realism also provides a new perspective as its primary focus is on explanation, understanding and interpretation to generate theories which 'cannot be predictive and so must be exclusively explanatory' (Bhaskar 1979 p. 27).

#### 4.5 Critical Realism and Phenomenological Research

Phenomenological research is anchored within the interpretive paradigm (Burrell and Morgan, 1979). It is defined as 'the understanding of phenomena (Pettit, 1969). Phenomenological research is focussed on uncovering the essence of a phenomenon from individuals' lived experiences to understand the meaning that individuals assign to these lived experiences (Guba and Lincoln, 1994). Understanding the lived experience is central to phenomenology. Hammond *et al.* (1991, p.1) defines it as 'the description of things as one experiences them or of ones experiences of things'. Knowledge resides with and is relative to the individual knower. Therefore a researcher with a critical realist epistemology gain, from people, a rich and deeply personal perspective on events that they have lived or experienced (Bogdan and Taylor, 1975). Using this research approach offers the view that reality is subjectively experienced and cannot be scientifically measured.

As discussed earlier in this chapter, Edmund Husserl introduced phenomenology as a philosophical tradition with research and writings being extended through Alfred Schutz and Martin Heidegger. Heddiger's work was mainstreamed through the influential works of Sarte, Abebresse and Vandenberg. A common thread in phenomenological research is the choice of the human science model of understanding the lived experience. This study looks specifically to the phenomenological philosophy of Husserl from a theoretical and methodological perspective.

The key thematics of phenomenology can be summarised as:

- Presuppositionless, defined by Husserl as the lived experience requiring the suspension of all cultural, scientific and frequently held assumptions. This is evidenced through the use of bracketing by Husserl which is also known as phenomenological epoche.
- A change from the natural to a phenomenological attitude to meeting the expected perfection of an object and the subjective way of experiencing it (noema and noesis)(Mingers, 2006)
- The lived world experience or as referred to by Husserl the 'Lebenswelt'. The term is used to describe how we understand and derive meaning from the world. Bogdan and Taylor (1975) assert that this is an attempt to see things for the other person's perspective.
- Husserl defines the term noesis and noema to show the relationship between intentionality as the whole meaning of what is expected (noema) and the mode of experiencing (noesis) (Mingers, 2006; Sanders, 1982).

Husserl (Bogdan and Taylor, 1975) asserted that the main of phenomenology was to capture how people live. To provide rich narrative descriptive with contextual understanding and their interpretation. Roberts (2014) and Cope (2001) advocate for the field of entrepreneurship benefiting from new perspectives as introduced by phenomenological research to the field of entrepreneurship. Despite the methodological capability of this approach to bridge theory and the lived experience, there are few studies in the field taking

this approach to uncover new theoretical concepts. The approach demonstrates the importance and value of the phenomenological approach in relation to providing valuable insights into how individual live and understand the phenomena being explored (Thompson *et al.*, 1989). In summary, this ontologically interpretivist study looks to critical realism and phenomenology to answer the research question and sub-questions. The blending of critical realism and phenomenology has potential for this study and its application into the academic entrepreneur and their role identity, which is impacted by their human agency. The following sections introduces the study's research strategy.

#### 4.6 Research Strategy

The research strategy is connected to the research paradigm and answering the research questions of the study (Blaikie, 2010). This research is inherently inductive and focussed on the lived experience of the academic entrepreneur.

##### 4.6.1 Data Collection

A qualitative approach was identified as best suited to the aims of this study. An understanding of the role identity of entrepreneurial academics in the university is at best incomplete. As such, theory-building investigations concerning this study are consistent with Eisenhardt's (1989) criteria for utilising a qualitative methodology. Markman *et al.*, (2008) suggest that such theory-building approaches are much needed in the relatively embryonic field of university-based entrepreneurship. This position is supported by recognition in the broader field of entrepreneurial scholarship that "unless entrepreneurship generally begins to embrace higher volumes of higher calibre

qualitative research, the relevance and potency of the entrepreneurial canon will be severely compromised" (Hindle 2004, p.577).

Similarly, Guerrerro and Urbano (2012) call for an in-depth analysis of how entrepreneurial identity and behaviour are shaped by academic institutions' cultural dynamics. Qualitative data seems most appropriate for generating insights into the complex dynamics of identity at the individual level (Miles and Huberman 1994). In conclusion, attentiveness to the lived experience of the individual, in this instance the entrepreneurial academic is served best through the utilisation of strategies of qualitative investigation which enable the researcher to adequately capture the rich context of the participant experience through both discovery and exploration (Kaplan and Maxwell 1994).

#### *4.6.2 Case Study Approach*

In addition to considering our ontological and epistemological beliefs, researchers must also assess the degree of "methodological fit" between the research philosophy adopted and the questions posited within the study (Edmondson and McManus, 2007). Having identified the suitability of a qualitative approach to the research study, this section outlines the rationale for utilising a case study methodology.

Authorship comes with the expectation of readership, and more importantly convincing readership (Siggelkow, 2007). The case study approach is utilised as it offers a style of methodology that is a mode of discovery. The case

methodology allows the researcher to explore multiple levels of enquiry, be they individuals, organisations, relationships, communities, or programs (Yin, 2003). The approach also enables the research to deconstruct and reconstruct various phenomena discovered in the process. A stated key advantage of this approach is the close collaboration between the research participant, the researcher, and the story's development (Crabtree and Miller, 1999). As defined by Creswell a case study "explores a real-life, contemporary bounded system (a single case) or multiple bounded systems (multiple cases) over time, through detailed, in-depth data collection involving multiple sources of information... and reports a case description and case themes" (2013, p. 97).

A case study methodology is considered an appropriate "methodological fit" for this study for several key reasons. The case study methodology enables the investigation and analysis of the dynamics present in specific settings (Eisenhardt 1989) . This appeared critical to addressing the research aims of uncovering how the academic entrepreneur manages the paradox of both identities (that of an academic and that of an entrepreneur). The control for this study is the academic institution. Furthermore, a significant strength of case studies is their suitability to fine-grained rich contextual analysis such as is required by this study. A quantitative approach is incompatible with this study as it cannot capture the richness of the social and cultural context to the same degree (Kaplan and Maxwell 1994). Balven *et al.* (2018) note that to date much of the richness of the social and cultural context has been lost in terms of

previous studies on the academic entrepreneur, which further confirm the methodological fit of the case methodology to this research study.

Many of the central issues of debate within the university-based entrepreneurship field are ambiguous and contentious (Balven, *et al.*, 2018). A methodological approach that is particularly suited to a developing a sparsely theorised field is required. If the study was overly prescriptive and structured in design, critical factors of interest or interrelatedness could be missed. Additionally, given the intangible nature of role identity, it is a suitable approach as it is difficult to separate the variables of interest from each other and from the surrounding context (Yin, 1989).

Yin (2003) suggests that several conditions are necessary to ensure that the case approach is the most appropriate "methodological fit" for a research study. Firstly, Yin (2003) suggests that the research questions should be a "How or Why" question, allowing for depth and richness in the respondent's replies. Secondly, a case approach is suitable when the researcher has no control over behaviours or events related to the field of study. Finally, when the area of study is more contemporary in nature occurring in a real-life context or lived experience. Details on the specific conditions as related to this study are outlined below in Table 4.1.

| Requirements   | Study Characteristics   |
|--|---|
| Must be a "how" or "why" question                                  | How does an academic entrepreneur manage the paradox and complexity of their role identity?   |
| Investigators must have little control over events                 | There is no scope for control over behaviours or events given both the complexity and scale of the area of investigation for this study   |
| Must be a contemporary phenomenon occurring in a real-life context | The entrepreneurial university, and the phenomenon of the dual identity of the academic entrepreneur on the part of academics, is a topic of much contemporary interest from a scholarly perspective. The factors under investigation in this study are of contemporary relevance happening in a real-life context(that are lived experiences of the units of analysis) |

**Table 4.1: Case approach and how it relates to this study**

This study adopts a single-site case study approach; the unit of analysis is the academic entrepreneur. A single site case was chosen as according to Siggelkow (2007), the existence of the phenomenon, in this instance, the role identity of the academic entrepreneur can be more richly described through a single case study. Dyer and Wilkins (1991) posit that single case studies are more preferential for creating or extending high-quality theory, as a single case study is considered to produce more opulent, rich and robust theories. The case site (NUI Galway) has embedded academic units (Colleges). Through these academic units, the researcher explored the case site, analysed data within the case site, and conducted a cross-site analysis. This enables the researcher to develop a deep and rich understanding and interpretation of how academic entrepreneurs manage the paradox and complexity of their role identity.

Furthermore, taking a case study approach, the objective is to identify a research site where the phenomenon is 'transparently observable' (Pettigrew, 1990). The organization selected for this is described in detail in the following section. A mature University setting, identified as a leader in technology transfer provides for an exemplary site for an intensive case study. A site to undertake 'a process of discovery' (Sayer, 2000) to uncover the patterns that exist in shaping the role identity of academics and the tensions or paradox that exist to build a theoretical discovery. The quality of the contribution of this intensive case study does not depend on the number of cases studied but on the insights that the single case studied in depth can reveal about the phenomena under study. Our use of a single case is also consistent with others who have studied academic entrepreneurship, including Philpott *et al.* (2011)

Qualitative research is framed by a focus of inquiry (Yin, 2003). Categories of meaning and relationships between categories emerge from the data through a process of inductive reasoning, which is known as coding. This study focuses on the approach of this researcher to conducting qualitative research on their program of works and the challenges they anticipate when developing their research instrument(s).

#### **4.6.3 Contextualised Explanation**

According to Welch *et al.* (2011), the most promising and least practiced type of case study in business research is the critical realist case study. The main virtue of such a type of study is the ability to explain a process historically in a

specific context. This study has adopted this approach and takes an interpretive sense-making approach to affirm the value of contextualisation to theorising (Welch *et al.*, 2011). The study advocates that context-orientated qualitative research forms part of the answer to many of our research questions (Banberger, 2008; Tsui, 2004). This study is rich in context; this context is the scene for the case study and cannot be disregarded for the sake of generalisation away from context. Context and explanation are reconciled, and thus staying close to theory and case this study has demonstrated theorising potential. The study allows for a fresh conceptual understanding that is also grounded in empirical data (Welch *et al.*, 2011).

What sets contextualised explanation apart from other methods of theorising is that it lies in critical realism (Bhaskar, 1998). Welch *et al.* (2011) posit that where a study is strong on context and causal explanation, these should not be traded off. Case studies can generate causal explanations that preserve rather than reduce contextual richness. Proponents such as Sayer (1992) notes that explanatory accounts are context bound 'making sense of events requires that we contextualise them in some way' (p.60). While from the positivist tradition we can abstract from time and space in contrast, contextualised explanation is a way of explaining without laws (Abbott, 1998).

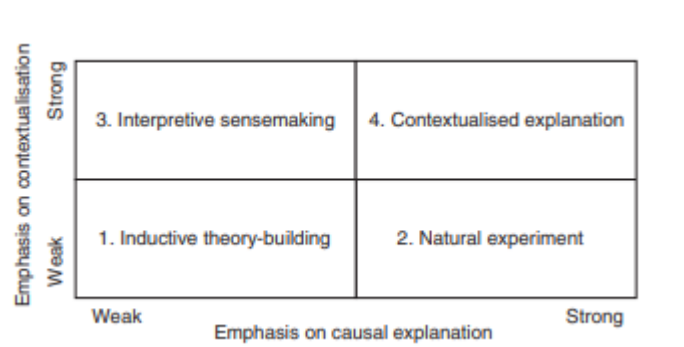


Figure 4. 2. Contextualised Explanation (Welch *et al.*, 2011)

Autio *et al.*, (2014) note that the question of contextual influences on entrepreneurship has received little to no attention. From the perspective of the U.S. National Systems of Innovation, literature has also largely ignored the topic of context and its increasingly important role in shaping academic entrepreneurs. Acs *et al.*, (2014) conclude that "... in the institutional tradition of the NSI literature, institutions engender, homogenize, and reinforce individual action: it is a country's institutions that create and disseminate new knowledge and channel it to efficient uses." In relation to this study, it responds to the under researched areas of individual-level agency and the micro processes of entrepreneurship and how these are regulated by context. Furthermore, the variety of such activity, as well as its impact on outcomes in terms of the types of entrepreneurial innovation and subsequent venture performance (Zahra and Wright, 2011), are also under-researched all which point toward the central role that contextualised explanation has in terms of understanding the evolving landscape in which the academic entrepreneur operates. The stated neglect of contextual influences constitutes which Zahra

and Wright (2011) constitute a significant gap, specifically since policy can have such an impactful role in influencing entrepreneurial activity through manipulating context (Audretsch *et al.*, 2007).

#### 4.6.4 *Locating the Research Population*

The primary objective of phenomenological research is to describe the lived experience of a phenomenon by a specific population at a particular point in time (Cope, 2005). It represented 'a photographic slice of life' (Lincoln and Guba, 1985) as a key differentiator from a positivists approach. The research population is defined as the cluster of people or events that the researcher wishes to study. The population for this study is Academic Entrepreneurs who are employed as academics in a mature university in the West of Ireland. The site was selected to the large sample size available to research and the level of maturity of the university.

#### 4.6.5 *Recruitment and Selection of the Interview Participants*

Hycner, 1999 posts that the phenomenon dictates the method. This includes the types of participants that should be recruited to the study. In this research study, participants were selected who have experience of the phenomenon, namely academic entrepreneurship. Stake (1994) opines that phenomenological research select participants on the basis of who can offer the most significant learning opportunity in relation to the unit of analysis. A purposeful sampling strategy was used for this research. A purposeful sample can be described as selecting participants based on the researchers understanding of the aims and objectives of the research and identifying who

is positioned to best contribute rich and insightful responses to the phenomenon being studied (Bannie and Mouton, 2001). This is supported by the work of Patton (2015), who advocates for a purposeful sample as it enables the researcher to select participants with rich descriptive lived experiences from whom much can be learned.

Participants for this study are awardees of the Enterprise Ireland Commercialisation Grant. This funding instrument has been identified as the entrepreneurial funding instrument for academics in Ireland's National Policy Statement on Entrepreneurship (2013). In total, 37 unique awardees have been funded, with 31 being available for interview. 4 declined, 2 have passed away, and one did not reply to requests to be interviewed. In total, 97 Enterprise Ireland Commercialisation Funds under this scheme in NUI Galway were awarded since 2007 spanning three University units (Medicine, Nursing and Health Sciences, Science and Engineering).

| P# | Acadunit                              | Title           | New or Experienced | Single Multiple or Project Holder | Project Value (cumulative) | Career Stage |
|----|---------------------------------------|-----------------|--------------------|-----------------------------------|----------------------------|--------------|
| 1  | Engineering                           | Senior Lecturer | N                  | S                                 | 200-500K                   | Mid-career   |
| 2  | Engineering                           | Senior Lecturer | E                  | M                                 | 500K+                      | Early-career |
| 3  | Medicine, Nursing and Health Sciences | Senior Lecturer | E                  | M                                 | 500k+                      | Established  |
| 4  | Medicine, Nursing and Health Sciences | Professor       | E                  | S                                 | 200-500K                   | Established  |
| 5  | Medicine, Nursing and Health Sciences | Professor       | E                  | S                                 | 200-500K                   | Established  |
| 6  | Engineering                           | Professor       | E                  | M                                 | 200-500K                   | Established  |
| 7  | Science                               | Professor       | E                  | S                                 | 200-500K                   | Established  |

|    |  |           |   |   |          |              |
|----|--|-----------|---|---|----------|--------------|
| 8  | Engineering                                    | Professor | E | M | 200-500K | Established  |
| 9  | Science  | Professor | E | S | 200-500K | Established  |
| 10 | Engineering                                    | Professor | E | M | 500k+    | Established  |
| 11 | Engineering                                    | Professor | E | S | 200-500K | Established  |
| 12 | Science  | Lecturer  | N | S | 200-500K | Early-career |
| 13 | Engineering                                    | Professor | E | M | 500K+    | Established  |
| 14 | Engineering                                    | Professor | E | S | 200-500K | Established  |
| 15 | Science  | Lecturer  | N | S | 200-500K | Early-career |
| 16 | Engineering                                    | Professor | E | S | 200-500K | Established  |
| 17 | Engineering                                    | Professor | E | S | 200-500K | Established  |
| 18 | Engineering                                    | Professor | E | S | 200-500K | Established  |
| 19 | Engineering                                    | Lecturer  | N | S | 200-500K | Mid-career   |
| 20 | Engineering                                    | Lecturer  | N | M | 200-500K | Mid-career   |
| 21 | Science  | Professor | E | S | 200-500K | Established  |
| 22 | Engineering                                    | Lecturer  | N | S | 200-500K | Early-career |
| 23 | Engineering                                    | Lecturer  | N | S | 200-500K | Early-career |
| 24 | Engineering                                    | Professor | E | M | 500k+    | Established  |
| 25 | Science  | Lecturer  | N | S | 200-500K | Early-career |
| 26 | Science  | Lecturer  | N | S | 200-500K | Mid-career   |
| 27 | Medicine,<br>Nursing<br>and Health<br>Sciences | Professor | E | M | 500k+    | Established  |
| 28 | Science  | Professor | E | S | 200-500K | Established  |
| 29 | Science  | Lecturer  | N | S | 200-500K | Mid-career   |
| 30 | Medicine,<br>Nursing<br>and Health<br>Sciences | Professor | E | M | 500k+    | Established  |
| 31 | Science  | Professor | E | S | 200-500K | Established  |

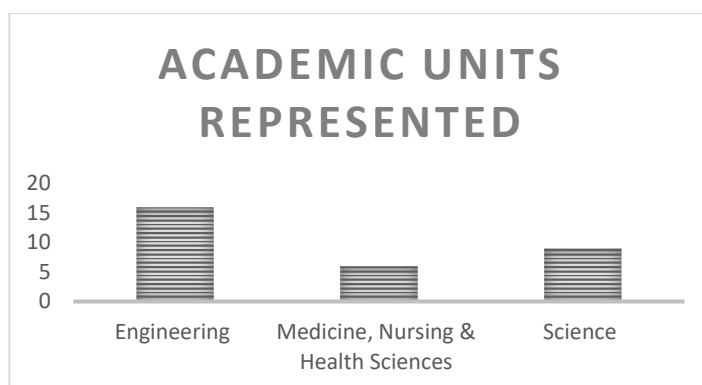
**Table 4.2: Summary of research study participants**

Study participants were contacted via email with a cover letter outlining the nature and background details of the research study and the nature of their contribution. Reassurances concerning anonymity were provided in addition to the provision of a consent form and a participant information sheet.

#### 4.6.6 Descriptive Study Data

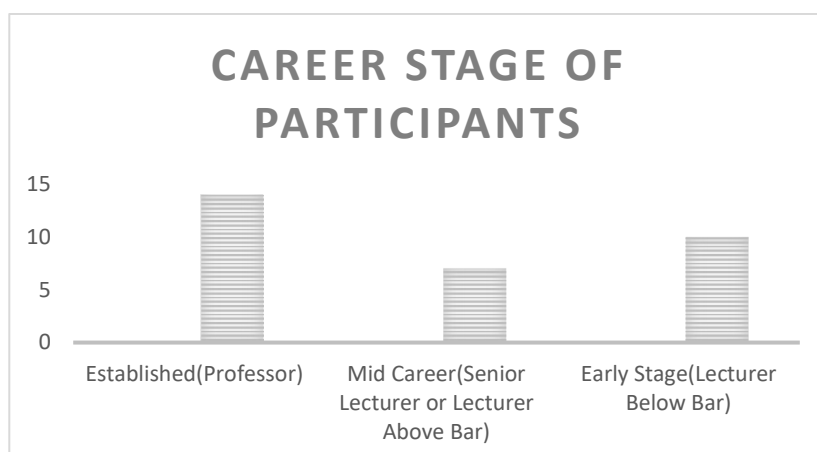
There was a total of 31 academic entrepreneurs participating in the study.

These were drawn from 3 academic units, as shown in figure 4.3



**Figure 4.3: Academic units represented in the research study**

All 31 participants' discussions concerning projects referred to projects that were the subjects of Enterprise Ireland commercialisation grants. Figure 4.4 below shows the career stage at which participants operated.



**Figure 4.4: Career Stage of Participants**

Figure 4.5 shows that 19 participants were multiple project owners while 12 were involved in a single project.

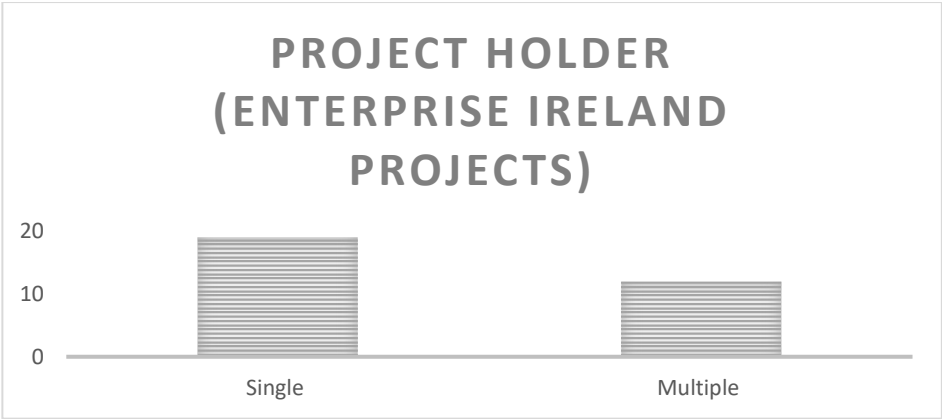


Figure 4.5: Enterprise Ireland Single/Multi-Project Owner

Figure 4.6 below shows the cumulative value of the various projects represented in the study.

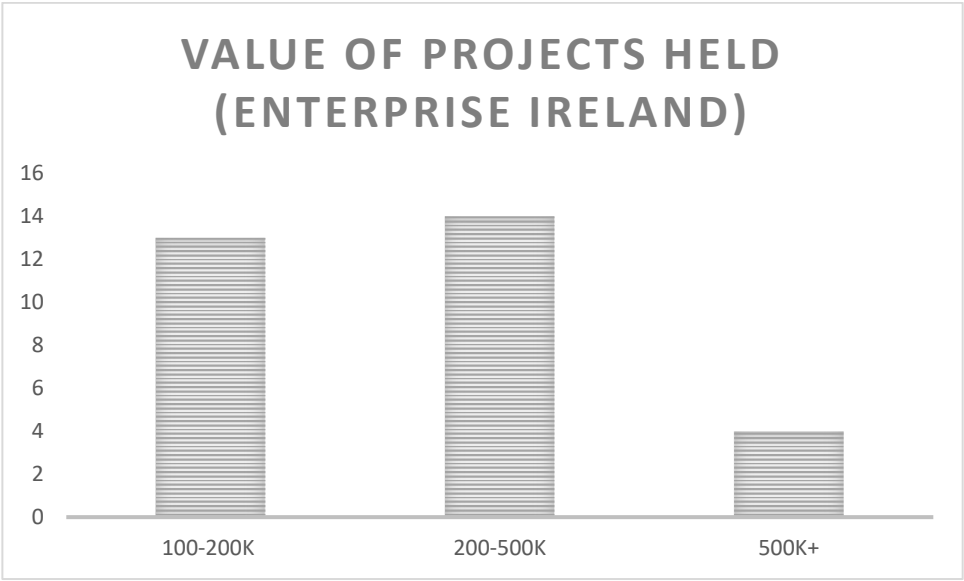


Figure 4.6: Enterprise Ireland Value of Project Held (cumulative)

4.6.7 *Semi-Structured Interviews:*

Maintaining a consistent approach to both qualitative and case approaches, this study utilised semi-structured interviews as the primary method of

collecting qualitative data in the field. Given the nature of this study and its focus on the role of the academic using semi-structured interviews 'brings us arguably closer than other methods to an intimate understanding of people in their social world' (Heremanowicz, 2002, p.480). Barriball and While (1994) state that semi-structured interviews bring the researcher closer than any other method to understand people and their social worlds. Yin (2003) further supports this approach in acknowledging that semi-structured interviews give researchers access to participants' understanding of both actions and events.

| Qualitative Research Genres and Strategies |                     |                                |
|--|---------------------|--------------------------------|
| Genre                                      | Strategy            | Focus of Inquiry               |
| Individual Lived-In Experience             | In-Depth Interviews | Individuals                    |
| Society and Culture                        | Case Study          | Groups or Organisations        |
| Language and Communication                 | Micro-Analysis      | Speech Events and Interactions |

**Figure 4.7: Qualitative Research Genres and Strategies Marshall and Rossman**

(1991)

#### 4.6.8 Interview Protocol

Rigid adherence to a set order of questions was observed for this study, as the interviewer would lead the conversation instead of the interviewee. Interviews took on a loosely structured format (see appendix 1 for interview schedule). The interview schedule includes an underlying protocol, which is linked to the research objectives of the study. Having identified the three guiding research objectives of the study from the literature, the researcher was careful not to include highly technical jargon or complex questions, which is crucial to uncovering participants' individual experiences.

#### 4.7 Data Analysis Method

The research design and data analysis methodology for this study based upon the principles of phenomenology, a disciplinary field of Philosophy. The approach is holistic and considers the context within which the lived experience takes place. Qualitative research seeks to access these lived experiences and better understand the inner world of meaning making and perception. This approach does not commence with an *a priori* hypothesis that can be tested or proved. It is more exploratory in nature and takes the researcher on a voyage of discovery. The research outcomes are not broad generalisations, they are contextual findings. The study sought to understand the experiences that informed 31 participating academic entrepreneurs who gave generously of their time to contribute to this research.

The methodology adopted by this study is based on the principles of Interpretative Phenomenological Analysis (IPA) as described by Eatough and Smith, (2008). The work of Eatough and Smith, 2008 draws heavily on the work of Husserl, Heidegger, and Merleau-Ponty in developing the IPA framework. There is no single definitive method of data analysis in IPA; the approach takes a flexible approach towards analytic development. IPA's common processes move from the specific (idiographic) to the shared and from descriptive to the interpretative (hermeneutic) (Smith and Osborne, 2015). Underpinning the Interpretive Phenomenology Approach is a commitment to focussing in on and understanding the participants lived experience and adopting a psychological

focus on meaning making from a personal perspective in specific contexts. This is referred to as the double hermeneutic— where the researcher is focussed on making sense of the participants who is also trying to make sense of their own experiences using memory recall and language (Smith 2011; Smith and Osborn 2008). The analytical strategy adopted in this study is informed by these principles and derived from Smith's (2008) practical guidelines for the process of data analysis and interpretation.

#### *4.7.1 Overview of Analytical Approach*

The focus of qualitative research is not mathematical abstraction. It does however take a systematic approach to data collection and analysis. The approach is framed by focussed inquiry. The data collection approach be it interview or questionnaire enables participants to voice their perceptions and lived experiences freely. Moving toward analysing data, the responses are not grouped or pre-defined. Categories emerge through inductive reasoning or as it is more commonly known coding. Using the IPA approach offers the researcher an approach. This approach involves breaking down the data into discrete segments or 'units of meaning' (Maykut and Morehouse, 1994) and then coding them into categories. Categories emerge from this approach in two forms. Those that are derived from participants own customs and language, and those that are identified by the researcher as significant to the study. "The goal of the former "is to reconstruct the categories used by subjects to conceptualise their own experiences and world view", the goal of the latter is to assist the researcher in developing theoretical insights through developing

themes that illuminate the social processes operative in the site under study; thus, the analytical process stimulates thinking that leads to both descriptive and explanatory categories” (Lincoln and Guba, 1985, p. 334-341).

#### *4.7.2 Using Data Analysis Software*

The use of data analysis software supports the efficiency of the data analysis stage. The software does not replace the researcher in the hermeneutic task of conducting analysis and drawing conclusions from the data. Qualitative researchers ‘want tools which support analysis, but leave the analyst firmly in charge’ (Fielding and Lee, 1998) p167). The software also serves as a tool for transparency and audit purposes, both of which are important considerations of the trustworthiness and plausibility of the research study

The use of qualitative analytical software logs the data movements and coding patterns that emerge through the study. The map the conceptual categories and their evolution from words to thematics.

#### *4.7.3 IPA Applied - Phases and Steps Taken in the Analytical Process*

For this study, eight discrete cycles of analysis were conducted. There were three separate cycles of coding, two cycles of coding management, one for initial categorisation of open codes and one for data reduction through the consolidation of codes into a more abstract theoretical framework (super-ordinate themes) and one which used writing itself as a tool to prompt deeper thinking of the data (Bazeley, 2009), leading to findings from which conclusions were extracted. These cycles are now described and discussed by phase:

**Phase 1: *Reading and Initial Noting*:** Phase one involved the transcription of the participant interviews and their subsequent reading and re-reading to note down initial ideas. The study transcripts and field notes were imported into Nvivo, a data management tool (QSR International Pty Ltd. Version R1, 2020).

**Phase 2: *Initial Coding and Noting*:** Phase two focussed on broad participant driven initial coding of the interviews. This was undertaken to deconstruct data from its original chronological order into non-hierarchical general codes. These code contain units of meaning which served as roles of inclusion as the coding process developed and progressed (Maykut and Morehouse 1994). This ensured that names and definitions assigned to names were actually reflected in the coded content (appendix c).

**Phase 3: *Developing Subordinate Themes*** involved breaking down the initial codes into categories of codes, described as "subordinate themes" in IPA. Such subordinate themes could be described as a 'halfway house' between organising initial codes into logical groups and the generation of super-ordinate themes for the study. This phase further involved 'coding on' subordinate themes into more refined sub-categories to create a more in depth understanding of the highly qualitative aspects of the study and to consider different views, negative cases, generalisations, attitudes and behaviours coded to these subordinate themes so as to glean more precise insights into the meanings that are attached to the codes (appendix c).

**Phase 4: *Developing super-ordinate themes (data reduction/consolidation)*:** Phase 4 involved bundling codes from previous cycles into more abstract,

philosophical, and literature- based set of super-ordinate themes. This created a final framework to form the basis of analysis and the write up of the study. Both the sub and super ordinate themes were placed in a matrix comparing each perspective to facilitate both 'in-case' and 'cross-case analysis of the study. Reading the matrix down reveals the extent to which themes and sub-themes impacted on individual academic entrepreneurs while reading across the matrix allows for comparing the extent literature to themes were shared across other participants in the study.

**Phase 5: *Analysis and write up*** involved *writing a series of analytical memos*: This phase focussed on considering the super-ordinate themes and accurately summarising the content of each category and its codes in order to propose empirical findings against these categories. These memos consider six critical areas of analysis:

1. The content of the clustering of the codes of the study(what was said)
2. The coding patterns were relevant (levels of coding to test for recurrence of the theme across participant transcript.
3. Considering background information recorded against participants and looking for any patterns that may exist concerning participants' profiles (who said it)
4. Considering findings in the context of extant literature to prepare for the discussion of findings to come in chapter six.

5. Situating the code(s) in the storyboard. This relates to the meaning and relatedness of themes to one another and their importance in terms of the research question(s) being posed. It also considers the sequencing of disparate codes and clusters of codes into a narrative which is structured and can be expressed in the form of a coherent and cohesive findings in chapter 5.

**Phase 6: Validation** involved testing, validating, and revising analytical memos to self-audit proposed findings by seeking evidence in the data beyond textual quotes to support the stated findings and seeking to expand on deeper meanings embedded in the data. Self-auditing ensures the researcher checks for her own bias and ensures she is not imposing her own worldview over that of her participants. This process involved the production of matrices, flow charts models, and reports derived from the data itself to support assertions made by the researcher, which result in evidence-based findings as each finding must be substantiated by being rooted in the data itself and supported with outputs that validate its existence in the data.

**Phase 7:** Involved within *case analysis* of the study. **Within-case analysis** is both structured and focused. The focus of this within-case analysis was on particular elements of the story that are revealed in the data, specifically around the identities of academic entrepreneurs and the development of a typology that supported three different identity types. This enabled the researcher to fuse theory and empirical data to create three typologies of the academic entrepreneur within a mature university setting.

**Phase 8:** involved *synthesising analytical memos* into a more coherent and cohesive structure that can support the findings chapter. This phase results in a more descriptive account of the study participants' views and perceptions in the context of managing the paradox and complexity of their dual identity in the context of roles.

Table 4.3 now links these stages and processes conducted in NVivo to the practical guidelines for data analysis and interpretation as set out by Smith (2009):

| IPA analytical focus (Smith <i>et al.</i> 2009)  | NVivo Process   |
|--|---|
| <p><b>Steps 1 and 2:</b> Reading and Initial Noting</p> <p>These steps involve complete immersion in the original data (interview transcripts) and initial noting. The focus at these critical stages is on paying attention to the participant and focussing on their sense making from their lived experiences. The intent at this stage is to move from the broad and general to the more specific details about events and activities. This stage considers how the participant uses language. The aim of this stage is to produce highly detailed and descriptive notes with exploratory comments related to the data rather than seeking out units of meaning</p> <p>The three primary processes that are involved are:</p> <ol style="list-style-type: none"> <li>1. Descriptive comments on the content of the transcript</li> <li>2. Linguistic comments on how the participant has used language throughout the interview</li> <li>3. Conceptual (interrogative and reflective) comments are added to start interpreting the transcript</li> </ol> | <p><b>Open coding</b></p> <p>The participant's own words are used to summarise the sense or meaning that they are conveying about their specific lived experiences from the transcript. Open codes are developed for the transcript and a first pass at reducing data to descriptive phrases and terms is completed. This is an iterative process with each transcript being reviewed several times to code, re-code and add comments that are both interrogative and reflective. In summary:</p> <ol style="list-style-type: none"> <li>1. Code Names capture the overall summary description of the content</li> <li>2. Rich descriptive comments to provide coding transparency are included in the code description.</li> <li>3. A journal captures reflective and conceptual comments arising from the interview.</li> </ol> |
| <p><b>Step 3:</b> Developing emerging themes.</p>  | <p><b>Category creation</b></p>   |

| IPA analytical focus (Smith <i>et al.</i> 2009)  | NVivo Process   |
|--|---|
| <p>During this step the research reduces the volume of data through summarising whilst still retaining the complexity of the transcript by looking for patterns and connections. The hermeneutic circle approach is used (Gadamer 2013; Grondin 2003; Heidegger 2012) which is concerned with interpreting the part of the transcript in relation to the whole and the whole in relation to the part. Themes should be 'a synergistic process of description and interpretation' (p.92), these themes should reflect both the participant's original words and thoughts and the researcher's interpretation to 'capture the understanding'.</p>  | <p>The first step in the data reduction stage includes creating a new 'Category' folder for the transcripts in Nvivo. Then the copy of open codes are added which leaves the original open codes folder for the participant fully intact.</p> <p>Each code is reviewed in the category folder and codes are reordered into broad categories (codes can be added to other codes as a parent or more usually as a child code that sits underneath a parent code). This process is repeated and codes are merged, and re-named, ensuring that new names accurately reflect coded content to allow a more in-depth understanding of the participant's lived experience</p>                      |
| <p><b>Step 4: Connecting Emergent Themes</b></p> <p>During step 4 the research searches for connections across the emerging themes and maps them together. There are a number of strategies used to support step 4. These are:</p> <p><u>Abstraction</u>: Developing a set of 'super-ordinate themes for theme clusters.</p> <p><u>Subsumption</u>: An emergent theme may naturally become a super-ordinate theme.</p> <p><u>Polarisation</u>: Looking for contrasts and complementarities across themes—oppositional relationship.</p> <p><u>Contextualisation</u>: Identifying contextual or narrative elements: organising into explicit temporal, cultural, and narrative themes that can highlight patterns.</p> <p><u>Numeration</u>: Seeking out frequency of themes as they appear.</p> <p><u>Function</u>: E.g., positive and negative meanings (language/discourse analysis).</p> <p><u>Bringing it together</u>: Summarising the development of the emergent themes from the raw data in a visual or table representation</p> | <p><b>Category Development</b></p> <p>Employing IPA strategies to create super-ordinate themes for clusters of codes.</p> <p>Firstly the researcher needs to consider how categories may link together or be reduced into emergent themes. New themes are created that can reflect the descriptive and interpretive aspects. These are known as super ordinate themes. For example reducing risk, taking a risk, avoiding risk could all be clustered under the theme of attitudes towards risk. This reduces the original data to between 3-6 themes that are relevant to the study's research question(s) and consolidates codes into a more conceptual or final framework of coding.</p> |
| <p><b>Step 5: Moving to the next case</b></p> <p>At stage 5 all the previous steps are repeated with reference to other transcripts (bracketing ideas that emerge from one case</p>  | <p><b>Next Transcript</b></p> <p>A folder is created in Nvivo in which to store these new codes that have been created which results in each transcript being treated as a new analysis</p>   |

| IPA analytical focus (Smith <i>et al.</i> 2009)  | NVivo Process  |
|--|--|
| <p>to another). IPA's project is a commitment to idiographic analysis. This type of bracketing is different from epochē, which Husserl (Hopkins 2011) meant to refer to bracketing out the 'natural attitude' or taken-for-grantedness of everyday life, and which Merleau-Ponty (2012) argues is never possible to attain anyway: human perception is always fully embodied and cannot be separated from the world. Smith et al, (2009) assert that bracketing simply means to allow new structures to emerge with each case yet being aware that the 'fore-structures' (hermeneutics) have changed and been influenced by what was previously found.</p> | <p>(steps 1-4) as far as possible, bracketing out references to codes that exist in other transcripts.</p>   |
| <p><b>Step 6:</b> Looking for patterns across cases</p> <p>During step 6 the researcher looks at themes across participants for patterns and connections, do themes that exist in one case (or individual) illuminate another. What themes are most interesting or repetitive? This can result in moving towards a more theoretical level of analysis at different thematic level. So far the analysis has gone from the part to the whole. This now reverses from the whole to each part. Reoccurrence of themes is considered. To be considered as a reoccurring theme it must be present in at least half of all cases.</p>                             | <p><b>Consolidation and Matrix coding</b></p> <p>A common themes folder is created where all themes are merged for the first time. Original category folders are left intact.</p> <p>Within the themes folders a process of merging or further consolidation of themes may take place.</p> <p>A specific type of query in NVivo (Matrix Coding) produces a table that shows participants by theme in columns or rows can be created. This can be used to look at themes both between and within participants' transcripts. This is referred to as in-case and cross-case analysis.</p> |

**Table 4:3: Stages and processes conducted in Nvivo to the practical guidelines for data analysis**

Using IPA and specifically during phase 3 and 4 as described above emergent codes develop and then patterns are linked together to create superordinate codes which map together. During phase 5 each case is considered and analysed. For example, academic entrepreneurs whose quotes related to too much emphasis on entrepreneurship and commercialisation and entrepreneurship taking from core academic role were grouped into a higher level or superordinate code of 'Negative Perceptions of Academic Engagement in Entrepreneurship'. The final step of the analysis involved integrating these higher-level themes into 3 academic entrepreneur typologies, which

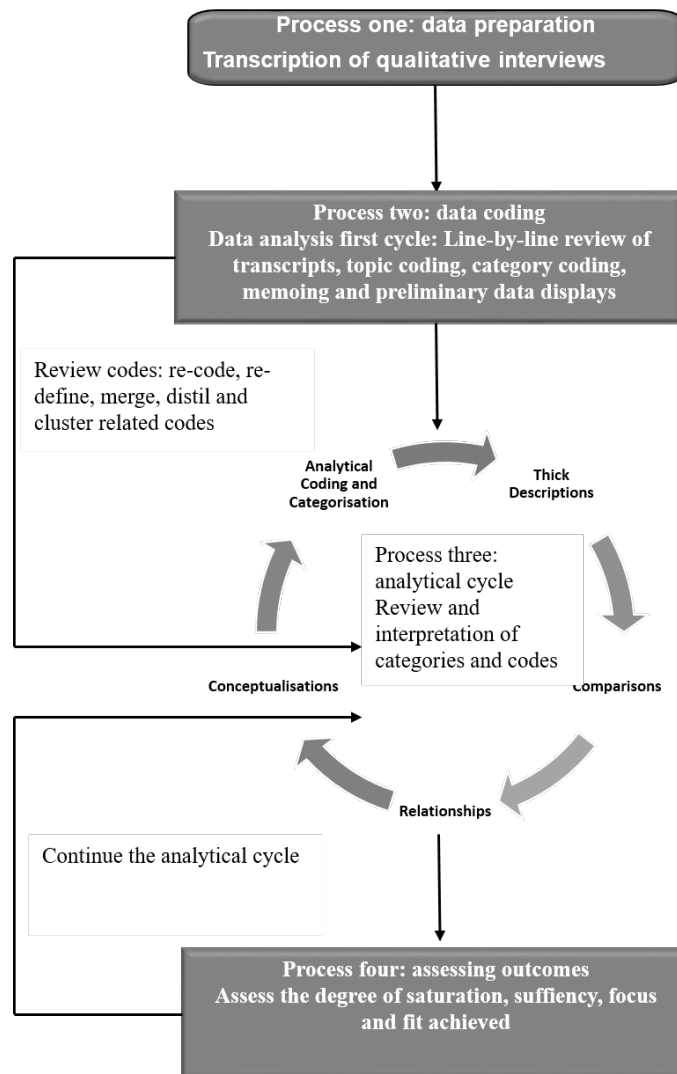
is described at step 6. The data-structuring table positions each core stage supporting the development of the academic typologies.

| Sub Ordinate Codes<br>(Frequency of Use)   | Superordinate Quotes<br>(Number of Quotes)  | Academic Entrepreneur Role |
|--|---|----------------------------|
| <ul style="list-style-type: none"> <li>• Shift in the role of University towards the D side of R and D aligned to Entrepreneurship(36)</li> <li>• Couldn't do Work Without Entrepreneurial Funding(35)</li> <li>• Role Has Expanded But So Has Team and Support Structures(30)</li> <li>• Autonomy Important to Pursue Passions and Interests(27)</li> <li>• Wear Multiple Hats At My Career Stage(27)</li> <li>• Dark Art of Publishing Whilst Having IP to Protect(25)</li> <li>• Field Closely Related to Innovation(22)</li> <li>• Commonalities between Academia and Entrepreneurship(19)</li> <li>• Grown as a Leader(19)</li> </ul> | <p>Strategies for Overcoming Entrepreneurial Challenges(153)</p> <p>Managing Entrepreneurial Grants(87)</p>       | Resourceful                |
| <ul style="list-style-type: none"> <li>• Network(26)</li> <li>• Training Students to Better Understand Business, Research and Innovation working Together(20)</li> <li>• Always Worked in This Area(17)</li> <li>• Academic Entrepreneurship Becoming More Relevant(14)</li> <li>• Field Closely Related to Innovation(17)</li> <li>• Role models(16)</li> <li>• Peer to peer support(21)</li> <li>• Couldn't do Work Without Entrepreneurial Funding(19)</li> <li>• Always Worked in Applied Research(7)</li> <li>• Individual Desire(8)</li> </ul>   | <p>Fit between Entrepreneurship and Academia(75)</p> <p>Reputational Opportunities for Commercial Funding(82)</p> | Readymade                  |
| <ul style="list-style-type: none"> <li>• Career Inhibiting (22)</li> <li>• Focus on Publishing (14)</li> </ul>   |   |                            |

|  |   |           |
|--|---|-----------|
| <ul style="list-style-type: none"> <li>• Student Driven (11)</li> <li>• Could Damage reputation if moving towards entrepreneurship (8)</li> <li>• Academics doing entrepreneurial research is unrealistic (6)</li> <li>• Too much emphasis on entrepreneurship and commercialisation (5)</li> <li>• Entrepreneurship taking from core academic role (5)</li> <li>• Drawing funding away from basic research (4)</li> <li>• Conflict of interest (9)</li> </ul> | <p>‘Negative Perceptions of Academic Engagement in Entrepreneurship’(53)</p> <p>‘Issues with Purpose of Academic Roles’(34)</p> | Reluctant |
|--|---|-----------|

**Table 4.4: Data Structuring Overview**

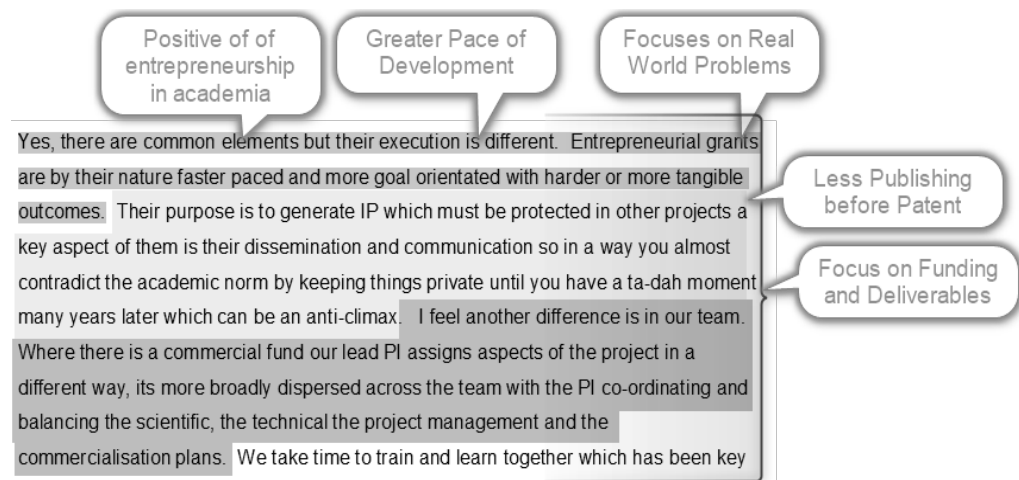
In the design stages and processes as outlined in Table 4.3 and 4.4 , the aim of the study and its philosophical foundations were given careful consideration. King (2004) states that tensions exist ‘between the need to be open to the data and the need to impose some shape and structure on the analytical process’ (p.267). For this study a systematic and rigorous data analysis approach and process was utilised that encouraged both impartiality and completeness (Lillis, 1999) while also recognising the complexity of the data under review and the interpretative nature of the study. As Figure 4.4 now illustrates, the process involved four inter-related and iterative processes (i) Process one: data preparation, (ii) Process two: data coding, (iii) Process three: analytical cycle and (iv) Process four: assessing conceptualisations and outcomes:



**Figure 4.8: Overview of the Analytical Process for the interpretation of categories**

It is noteworthy that when reporting on the numbers of comments coded, the sum of the parts may total a more significant number than the whole. This is because a comment, or part thereof, may be coded to more than one code. For example, the comment below in Figure 8 was coded to 5 codes meaning that if one added up the comments in the category of codes to which these codes belong, there would be more comments than the total number of comments received. However, this is common in qualitative data analysis coding and reporting because each code contains coded 'units of meaning'. A comment

may contain several units of meaning and therefore be legitimately coded in several codes.



**Figure 4.9: Example of the qualitative coding process**

#### 4.7.4 *Validity and Reliability:*

When establishing the rigour of a study, two significant issues must be considered. The first is validity, the extent to which the research accurately reflects and measures the phenomenon (Silverman, 2006). The second is reliability, the extent to which the research instrument would yield the same results when applied at a point in the future.

This study utilises three levels of research validity, construct validity, internal validity and generalisability (external validity). Construct validity relates to the operationalisation of variables within a study (Yin, 1994). This has been achieved through an extensive analysis of the literature on role identity and academic entrepreneurship and the development of thematic areas from the study. Internal validity relates to causality (Miles and Huberman, 1994). This is

addressed throughout the data analysis phase by examining the credibility of emergent links between data and theory.

Finally, external validity is considered. This relates to the generalisability of findings beyond the study and is an area often subject to criticism in case study research. This study cannot provide statistical generalisation. However, it may result in analytical generalisation. Analytical generalisation occurs when researchers strive to generalise from particulars to broader constructs or theories. Through the course of their analytical enquiry, qualitative researchers 'distinguish between information that is relevant to all (or most) participants, in contrast to aspects of the experience that are unique to particular participants' (Ayres *et al.*, 2003, p. 871). This is an ideal that is not always realised. Therefore, it is not possible to comment further at this stage of research enquiry.

This study uses a formal case study protocol to ensure that a 'chain of evidence' (Yin, 1994) is maintained from a reliability perspective. This shows a clear line of progression from research design to data collection and data analysis.

#### 4.8 Ethical Considerations

This research has been conducted in line with Trinity College Dublin Ethical Guidelines. Trinity College Dublin has rigorous and professional ethical policies and procedures in place governing the conduct of research, including humans. The researcher devised a protocol, which was submitted to the Trinity College

Business School Ethics Committee in 2017. In advance of each interview, the participants gave informed consent by agreeing to and signing the informed consent letter (appendix a). The informed consent letter confirmed the nature of the study, participant confidentiality and how the interview would proceed, in addition to how data would be recorded, managed and stored. To maintain confidentiality, each participant was given a unique participant number during the transcription stage of the process.

#### 4.9 Limitations

This study's research design and methodological choices have been made after careful consideration of their suitability to the research question and sub questions. A number of limitations should be acknowledged.

The first limitation relates to the generalisability of the study. While the study had 31 participants, the context for the study was a single site that exists within a broader academic population. A large sample studied was deemed appropriate given the complexity of the phenomenon and how transparently observable it was (Pettigrew, 1990). This is further supported by how exploratory in nature the study itself is. While the area of academic entrepreneurship is abundant and flourishing, there is little written on the academic entrepreneur with regard to their role identity and the paradox or tensions that exist in navigating the entrepreneurial landscape of their institutions (George *et al.*, 2005; Lam 2010; Shi, *et al.*, 2020).

A second limitation of this study is the risk of bias associated with the study. Firstly, the bias associated with the chosen methodological framework must be considered. There is strong evidence to support the research design of this study with studies noting that 'very little is known about the cognitive and social psychological processes associated with scientists reshaping their career trajectories and pursuing entrepreneurial paths (Audretsch and Erdem, 2004) and missing from most of the conversation on academic entrepreneurship is a deeper understanding of the involvement of a key actor in the academic entrepreneurship debate- the university scientist (Jain *et al.*, 2009). The single case study offers a valuable and rich source of insight for both theory building and the identification of promising avenues for future work in the field by analysing the underlying causes of both similarity and difference (Eisenhardt 1989).

The final limitation relates to the researchers own orientation toward participants at the site of the case. The researcher is a full-time member of staff (Professional Services Staff) at the academic institution. The researcher's own beliefs, values, and pre-existing assumptions which may adversely affect the investigation of important issues and unduly influence the analysis of the empirical data (Miles and Huberman 1994). As the researcher is part of the research process, these factors are to some degree inseparable from it. The researcher has addressed these issues by considering their impact throughout

the research process and by coding and analysing the qualitative data in accordance with a systematic protocol as described earlier in this chapter. Nonetheless, bias cannot entirely be eliminated given the methodology employed, and this limitation remains worthy of consideration.

#### 4.10 Conclusion

This chapter has described the research methodology selected to address the research objectives of this study. The primary research question and the three supporting sub-questions were presented and discussed. The chapter then examined the major philosophical perspectives, which underpin the scientific process, before presenting the arguments for the adoption of a critical realist perspective for the study at hand. Following the presentation of this justification, the underlying rationale of a single site case study methodological approach was then provided. The selection and empirical background of the case studies were then explained, along with the sampling strategy and an overview of the participating interviewees. The data collection and analysis procedures were then described before factors relating to the validity and reliability of the adopted methodological framework were discussed. Finally, the limitations of this framework were acknowledged and considered. The next chapter presents the research findings as they relate to the interviewed academics' role identity in a mature entrepreneurial university site.

## Chapter Five – Research Findings

### 5.1 Introduction

This study aims to gain insights into how academic entrepreneurs manage their hybrid role identity in a mature entrepreneurial university environment. This chapter focuses on the qualitative descriptive findings from 31 in-depth interviews of academic entrepreneurs in based in a sizeable third-level institution in Ireland. The data collection instrument was an interview schedule designed to explore participant's perceptions and perspectives of the following research sub questions:

1. What are the perceptions and understanding of academic entrepreneurship by academic entrepreneurs?
2. How are the entrepreneurial orientation and role identity of the academic entrepreneur perceived?
3. How do the typologies of Hybrid Academic Entrepreneur manifest in a mature entrepreneurial university setting?

The findings are reported in three parts, these are:

**Part 1 – Understanding and Perceptions of Academic Entrepreneurship (AE)**

**Part 2 – Perceptions of AE Role Models, Reputation and Career Impact**

**Part 3 – Typologies of hybrid Academic Entrepreneur**

Each part considers the analysis of questions put to participants designed to illicit reflexive accounts of their experiences working as academic entrepreneurs in their institutions.

## 5.2 Understanding and Perceptions of Academic Entrepreneurship

This section of the findings is concerned with exogenous attitudes, perceptions, understandings and opinions of participant academic entrepreneurs on entrepreneurship within a mature entrepreneurial university. Such external and contextual conditions can influence both the manner in which the academic entrepreneur participates in entrepreneurial activity and the mechanisms that support their engagement.

The section explores these thematics under three headings.

- I. The purpose of Academic Entrepreneurship. This study is focused on the academic entrepreneur and to facilitate a better understanding of the individual's perspectives and the role, this question was asked to interviews. Having insights into what participants see as the purpose of academic entrepreneurship, the centrality of entrepreneurial activity to their roles and how their own role aligns with the purpose gives a richer understanding of academic entrepreneurship in practice.
- II. Perceptions of Role Models, Reputation and Career Advancement. This study seeks to understand participant's perception of role models, reputation and career advancement. A better understanding of the impact of role models on academic entrepreneurs and how they leverage those that have had success will give insights into the motivations of academics. This enables for a richer understanding of role salience and supports the academic entrepreneur to action their entrepreneurial self.

III. Communities of Entrepreneurial Practice. Communities of practice exist when a peer to peer network, organise to share information, advice and know how that exists to cultivate their entrepreneurial endeavors and again supports role salience in terms of supporting academic entrepreneurs to build out their individual knowledge, influence and reinforce entrepreneurial behaviours and support growth and development of a phenomenon such as academic entrepreneurship.

#### 5.2.1 Purpose of Academic Entrepreneurship

*'You could look at it in a whole variety of ways, but now I see it is in terms of trying to ensure that your research is translated into something of societal benefits, whether that's in the science, technology, engineering space, it's some technology or application that can be commercialised and does provide some value. Be it medical or other; could be wastewater treatment, for example, in other areas. That to me is entrepreneurship, where you're not just doing research for research's sake, but you're looking at other ways of applying knowledge learned through this research. That can have some societal benefits.'*  
( Societal Benefit)

P11

*'It is about looking at your work and seeing is there more I could do with this; could it be something that people would want? Something that people would buy; Something that there is a market for; and if the answers are yes, it's taking that and coupling it with your idea, and finding a way to get it into those people's hands and making some money along the way.'*(Market Value)

P29

*'Working on commercial projects require a certain shift in mindset from publish to protect. The mindset is not conducive to traditional academia so on all fronts, you are meeting obstacles instead of opportunities. They can be overcome but for the majority, it is easier to go around them using research metrics than through them and fight for their acknowledgement as metrics and outputs. It's challenging as 'publish or perish' is more relevant today than ever and we are expected to churn... innovation does not lend itself to churning out publications. Managing the duality is complicated, time consuming and brain consuming and that's in addition to the usual draws on our time in the teaching and research realms.'* (Mind-set)

P27

*'Entrepreneurship is seen as an art and not a science, so people who've gone through the process a number of times can divide it into clear, measurable and executable steps. People who haven't done it see it as kind of a black art. There is a role for academics, who've been successful in securing investment for a start-up company, to come back in and train other academics on that process.'*  
(Entrepreneurship as a process)

P18

*I think it's very compatible with being an academic, having a focus on what I would consider real world [laughs] applications rather than very ivory tower type research. I think the term 'entrepreneurship' can be seen as a dirty word linked to capitalism, something to stay away from, however, it creates channels and opportunities we cannot ignore, both from our perspective and indeed that of our students and society. It may be the word 'entrepreneurship' rather than the reality of what it achieves and that is something we need to reflect on.*(Complementarity)

P21

*'Given the direction that funding has taken, the various strategies we have nationally promoting innovation and commercialisation and the value that academia can bring to it, we seem to whisper when we should be wonderfully articulate and loud. The disjointedness of our approach worries me, but are we very different to other institutions? I think not, well not in the Irish context anyway.'* (Context Driven-Funding)

P18

*'More and more students are asking well what I can do with this knowledge, how can I apply it. We ask students to do projects; normally in their final year and one of the best ways to ensure full engagement is to create something with a real-world need. Where they see an opportunity, they can fill with their solution. This has changed how our students think, where they want to work and what career path they want to take. This, coupled with an increase in Irish entrepreneurs from aviation to Medtech has changed how we train our students; what they see as a career path and ultimately, where they will end up in a few years' time.'*

P9( Context Driven-Students)

Participating academic entrepreneurs were asked to describe their understanding of the purpose of entrepreneurship. All participants offered

opinions on this. There were mixed views in the response to purpose with societal and market value featuring prominently.

Two inter-related thematics emerged which form the basis of many general discussions around entrepreneurs being ‘born’ or ‘made’. Participants noted that they were driven by an entrepreneurial mind-set or saw entrepreneurship as a process that they wanted to uncover. The academic entrepreneurs interviewed sought to take action and develop the innovation or commercial opportunities presented with the entrepreneurial role being a part of who they were professionally.

Finally, context and the purpose of academic entrepreneur as a theme emerged. In this instance, two distinct sub-themes emerged: context or supply side driven or student and demand side driven. Those that were student-driven saw students pursuing an entrepreneurial project within the institution and sought out the expertise of the academic to support the execution of a project or proposal application to support its development. From a context perspective, when we consider the funding theme, academics recognise a shift in the funding landscape. They need to respond to that shift by reframing their approach to research proposals by focusing on ‘real world problems’ domain.

#### 5.2.2 *Perceptions of Role Models, Reputation and Career Impact*

*‘There are indeed academic entrepreneurs who are role models, but I feel that the University does not shine a spotlight on them. Little is written in internal or external communications to celebrate commercial success. Those who come to*

*mind have been successful across different aspects of entrepreneurship or innovation, so it would be useful to those of us working in the broad entrepreneurship area to know who they are and learn from them. We see minimal coordinated effort from the University to do this. It would help to demystify aspects of innovation, develop a network for those interested and also may help to put pressure on policy changes around promotion, jobs and workloads, where bottom-up meets top-down within the institution.'*(Role modelling)

P31

*'The number of entrepreneurs on campus is small but they're highly effective because they know how to build an investable opportunity. (Role modelling)*

P18

*'Yes, but I will not name them ... When I think about this question, I think oh how did I find out about them? Where did I hear about their success, and on reflection, it is definitely not through [institution name] and our email or news updates. It's largely through press pieces generated by the lab or academics themselves and then shared on social media. Again, it speaks to the lack of understanding and awareness that we as an institution have in recognising these successes.'*(Role modelling)

P13

*'There are some really good people and they tend to be repeat entrepreneurs, and I think that's not a coincidence. Once one person has gone through the process of building an investable opportunity and going out and talking to investors, they know what's required. When another opportunity arises for them, they know how to execute on a plan to deliver an investable opportunity'*(Role modelling – Serial)

P18.

*'I was a former head of school and I have to think about people's promotions. I would have seen people who would have done very nice work leading to commercial licensing opportunities who would not be viewed as favourably as people who would have published papers. It was said that this was valued activity, but in practice, it really was not. It could not be. The system didn't allow for it to be measured and scored as it does publications and grants, so the system is inequitable. That's why we see so many of us move toward it once we have achieved a certain level. Systems drive institutions, and our system needs to be changed.'* (Promotional Challenges)

P9

*'We do not measure, reward or encourage entrepreneurship. If you can position it as a contribution or have some research outputs associated with it, you may. This is camouflaging a problem in that our systems and structures are not fit for*

*purpose so I would certainly not condone that approach but understand if you are on a promotional or tenure path that you would, as these are measurable and recognised within the Institution (Promotional).*

P1

*'Yes, funding of this nature enhances my reputation within my field and also takes me into new fields. We are seeing the convergence of technology with other domains, including medicine, health, and culture. Through building my reputation in my own field, I now look to these new and emerging fields of AI and VR coupled with new areas such as medicine, etc. as where I will be in a few years' time. The funding secured has given me credibility, the reputation needed and also the business acumen to capitalise on the convergence of fields and domains.'* (Reputation)

P16

Participants were asked about their knowledge, if any, regarding other notable academic entrepreneurs in their institution. All participants made contributions in this regard with it broadly recognised that role models across the campus played an essential part in the entrepreneurial University. Furthermore, it was recognised that most participants were aware of other the academic entrepreneurs despite there being a lack of communication from University leadership on this topic. Most cited finding their information in local press or television programmes as the source of knowledge.

Informal role models can hugely influence the outcome expectancy and self-efficacy of the academic entrepreneur. They are both a source of inspiration and knowledge to the academic entrepreneur and have the potential to provide guidance and support to enable the academic entrepreneur to develop their pathway in the commercial world.

A less common theme emerged on the role modelling of repeat academic entrepreneurs, those who have developed multiple entrepreneurial assets. It was noted that these types of entrepreneurs demonstrated the repeatability of the process and the willingness to re-engage and take action with further successes achieved.

Participants were invited to discuss their beliefs concerning the impact that being an academic entrepreneur might have on their academic careers. All participants made contributions in this regard. For most participants, it was recognised that the area of entrepreneurship is not recognised as a measure of success in relation to progression or promotion. If not managed correctly, it could negatively impact upon the academic entrepreneur's career given how polarised it is from core activities. At present, the structures and systems still do not exist to support different types of academics. The model is still a one size fits all model that is outdated for several reasons. Participants recognised that this could disincentivise academics, particularly those who are on the promotional track. However, participants also noted that it was possible to publish and commercialise and that depending on unit structures and experiences one could have a very successful career managing both. These structures exist at the local level and use a word of mouth approach instead of any formal procedure or policy at the local level.

Many looked to their own networks from a reputational perspective to validate their entrepreneurial endeavours and actively seek to grow their international

networks in the entrepreneurship domain. These networks are already established for many, so achieving entrepreneurial success validates them within their peer groups.

### 5.2.3 Communities of Entrepreneurial Practice

*'We academically 'grew up' in this space so we work at the intersection of innovation and academia since those early days. Looking across campus there are very few disciplines that have the pedigree with industry and innovation that we possess. I would say in the majority, we work directly in the space or have a team or two who are more aligned to the innovative and entrepreneurship agenda, and we support each other. '(Peer to peer network)*

*P25*

*The positives are access to talent and knowledge. And as I said knowledge with purpose, a clear pathway for funding. Building on those who went before, and what I mean by that is the entrepreneurship is not new to the University, so there is a peer to peer network here that can help and offer advice. We are seeing the policies push more for return on investment and tangible impact beyond publications and knowledge generation to knowledge application. All of which are positive'(peer to peer)*

*P14*

*'I think in our field of engineering we are creators and makers naturally so there are some projects within the Discipline that are very entrepreneurial and innovative. We are a small discipline so we share knowledge and experiences where we can and always learn from one another. I think if it was not that way, I would have had challenges with the project but peer to peer support at staff level is good and also across our students too.'(peer to peer)*

*P24*

*'Within my immediate circle in the lab it is an integral part of what we do. Certain members of the team will be closer to entrepreneurial activities than others, but we all understand it, recognise IP and respect it. More broadly, there seems to be an appetite for it and recognition of it as important.'(entrepreneurial lab)*

*P15*

*'I think common to all of my network is the interest in entrepreneurship, curiosity and innovation and I have worked hard to build my network that way. There is*

*a wonderful community of innovative and entrepreneurial academics and I work within that. There are excellent journals in the space and conferences so I have my priorities straight. I know where they are valued most and I work in that space to maximise my reputation and brand, a term slowly sneaking into my vocabulary because of my entrepreneurial engagements.'* (External Networks)

*P17*

*'I would generally defer to experts in the Technology Transfer Office. I know colleagues engage in entrepreneurship, but our questions are managed by one of my Postdocs, so I direct them to the TTO rather than colleagues as they are generally very commercially specific.'*

*P19*

Participants were encouraged to discuss how colleagues perceived academic entrepreneurship and what communities of practice looked like within their own domain and Discipline. All participants made contributions in this regard. The theme of being part of a peer to peer network emerged as the most cited type of community of practice. Within the peer to peer network, the academic entrepreneurs leveraged the skills and knowledge that exist to further activate and cultivate their entrepreneurial endeavours. Leveraging local 'know how' has created a knowledge pool and expertise that others who join the network can leverage and learn from.

A second thematic of working within an entrepreneurial lab emerged. This was different from the peer to peer network, where supports may exist beyond their own domain. In the entrepreneurial lab, teams work together to develop the lab footprint spanning commercial and academic domains. This primarily relates to a broad mix of academics with different expertise or 'hats' who, when combined,

generate appropriate levels of 'academic' and 'entrepreneurial activities to support the promotion of members of the team but also develop an entrepreneurship portfolio to be recognised as a commercial or bench to bedside lab. The 'hat' wears recognise the complexity and duality of their roles but use different mechanisms to support their success.

A minority of respondents noted that they do not tap into communities of practice and use central supports, including the TTO to manage workflow and queries related to entrepreneurship. They tend to be very specific queries that they do not feel should be answered through a community based approach.

Finally, broadening the communities of practice beyond the institution walls was discussed by participants. Many noted that to develop successfully within the entrepreneurial space, they needed to look to international partnerships, conferences and opportunities to grow and develop. The US and UK were noted as locations that have similar policies to Ireland but are at a more advanced stage of development due to their organisational structures and national policies, which began in the 1970s and 1980s. Leveraging key opinion leaders or 'KOL's was noted as an important aspect of being an academic entrepreneur, and many in the commercialisation space sit in countries with high market access penetration.

This section of the findings has introduced the understanding and perceptions of academic entrepreneurs of their environment and context. There were mixed views on the purpose of academic entrepreneurship with key thematic including societal value, market value and the traditional entrepreneurial dichotomy of 'born' or 'made' being discussed. The role of context was explicitly addressed through the introduction of both supply and demand side context drivers. Supply side drivers included funding sources and the shift of funding instruments towards entrepreneurial outcomes with demand side drivers featuring students as a driver to engage in entrepreneurial activities.

All participants noted the importance of role models. All participants made contributions in this regard with it broadly recognised that role models across the campus played an essential part in the entrepreneurial University. It was also acknowledged that the University should have more robust communication in this regard. Most participants were aware of who on campus engaged in entrepreneurship and the types of projects within their portfolios. Responses on promotion and career advancement acknowledged the challenges faced by those seeking promotion in a system that does not yet fully understand or have mechanisms to measure entrepreneurial efforts and engagements. From a reputational perspective, many respondents looked to their own networks for validation and reputational support.

The role of networks was extended into the communities of practice section, with many positive responses noted on the support structures created by units 'locally' to support the entrepreneurial mission. Firstly the peer to peer network that exists across the campus was discussed and recognised as a support to those who want to develop their entrepreneurial self. Some participants also discussed the role of their immediate work environment or lab as a creator and enabler of academic entrepreneurs. For some academic entrepreneurs, they are born in such an environment, so they are attuned to entrepreneurship from the very early stages of their role identity and career development. Finally, international networks were discussed by participants. It was acknowledged that Ireland has a limited market size and pool of experts in academic entrepreneurship and the advice and guidance of 'key opinion leaders' or KOL's is often sought to support commercialisation, legitimisation and accessibility to large potential markets.

### 5.3 The Entrepreneurial Orientation and Role Identity of the Academic Entrepreneur

This section of the findings is concerned with the cognitive-self, the internal attitudes, perceptions, understandings and opinions of participant academic entrepreneurs on entrepreneurial identity and orientation. The cognitive self and how central entrepreneurship is to the role identity of the academic entrepreneur will provide insights into their orientation and identity. The section explores the titles and labels ascribed to the academic entrepreneur in addition to their entrepreneurial orientation, both of which contribute towards the identity of the academic entrepreneur. Building the earlier questions of this study the title and label that academic entrepreneurs identify with help to further

establish how the unit of analysis identified using external titles and labels. As the title of academic entrepreneur is a relatively new term within academia, it may provide insights into the mainstreaming and use of the title in the case site.

The entrepreneurial orientation question seeks to give insights into the intentions and actions of the academic entrepreneur and the purposeful enactment of entrepreneurship as a core part of their being. Orientation and role salience are interlinked as salience refers to the likelihood that the identity will be active or actioned across situations. Therefore orientation, and in this instance the prioritisation of individuals orientation give insights into role salience and likeliness to action entrepreneurial activities.

The coupling of the internal and cognitive factors together with those introduced in section one create a holistic view of the academic entrepreneur.

This section considers the internal attitudes under the following headings:

- I. Titles and Labels
- II. Entrepreneurial Orientation

#### 5.3.1 Titles and Labels

*'It is very clear from my profile that my domain spans the commercial world. It is not something I dilute. I am incredibly proud of my projects, funding and outputs, so everything is published online in addition to our lab profile and information about the team etc. We do this to signal that yes, we develop commercial projects to spin out or licences, we understand the rules of engagement. We do it to attract talent and demonstrate to funders and evaluators that our lab spans academia, enterprise, and government*

*boundaries. Would I take offence if it was how I was referred to? Absolutely not, for it is part of who I am.'*

P17

*'Yes, at some conferences, but more in the business domain, it has been used. I think the word academic is almost lending itself to a hyphenated term. So, for example: policy-academic, entrepreneurial-academic, or academic-journalist. We are seeing changes, and I think that is good. You don't want to devalue academia, but you do want to recognise the value of different types of academia.'*

P9

*'No, generally people focus on the clinical me and that is how I am generally referred to. I would have no issue with the title, but I think at this stage of my career, I must hold between 20-30 so they interchange so often I lose track. Different name tags for different days and different roles. It seems to be how academia is going, but as I think I said when we started, whatever else you do cannot erode the core of academia, it must complement the approach, synergise with it and most importantly contribute back.'*

P27

*'I am comfortable with it, but I think labels really limit us. I think the term academic is so broad yet so narrow in some ways that maybe it's time to revisit the term academic itself or to have different roles and types so that we can step closer to the label and be more comfortable with it. We have a better sense of the landscape and types of engagements that we work on, so it might be time.'*

P12

*'I would not consider myself to be an academic entrepreneur. I am an engineer. A technical lead on projects. I know my grants are in the commercial space, but that's where the TTO come in. They support that part of the project, not me.'*

P22

Participants were invited to discuss their views on how they respond to being described as an academic entrepreneurs. All participants made contributions in this regard. Results for this finding gave mixed views. For most, being described as an academic entrepreneur was an acceptable title, as it aligns with their identity and does not diminish the other roles, in which they play in either academic or commercial life. Most recognised it was not a title that they had

actively sought out as generally 'an academic' is just known as 'an academic' but are happy to be described in those terms and actively promote their entrepreneurial engagements and activities publicly. Participants recognised the multiplicity of titles they can and do hold because of the multi-faceted nature of the various roles played through their day-to-day work.

For a minority of respondents, the title did not sit well with them. They acknowledged that their role in entrepreneurship was more as a facilitator and an enabler of others rather than a core part of their identity. They recognised that given the nature of their funding portfolio, they could look to be entrepreneurial at a superficial level. However, their expertise sat in their respective academic domain, and they bring subject matter expertise to the project, not business or commercial acumen.

### *5.3.2 Entrepreneurial Orientation*

This section of the findings explores the entrepreneurial orientation of academic entrepreneurs. Entrepreneurial orientation is an important concept to consider as it gives insights into the frame of mind and perspectives of entrepreneurship that the academic entrepreneur identifies with. It gives insights into the intentions and actions of the academic entrepreneur and the purposeful enactment of entrepreneurship as a core part of their being.

Participants were asked to select their top two choices from amongst four statements related to entrepreneurial orientation (see table 5.1). The statements draw attention to the role of entrepreneurship within their professional role identities and how they view their roles as either distinct from or intertwined with entrepreneurship. The statements are adapted from a study by Lam (2010).

Participants were asked to pick their top 2 choices amongst the following four statements:

|  |
|--|
| 1. I believe that academia and entrepreneurship should be distinct, and I pursue success strictly in the academic arena  |
| 2. I believe that academia and entrepreneurship should be distinct, but I pursue entrepreneurial links activities mainly to acquire resources to support academic research |
| 3. I believe in the fundamental importance of academic entrepreneurship and I pursue these activities for societal and scientific benefit                                  |
| 4. I believe in the fundamental importance of academic entrepreneurship and I pursue these activities for commercial exploitation  |

**Table 5.1: Academic Entrepreneur Orientations Statements**

Table 5.1 above shows options available to 31 academic entrepreneurs and how they ranked their 1<sup>st</sup> and 2<sup>nd</sup> choices. The majority believed in the importance of entrepreneurship for both scientific benefit and commercial exploitation. Five participants ranked statement 2 as their 1<sup>st</sup> choice, and four ranked statement one as their 2<sup>nd</sup> choice, demonstrating a small number of participants take a more traditionalists view of academia. Statements 3 and 4 garnered higher selection with statement selected as the 1<sup>st</sup> choice for 19 participants and 2<sup>nd</sup> choice for 8, whilst statement 3 was selected as the first choice option for 7 participants and 2<sup>nd</sup> choice for 19.

| Statement No | 1 <sup>st</sup> Choice # | 2 <sup>nd</sup> Choice # |
|--------------|--------------------------|--------------------------|
| 1            | 0                        | 4                        |
| 2            | 5                        | 0                        |
| 3            | 7                        | 19                       |
| 4            | 19                       | 8                        |

**Table 5.2: Entrepreneurial Orientation Responses Summary Table**

The findings show that nineteen respondents selected statement four as their first preference. Eight participants selected this option as their second preference. This demonstrates that the majority believe that academic entrepreneurship is fundamentally important to the overall academic mission of the University, and they (both the individual and the institution) should seek to exploit that for commercial gain. This aligns with the demand side findings noted earlier in section 1.

The second highest ranking of first choice selection was option three, which saw seven respondents recognising that academic entrepreneurship is important regarding benefits to society and the scientific community. This was the highest ranking of second choice responses. The pursuit of societal and scientific benefits is primarily achieved through a mix of resources and funding sources that are

supply and demand side driven. Again this is noted earlier in this chapter in section 1.

The third highest ranking of the first choice is statement two. Five participants believe that academia and entrepreneurship should be distinct and that entrepreneurial activity should only be considered a mechanism to support academic research. This again sat with the concept of supply side drivers of entrepreneurial activity. This statement demonstrated that entrepreneurship is not central to the identity or orientation of the respondent that it is only utilised to support their longer term ambition to conduct research. There were no second choice responses for this statement.

Finally, there were no responses to the first statement relating to academia and entrepreneurship should be distinct and only pursuing success strictly in the academic arena. There were four second choice responses. This demonstrated a definite shift in role identity „ which could be attributed to the factors discussed in earlier sections of the findings. In the minority, there are still some academic entrepreneurs who are reluctant to move beyond their core identity of being an academic.

In this section of the findings, the study has narrowed to focus on the individual, their title and entrepreneurial orientation. Firstly, participants were invited to discuss their views on how they respond to being described as an academic

entrepreneur, with the majority comfortable with the title and the associated attributes of being an academic entrepreneur.

Most recognised it was not a title that they had actively sought out but are happy to be described in those terms. Participants recognised the multiplicity of titles they can and do hold because of the multi-faceted nature of the various roles played through their day-to-day work.

In conclusion, this section considered the entrepreneurial orientations of academic entrepreneurs, with most identifying as pursuing entrepreneurial activities for commercial gain. A minority of respondents noted that they were reluctant to move beyond their core identity of being an academic with success for them coming specifically from the academy rather than through academic entrepreneurship endeavours. This study now goes beyond these insights on entrepreneurial identity and orientation to examine how the academic entrepreneur perceives their identity and develops a number of typologies of academic entrepreneurs.

## 5. Typologies of Hybrid Academic Entrepreneur

Part 3 utilises a within and cross case analysis to explore the overarching insights into how academic entrepreneurs manage the paradox and complexity of their role identity. This is presented through three academic entrepreneur typologies, the Resourceful academic entrepreneur, the readymade academic

entrepreneur and the reluctant academic entrepreneur. The author proposes that the mobilisation of case knowledge or, in this case, academic entrepreneurs as individual cases when compared and contrasted can offer new knowledge and insights into the field of inquiry.

This section of the findings introduces a number of typologies associated with the research conducted for this study. Commonalities emerged from this iterative and interpretive process using sub-ordinate codes themes, which were then grouped into higher level role types. These typologies are Resourceful (AE), Readymade (aE) and Reluctant (Ae).

#### *5.4.1 The Academic Entrepreneur- Resourceful*

The development of the Academic Entrepreneur Resourceful (AE) emerged from patterns emerging in the sub-ordinate themes, which were then validated through quotations provided by academic entrepreneurs. It was possible to group these themes and quotes together to create this typology that mapped to individuals within the study. A vignette of the Resourceful Academic Entrepreneur is included to provide deeper insights into their role and identity.

The Resourceful Academic Entrepreneur manages the duality of their role through their own experience and by creating and nurturing a like-minded team to support their entrepreneurial endeavours. They hold posts at Professorial level

within the institution and are in their 50's. Their focus is no longer on promotion. They are focused on attracting and growing talent within their team.

They understand the HEI landscape, have a strong reputation in the entrepreneurship domain. They are knowledgeable about technology transfer and all its aspects and have a working relationship with the technology transfer unit of the University. They hold licences or patents and have or are focussed on spinning out a company in their respective field, which is in the West of Ireland, most likely Medtech or technology based. They are a resourceful individual with the requisite seniority and reach to create commercial outputs.

They are recognised as leaders in the entrepreneurship space by other colleagues. They are known to work in commercially focussed space which includes collaborating with industry and their aforementioned commercial outputs. Their language is a mix of their academic and entrepreneurship experiences, and they speak at ease about pathways to commercialisation. They publish and protect their IP by building the necessary structures and supports to achieve both outcomes. They straddle both the role of academic and entrepreneur successfully and both identities are central to who they are.

Their funding portfolio is a broad mix of state and international funding spanning Enterprise Ireland Commercialisation Fund, Disruptive Technology Innovation Fund (DTIF), Science Foundation Ireland and the European Union.

### **Vignette 1 – Academic Entrepreneur Resourceful(AE)**

Participant nine (P9) is a Resourceful Academic Entrepreneur. They are a Professor in the School of Natural Sciences working in microbial ecology and bioprocessing. Their collaboration and partnerships areas include mitigation of greenhouse gas emissions from agriculture and agri-industries; on anaerobic biofilm reactor technology for bio refining, energy production and wastewater treatment; and on treatment and prevention of biofilm-mediated infections. They are the co-founder of two companies and the lead inventor of an LtAD technology. The companies are in the area of anti-infective agents and maximising the efficiency of natural resources, deriving value streams from a variety of materials, often those deemed as waste. Their companies employ 16 people. The licenced technology is licenced to a start-up company in the West of Ireland that has won multiple awards working in the waste water space.

They actively teach, research and publish. Each year they generally publish between five and seven articles in academic journals. In 2021 they have published six articles thus far. They have supervised twenty three PhD students and runs a lab with approximately ten staff. They hold a broad portfolio of funding projects spanning agencies including Enterprise Ireland, the Environmental Protection Agency, the European Union, Science Foundation Ireland and the Irish Research Council.

| RESOURCEFUL- Academic Entrepreneur(AE)   |   | N=17   |
|--|---|--|
| Sub-Ordinate Themes  | Illustrative Quotes   | Summary Details  |
| <ul style="list-style-type: none"> <li>• Shift in the role of University towards the D side of R and D aligned to Entrepreneurship(36)</li> <li>• Couldn't do Work Without Entrepreneurial Funding(35)</li> <li>• Role Has Expanded But So Has Team and Support Structures(30)</li> <li>• Autonomy Important to Pursue Passions and Interests(27)</li> <li>• Peer to peer support(28)</li> <li>• Wear Multiple Hats At My Career Stage(27)</li> <li>• Dark Art of Publishing Whilst Having IP to Protect(25)</li> <li>• Field Closely Related to Innovation(22)</li> <li>• Commonalities between Academia and Entrepreneurship(19)</li> <li>• Grown as a Leader(19)</li> </ul> | <p>'With every project, I learn, and my role adapts and changes in response to those learnings. For commercialisation, funding this was more prevalent. The terminology was alien to us at the beginning, the TTO team were excellent in providing advice and support but when you are in the project you need to grasp these terms, their meaning and the expectation around them to ensure that the project is delivering, technically we knew everything and we confident in the project but converting that technical knowledge to commercial output was challenging. Across the team, we had a driving ambition that this technology needed to make a broader societal impact, and it drove it with that in mind. If we have to learn commercial language to achieve this, let's do it. So we did. Am I fluent, absolutely not, but others in the team are. They depend on me technically I depend on them commercially' (P31)</p> <p>'I would have always been very aware of and tuned in to the whole technology transfer commercialisation and everything around that. It's always been part of my DNA, really. Even from before I joined the University, while I was working here on campus but not employed by the University, it would have been very, very much a focus of my activities.' (P28)</p> <p>'My colleagues and those close to me were like hearted and differently minded, what I mean by that is they had the motivation and drive for entrepreneurship but brought different aspects of knowledge to the projects.' (P4)</p> <p>'I had always been entrepreneurial, I suppose. Even back to my undergrad days, I ran various different sporting activities, adventure sports, just going to set up businesses around those areas, just summer businesses. I was curious and driven, and those traits span both research and innovation. As my career developed, I felt myself returning to these values.'(P8)</p> | <p>These academics are senior in their respective roles and have autonomy within their units to harness innovation.</p> <p>They have extensive involvement in funded research and lead teams and units with a focus on the commercialisation of research.</p> <p>They do not feel pressure to 'perform' due to their seniority. They engage actively from a perspective of interest and contribution to society.</p> <p>From a profile perspective, they are all Professorial level with the exception of one individual who at the time of the study had applied to the Personal Professor promotion track within the study site.</p> |

#### 5.4.2 *The Academic Entrepreneur- Readymade*

The development of the Academic Entrepreneur Readymade (AE) emerged from patterns emerging in the sub-ordinate themes, which were then validated through quotations provided by academic entrepreneurs. It was possible to group these themes and quotes together to create this typology that mapped across individuals within the study.

The Readymade academic entrepreneur was born into an industry or commercial facing lab. Their identity straddles both academia and entrepreneurship comfortably with entrepreneurial action central to their core activities and engagement. They are at the early stage of their career as an academic entrepreneur, and they are focused on promotion, progression and career development. They have a passion and a desire for innovation and are part of a community of academic entrepreneurs who support and develop one another.

They are fluent in academic and entrepreneurial languages and building their reputation in the space. They understand the HEI landscape and are building their reputation in the entrepreneurship domain. They are knowledgeable about technology transfer and all its aspects and have a working relationship with the technology transfer unit of the University. They are most likely trained in innovation and entrepreneurship informally through their lab.

They are recognised as being at the early stages of their career and focus on both publishing and protecting IP. They are most likely to work under the direction of an Academic Entrepreneur (Resourceful).

They are at the early stages of developing their funding portfolio but are keenly aware of the funding instruments that align with their expertise and have received funding minimally from Enterprise Ireland through their Commercialisation Fund, again linking with the role salience to act on their entrepreneurial interests . They mentor, support and advise other academics and are recognised as a developing entrepreneur in the University.

#### **Vignette 2 – Academic Entrepreneur Readymade(aE)**

Participant 12 (P12) is a lecturer in Microbiology. Their domains of expertise are on the development of innovative solutions for infectious disease diagnostics and public health microbiology. Of particular interest to participant 12 is the application of whole genome sequencing in clinical microbiology, both from human and healthcare environmental reservoir samples. They completed their PhD in a lab under the direction of a 'Resourceful Academic Entrepreneur' and uses innovation terminology with ease. During their PhD, they have worked on developing technologies and with industry as part of their learning and development. They see academia and entrepreneurship as largely complimentary from working within that environment for a number of years.

Participant 12 has completed an innovation accelerator programme enabling them to develop their technology to bridge the gap between being de-risked and receiving investment which has supported them to develop the technology at pace. They are now the interim CEO of a diagnostics spin-out that develops innovative PCR tests for the detection of microbial pathogens associated with water contamination in environmental and industrial processes. Together with their team of 3, they develop and market these PCR test kits worldwide using patented technologies. The first technology created by the company, Bio Lp-1, a transformative Legionella test kit and was funded by the prestigious Fast Track to Innovation Award in 2020. They are very active in the start-up space and have acted as mentors and advisers to others seeking to innovate and commercialise.

They publish two to three papers each year and has held Enterprise Ireland and EU funding. They actively contribute to teaching and research and supervises both Undergraduate and Postgraduate students.

| READY MADE (academic Entrepreneur)   |  | N=9  |
|--|--|--|
| Sub-Ordinate Themes  | Illustrative Quote s   | Summary Details  |
| <ul style="list-style-type: none"> <li>• Network(26)</li> <li>• Training Students to Better Understand Business, Research and Innovation working Together(20)</li> <li>• Always Worked in This Area(17)</li> <li>• Academic Entrepreneurship Becoming More Relevant(14)</li> <li>• Field Closely Related to Innovation(17)</li> <li>• Role models(16)</li> <li>• Peer to peer support(21)</li> <li>• Couldn't do Work Without Entrepreneurial Funding(19)</li> <li>• Always Worked in Applied Research(7)</li> <li>• Individual Desire(8)</li> </ul> | <p>'From a day to day perspective it is a core part of my role. Our lab is industry focused, my research sits in the public health space so for me I work to get my science out there, into labs, into patient care. Entrepreneurship is the vehicle that will be used to get it from the lab out of the University into society' (P12)</p> <p>'I would struggle to separate it from my identity as an academic. For me engaging with industry and maybe having that awareness of commercialisation and that need to commercialise and the reality that you can translate research through companies a lot quicker at times, that would be standard of an academic coming out of our lab' (P2)</p> <p>'We run alongside industry in terms of our research and educational training. Many of our projects are partner orientated with a mix of academic and non-academic partners, even our publications go to print mainstream industry magazines in addition to the more traditional academic publications'(P26)</p> <p>'I feel that in the earlier days of commercialisation engagement, we learned through our experiences, now obviously we have a technology transfer unit on campus who support our engagement with entrepreneurship and funders in the commercialisation space. We are versed in the terminology, licensing, IP and negotiations' (P15)</p> | <p>These academics are mostly junior in their respective roles, with the exception of one who is a Professor. They have autonomy within their units to harness innovation however it is limited to being part of a team and working under the direction of a senior academic (not applicable to Professor)</p> <p>They have extensive involvement in funded research, but most are holding their first award as a funded PI (One is at the Professorial level and holds full autonomy).</p> <p>They feel pressure to 'perform' due to the level of their post, and they engage actively in all aspects of academic life to support their promotion track(research, academic, leadership and administration)</p> <p>From a profile perspective, they are at Lecturer below and above the bar levels with the exception of one as described above.</p> |

#### 5.4.3 *The Academic Entrepreneur- Reluctant*

The development of the Academic Entrepreneur Reluctant (Ae) emerged from patterns emerging in the sub-ordinate themes, which were then validated through quotations provided by academic entrepreneurs. It was possible to group these themes and quotes together to create this typology that mapped across many individuals within the study.

The Reluctant Academic Entrepreneur is somewhat pushed towards Entrepreneurship, it is not a central part of their role nor do they want it to be. This push is primarily driven by students or a lack of funding in their domain of expertise. They span levels within the institution and are more aligned to the teaching and research mission of the University.

They understand the higher education landscape. They do not have a strong reputation in the entrepreneurship domain. They are aware of and understand the role of the technology transfer office and look to them as the commercial agents of the institution and recognise that this is not an area that they want to build expertise in. Their funding opportunities are shrinking as state, and EU funding moves towards research with higher technology readiness levels (TRL's) or the expectation of commercial outputs.

They hold licences or patents but are not focused on these entrepreneurial assets. They were developed at the request of the technology transfer office or as part of their funding requirements. They are not comfortable with the title of 'entrepreneur' and see it as a paradox from their core activities. Their language is that of an academic who defers to the technology transfer office on all aspects of commercialisation or entrepreneurship. Their funding portfolio is a broad mix of state and international funding, but most are non-commercial and research-focused. They do not mentor, support and advice within and beyond the institution and refer students or colleagues with interest in innovation and entrepreneurship.

### **Vignette 3 – Academic Entrepreneur Reluctant(Ae)**

Participant 19 is a reluctant Academic Entrepreneur. Their main research areas are in the fields of integrated and planar magnetics, which includes power electronic applications, energy harvesting and wireless power systems. They are an expert in the field of FEA (Finite Element Analysis) modelling of magnetic components.

They have supervised 12 PhD students and actively publishes (approx. 3-4 articles) per annum. Their engagement with entrepreneurship is funding and student driven. Their funding portfolio includes Enterprise Ireland and the Irish Research Council. They hold a number of licences primarily due to their research area, which is closely aligned to many technologies (battery based). Funding in their area is limited and tends to sit in the commercial space, although their expertise is in the engineering field of developing batteries. From a student perspective, their interest and curiosity in innovation have resulted in a number of grants being awarded to develop out technologies. Still, they see their role in the technology development rather than the commercial development space. They leverage all support available within the

institution to support the innovation and commercialisation aspect of projects and does not have a desire to progress beyond licensing.

They do not engage in any mentorship or provide innovation support to students or others or contribute to the innovation ecosystem.

| Reluctant(Academic entrepreneur)  |   | N=5   |
|---|---|---|
| Sub-Ordinate Themes   | Illustrative Quotes   | Summary Details   |
| <ul style="list-style-type: none"> <li>• Career Inhibiting (22)</li> <li>• Focus on Publishing (14)</li> <li>• Student Driven (11)</li> <li>• Could Damage reputation if moving towards entrepreneurship (8)</li> <li>• Academics doing entrepreneurial research is unrealistic (6)</li> <li>• Too much emphasis on entrepreneurship and commercialisation (5)</li> <li>• Entrepreneurship distracts from core academic role (5)</li> <li>• Drawing funding away from basic research (4)</li> <li>• Conflict of interest (9)</li> </ul> | <p>'I would never have seen entrepreneurship fitting with my role, I enjoy being creative and finding solutions but the pursuit of funding or developing an idea at scale is not something that I ever considered. I am, to all intents and purposes, a reluctant entrepreneur.' (P30)</p> <p>'My students largely drive my engagement, and in particular one group of students who were hugely interested in taking a prototype that they had developed and trying to build a commercial case for it. I was happy to help with the engineering aspects of the project, but once the project developed me needed the support of colleagues in the technology transfer office to look at the business case.'(P19)</p> <p>'It is an implicit directive. The funding landscape has obviously changed in recent years. We move further and further away from basic science research being funded, which obviously brings us closer and closer to applied and translational research. As funders requirements shift, there is no definitive you must apply for research grants that seek to commercialise or innovate' (P22)</p> | <p>These academics are a split of senior (3) and junior (2) in their respective roles and have autonomy within their Colleges to harness innovation and engage with entrepreneurial activities.</p> <p>They have extensive involvement in funded research but limited experience of commercialisation funding due to their reluctance to engage in this type of funding source.</p> <p>They feel pressure to 'perform' and feel somewhat stifled by the direction that research funding is taking, limiting their opportunity to apply given their interest in the non-commercialisation of research.</p> <p>From a profile perspective, they are at Lecturer below and above the bar levels.</p> |

#### 5.4.4 Typologies Mapping

This section of the findings presents a visual mapping of the different typologies with a detailed narrative of the various quadrants and their respective participants. Figure 5.1 provides an overview of this information in a two by two matrix diagram.

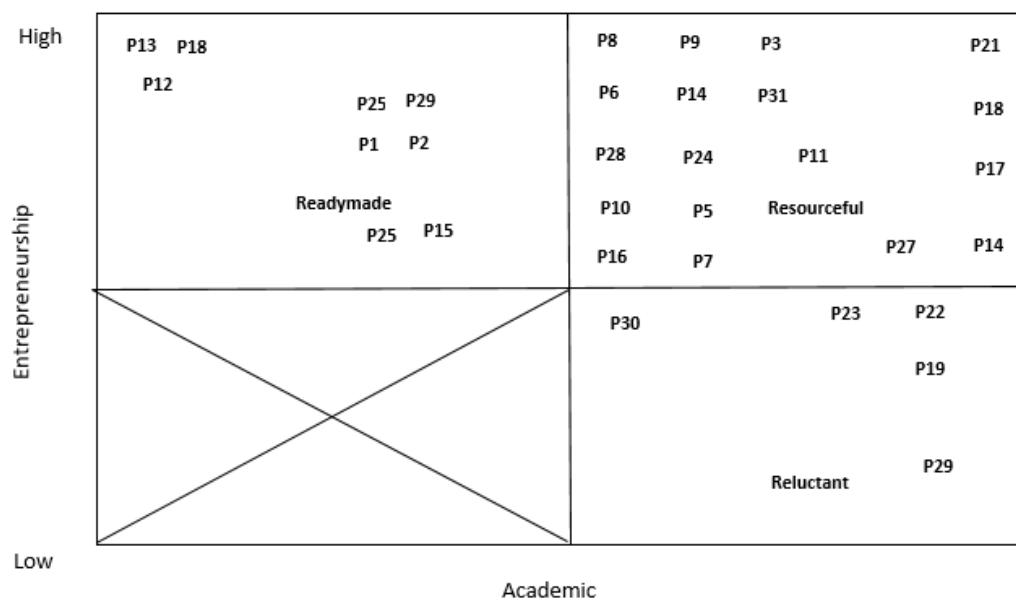


Figure 5.1: Mapping of Hybrid Typologies of Academic Entrepreneurs.

**Resourceful Quadrant:** There are 17 ‘Academic Entrepreneur’s that were identified as ‘Resourceful’ within this study. Within this quadrant, they are positioned in six distinct sections of the resourceful quadrant. This positioning is discussed below.

- P8, P9, P3, P6, P14 and P31 are serial academic entrepreneurs who hold multiple licences, spin outs and/or patents. They are acknowledged as experts in their domains. They actively publish in the public domain and are active contributors to the internal network of academic entrepreneurs. They

acknowledge entrepreneurship as a core part of their identity and manage a work environment that is training and growing 'readymade' Academic Entrepreneurs.

- P28 sits a little away from P24 and P11 in figure 5.1. P28 is an established academic with a thriving entrepreneurial asset. They have not achieved the success of the P8 cluster but are vocal and knowledge share broadly, and they are recognised as being entrepreneurial. P24 and P11 are in a similar position however, both work together to develop and commercialise technologies. Their small peer to peer network is closed, and whilst they support others, it is through referral rather than an open door approach.
- P10, P5, P16 and P7 work in the technology space, which is a different space to operate in from an entrepreneurial perspective. This group clusters for peer to peer knowledge exchange around commercialising and has a mixed portfolio beyond Enterprise Ireland funding. They are established in their domain, but the pace of innovation is far faster and of lower value. The cluster is responding to change through convergence with other domains, but that is currently at an embryonic stage.
- P21 and P18 sit in particular domains that have shifted from applied to more translational in nature. They are resourceful in that they have adapted and increased their capacity to develop their centres in an entrepreneurial way but are still learning the art and science of entrepreneurship and leveraging expertise from others through role modelling and mentorship in addition to supports, including training from the Technology Transfer Office.

- P27, P17 and P4 sit close to all quadrants but are recognised as ‘Resourceful’ Academic Entrepreneurs. They hold a broad portfolio of commercial projects, have large labs and hold multiple licences, patents and spin-outs. However, they are very chameleon-like and can adapt and respond to contextual shocks and changes rapidly. They are high exploitative and opportunistic and, depending upon the opportunity, shape shift to respond accordingly. However, central to their identity is commercialisation, but beyond this, they could be classified as policymakers, politicians, or indeed PR experts.

**Readymade Quadrant:** There are 9 ‘Academic Entrepreneurs’ that were identified as ‘Ready Made’ within this study. Within the quadrant, they are positioned in three clusters

- P13, P18 and P12 are positioned at the top left of the quadrant. P13 and P18 are staff that have recently been promoted to Professors. They have secured significant funding to support their entrepreneurial activities and are building entrepreneurial capacity through their centres. Their roles have always been in the industry and entrepreneurial space, so their identity is that of a readymade academic entrepreneur. P12 has a similar lineage. However, they have only recently secured an academic post within the institution. They have significant experience as a postdoctoral research, are building their independent research portfolio and have taken part in multiple entrepreneurial programmes, including accelerator programmes which have resulted in a Spin out company and multiple licence agreements. They are

located high on the quadrant as they are fully established within their domain and role models and supporters and mentors of others in the academic entrepreneurship space.

- P26, P1 and P29 are early stage academics working at lecturer level but have secured significant funding to support their entrepreneurial activities. They are on the promotional track and part of a peer to peer network.
- Also operating within the peer to peer network is P2 however they are at an earlier stage of their career and learning from the more established network and role modelling supported by P26, P1 and P29. P26, P1, P29 and P2 are located centrally within the quadrant as they are continuing to develop their portfolios and reputation in the entrepreneurial space.
- P15 and P25 are early stage academics also having just secured their first entrepreneurial fund with patents filed for both. They have formed a support network within the Sciences field, and both worked from their PhD stage on entrepreneurial projects. They are located lower on the quadrant map as they are still developing their entrepreneurial capabilities and funding portfolio.

**The Reluctant Quadrant:** There are 5 Academic Entrepreneurs' that were identified as 'Reluctant' within this study. Within the quadrant, they are positioned in three clusters

- P20 sits alone with the study as their role as a reluctant entrepreneur relates to a failed spin-out that has impacted their identity and desire to engage in

entrepreneurial activity. The failure to spin out the company was time and resource intensive and occurred close to the participant's interview. They are positioned low on the quadrant as it is unlikely they would seek any future funding in the entrepreneurial space.

- P30 also sits alone within the mapping of typologies. This participant takes a deferral approach to academic entrepreneurship, and whilst they engage with and draw funding, it is wholly managed by their team. They have no interest in generating spin outs, patents or IP but are comfortable managing a centre that does. The centre is largely independent of P30, with their role focussed on high level activities primarily related to clinical research and patient care. P30 continues to exploit entrepreneurial funding within the current structures they have established within their centre.
- P19, P22 and P23 are clustered as they exhibit similar attributes. They are context driven to be academic entrepreneurs by their students or the funding environment as identified earlier within this study. They have little or no desire to be entrepreneurial but feel compelled to by these external factors. They may, however, continue to exploit such funding as they recognise and respond to contextual factors.

#### *5.4.5 Intrinsic and Extrinsic Factors of Academic Entrepreneurship*

Earlier this chapter in sections 1.1, 1.3 and 2.2 the concepts of supply and demand side factors that influence identity were introduced. Supply side concepts are extrinsic or push factors that drive the academic entrepreneur towards

entrepreneurship. Supply side concepts support the lack of willingness to engage in entrepreneurship, which show that both role salience and centrality are low in respect of entrepreneurship. These factors include student and funder requirements and can result in the academic needing to reframe their identity towards entrepreneurship. From the demand side perspective these are intrinsic and form part of the internal drive for entrepreneurship and include factors such as curiosity and the benefits to society. Those who are intrinsically motivated see entrepreneurship as central to their identity and their decision to take action supports role salience in defining them as ‘Academic Entrepreneurs’. It is unsurprising that the Resourceful Academic Entrepreneur has the most balanced factors of both intrinsic and extrinsic factors, whilst the Ready Made is largely internally driven and the Reluctant is large externally driven. Such findings offer further insights into the influences of both context and identity on the academic entrepreneur and their current typology. See table 5.2 for a summary of each typology.

|           | Resourceful(AE) | Ready Made(aE) | Reluctant(Ae) |
|-----------|-----------------|----------------|---------------|
| Extrinsic | 162             | 77             | 86            |
| Intrinsic | 181             | 125            | 49            |

**Table 5.3: Intrinsic and Extrinsic Mapping of Academic Entrepreneur Typologies**

Using the information provided throughout the data analysis, we can further map this data in relation to the role salience and centrality of the Academic Entrepreneurs as follows:

| Typology    | Role Centrality   | Role Salience  |
|-------------|---|--|
| Resourceful | A dual role centrality where the academic is equally comfortable in academic or entrepreneurial domains.<br><br>A role that exhibits equilibrium.   | Medium – driven by both extrinsically and intrinsic factors to take action. All have multiple examples of actions taken to support entrepreneurial activity. |
| Ready Made  | A role centrality that is more focused on entrepreneurship than academia and sees entrepreneurship commonplace within their network, work environment and with their students. Commercialisation is the focal identity. | High for Entrepreneurship as demonstrated evidence to take commercial action and largely intrinsically driven.   |
| Reluctant   | Role centrality that is more focused on academia than entrepreneurship and sees entrepreneurship as unavoidable within the institution. Academia is the focal identity  | Low as largely extrinsically driven to take entrepreneurial action.  |

**Table 5.4: Role Salience and Centrality of Academic Entrepreneur Typologies**

## 5.5 Conclusion

This chapter considered the analysis of interviews with 31 academic entrepreneurs in a large third level institution in Ireland. The chapter has analysed the experiences, attitudes, beliefs and behaviours of study participants across three domains. Firstly, the exogenous attitudes, perceptions, understandings and

opinions of participant academic entrepreneurs on entrepreneurship within a mature entrepreneurial university were considered. The role and importance of external and contextual conditions can influence both the manner in which the academic entrepreneur participates in entrepreneurial activity and the mechanisms that support their engagement. Secondly, this study has considered the cognitive-self, the internal attitudes, perceptions, understandings and opinions of participant academic entrepreneurs on their entrepreneurial identity and orientation. Finally, this study utilised a within and cross case analysis to explore the overarching insights into how academic entrepreneurs manage their hybrid role identity and introduced three typologies of academic entrepreneur, the 'Resourceful', the 'Readymade' and the 'Reluctant' academic entrepreneur.

The next chapter presents a discussion of the findings outlined in this chapter which specifically address the research question of this study 'How academic entrepreneurs manage the paradox and complexity of their role identity in a mature entrepreneurial university environment.

## Chapter 6- Discussion Chapter

### 6.1 Introduction

This chapter discusses the findings outlined in the previous chapter, which addresses the study's research question," How do academic entrepreneurs manage their hybrid role identity in a mature entrepreneurial university environment?" The study considered the perceptions and understanding of academic entrepreneurship, how the entrepreneurial orientations and role identity of academic entrepreneurs is perceived and how to the typologies of academic entrepreneurs manifest in a mature entrepreneurial university.

The ongoing expansion of university-entrepreneurship ties has been a profound organizational change that has shaped academics' work experiences, particularly in the last two decades. These changes have influenced the norms, context, and perceptions of academic entrepreneurs by blurring the boundaries between science and entrepreneurship (Beck and Young, 2005, Hackett, 2001). The first goal of this research is to look at how context and perceptions affect academic entrepreneurs' role identities. The literature has primarily focused on formal policy level changes, with little emphasis on cultural norms at the local or individual level (Aldrich and Fiol, 1994). The social structures in which the academic entrepreneur is situated is central to their formation and modes of engagement (for readymade academic entrepreneurs), their leadership and role modelling (for resourceful academic entrepreneurs), and their tolerance of

entrepreneurship (for reluctant academic entrepreneurs) (Duberley *et al.*, 2006; Mouzelis, 1989).

The second objective of this study is to understand the orientation and identity of the academic entrepreneur within the mature entrepreneurial university setting. This research focuses on academic entrepreneurship at the micro-level (Jain *et al.* 2009; Perkmann *et al.*, 2013). At the micro-level, we see the critical drivers of an individual's role and orientation toward academic entrepreneurship, as well as how they manage the duality of that identity within a mature entrepreneurial university site. A more in-depth understanding of academic entrepreneurs' involvement is lacking in most discussions about academic entrepreneurship (Jain *et al.*, 2009).

Furthermore, the majority of studies to date (Balven *et al.* 2018) have focused on single characteristics associated with academic entrepreneurship, such as propensity to patent or industry engagement (Perkmann *et al.*, 2013; Rothaermel *et al.*, 2007). An exploratory in-depth qualitative approach was required to gain a complete and in-depth understanding and appreciation of the changes and challenges faced by academic entrepreneurship. This has resulted in a better understanding of the academic entrepreneur's drawing and redrawing of academic boundaries of their roles, how they consider their role identities to impact their careers, and how they manage their workload. All of these are critical

questions that underpin the entire concept of the modern entrepreneurial university.

The study then considers how academic entrepreneurs manage their role identity within the entrepreneurial university and identifies three typologies of academic entrepreneurs that exist within the study site. We have a limited understanding of academic entrepreneurship due to a lack of scholarly emphasis on the academic entrepreneur and, more specifically, the types of academic entrepreneurs that exist. The lack of scholarship focus on this area, and more specifically the lack of qualitative research in this area, has been through formal mechanisms of Academic Entrepreneurship, primarily due to the availability of systematic data on patent numbers, licences, and start-ups.

Such mechanisms serve as proxies for formal academic entrepreneurship efforts (Balven *et al.*, 2018), but they provide little information about the inventors of patents, licenses, and technologies. As we look more closely at academic entrepreneurship as an economic driver, we need to better understand the academic entrepreneur, the engine of academic entrepreneurship. It is acknowledged that a significant portion of the academic entrepreneur may not involve the formal university approved mechanisms (Kumar, 2010; Markman *et al.*, 2005; Balven *et al.*, 2018), so it is critical to examine the individual and their role in contributing to the entrepreneurial university. Using the discussions on the

academic entrepreneur presented in chapter 2, it can be argued that their role is an important and worthwhile topic to explore.

## 6.2 Context and Perceptions of Academic Entrepreneurship

The academic entrepreneur and their role identity are central to this study. Roles are the primary mechanism by which the institution's cultural and cognitive imprint interacts with the individual to create and shape behavioural boundaries and frame the meaning of their engagement, in this case in entrepreneurship. The context and perceptions of the academic entrepreneur create a role frame that adds meaning and brings legitimacy to their entrepreneurial efforts (Thornton and Ocasio, 2008).

According to the literature, there is currently very little understanding of the academic entrepreneur and their role frame (Kodeih and Greenwood, 2014; Jain *et al.*, 2009). The development of a more comprehensive understanding of the context and perspectives of the academic entrepreneur is thus an important goal within academia (Bercovitz and Feldman, 2008; Kodeih and Greenwood, 2014). This study sought to address this gap from a theoretical and empirical standpoint by exploring national innovation systems, the external environment, the entrepreneurial university, and, more specifically, the case site.

We have seen a remarkable shift in the attitude of universities toward entrepreneurial activity over the last decade (Etzkowitz, 1998; Owen-Smith,

2005). Much of the discussion lacks a more in-depth understanding of the role of the academic entrepreneur (Jain *et al.*, 2009; Lam, 2010). The purpose of this research was to gain a better understanding of the academic entrepreneur's role, orientation, and identity within the context of the entrepreneurial university. Seeking inspiration from authors including Zucker and Darby(1996), Lockett *et al.*(2005), Audretsch and Erdem(2004), Jain *et al.*(2009), Lam(2010), Shi *et al.*(2020), Balasubramanian *et al.* (2020) and Wang *et al.* (2021) this study incrementally and progressively (Kaplan, 1964) extends our knowledge of the role identity of the academic entrepreneur through a deeper understanding of how entrepreneurship fits within their roles using role identity theory (Merton, 1957), how they modify their roles since securing entrepreneurial funding, as well as their strategies for overcoming and managing entrepreneurship within their domains. Given that the participation of these individuals in the commercialisation process is integral to the modern university, it is surprising how little is known about their roles and how they have reshaped their careers to pursue entrepreneurial paths (Audretsch and Erdem, 2004). This study introduces the sense making activities that individuals undertake to manage the duality of being both an academic and an entrepreneur, as well as how they manage their work within this shifting landscape.

Furthermore, this research has added to the Mature Entrepreneurial University's body of knowledge (Klofsten and Jones-Evans, 2000; Philpott *et al.*, 2011). These activities, which include licenses, patenting, and spin-off formation, are at a

perceived level of entrepreneurial sophistication for academic entrepreneurs to engage in and are generally regarded as more tangible outputs of the mature entrepreneurial university(Rasmussen *et al.*, 2006; Klofsten and Jones-Evans, 2000;Philpott *et al.* 2011). It improves on previous research that looked at AE in the context of university-industry relationships (Owen-Smith and Powell, 2006; Link *et al.*, 2007; D’Este and Patel, 2007).

### 6.3 The Entrepreneurial Orientation and Role Identity of the Academic Entrepreneur

The study sought to understand the academic entrepreneurial orientation. Entrepreneurial orientation statements were adapted from a study by Lam (2010). Using surveys and in-depth interviews, this study determined academic scientists' attitudes toward university-industry collaboration. For this study, the statements were modified to focus on entrepreneurship and academia—academics' choice responses aligned with the role typologies presented later in this chapter.

|  |
|--|
| 1. I believe that academia and entrepreneurship should be distinct, and I pursue success strictly in the academic arena  |
| 2. I believe that academia and entrepreneurship should be distinct, but I pursue entrepreneurial links activities mainly to acquire resources to support academic research |
| 3. I believe in the fundamental importance of academic entrepreneurship and I pursue these activities for scientific advancement   |
| 4. I believe in the fundamental importance of academic entrepreneurship and I pursue these activities for commercial exploitation  |

Table 6.1: Entrepreneurial Orientations adapted from Lam (2010)

Another contribution of this study is the concept of 'hybrid role identities,' which is discussed in detail in chapter two. This study extends academic entrepreneurship research by investigating the academic entrepreneur using identity theory, specifically identity centrality and salience. Although a large body of research focuses on psychological perspectives of individual academic scientists, such as motivations (Hayter 2015; Lam 2010), cognition styles and passions (Huyghe *et al.*, 2016), attitudes and belief (Urban and Chantson, 2019), few studies provide empirical evidence on the effects of identity centrality and salience in supporting or inhibiting entrepreneurial activities, such as spin-off creation, patenting, and licences.

There is limited prior research in the formal 'Academic Entrepreneurship' domain (Miller *et al.*, 2018), where academics engage in licences, patents and spin out formation. Jain *et al.* (2009) and Wang *et al.* (2021) focus on the academic scientist and a very broad definition of the Academic Entrepreneur. This study has solely focussed on the 'Academic Entrepreneur' who has utilised a specific funding instrument to develop a commercial product or service with a focus on patenting or spin out rather than the broader or more informal and all-encompassing gamut of activities described in the academic entrepreneur continuum by Miller *et al.*, 2018 (see chapter 2). The study found that some aspects of one's role identity are more important to oneself than others (Callero, 1985).

Recent journal articles, such as Curtin *et al.* (2016) and Shi *et al.* (2020), advocate

for a more coordinated expression of social groups and identity influence at the individual level. This study also contributes in that regard, as peer support and networks were identified as essential factors in supporting the role identity development of both the 'Resourceful' and 'Readymade' academic entrepreneur typologies.

When we consider the perspectives of the academic entrepreneur introduced throughout this study, we see that a lot of emphasis is placed on the assumed inevitability of the entrepreneurial university. Much of the prior research has been conducted at a high level of aggregation and generalization of the entrepreneurial university rather than the individual academic entrepreneur (Lam, 2010). This approach may obscure the complexity and diversity of the academic entrepreneur (Tuunainen, 2005) and provides no insight into their role frame or role identity at the micro level. The failure to consider the role of actors, specifically academic entrepreneurs, in interpreting and shaping change has created the first theoretical gap addressed by this study. This study goes beyond these limitations by investigating these phenomena at the micro level. This research strives to provide deeper insight into the academic entrepreneurship community, their roles, and how they have adapted, modified, and responded to entrepreneurship.

This study contributes to calls for more research in the field made by authors such as Battilana *et al.*, (2009), who take an exploratory approach to understanding

the nature of entrepreneurship in a specific social context in which actors are embedded. Scaffolding this statement is Suddaby's(2010), which contends that 'if we take seriously the notion that institutions are powerful instruments of cognition, there must be some opportunity in conducting research on how institutional logics are understood and influence at the individual level of analysis.' We investigated the links between the institution (macro) and the academic entrepreneur (micro) in this study and the empirical investigation of the academic entrepreneur in order to better understand the context and perceptions of the entrepreneurial university from the perspective of the academic entrepreneur.

Thus, this study expands on the empirical work of Bozeman (2000), Rothaermel *et al.* (2007), Bozeman *et al.* (2013), and Wright (2014) in order to increase research studies in the more formalised academic entrepreneurship domains spanning knowledge transfer activities such as licences, patents and spin out companies. While the importance of knowledge transfer and academic entrepreneurship go hand in hand, there is some debate within the research about how to define academics who engage in commercialization, with many studies including industry engagement as an entrepreneurial activity. It is unsurprising that this confusion exists given the changing role of academics in the commercialisation space, changing policies at the national and institutional level, and a lack of focus on the individual 'Academic Entrepreneur.' This study empirically responds to recent shifts that see the emergence of differentiation

between the types of academic entrepreneurs delineated by their activities as either entrepreneurial academics or academic entrepreneurs (Miller *et al.*, 2018) and contributes empirically to this domain.

#### 6.4 The Development of Academic Entrepreneur Typologies

This study extends academic entrepreneurship research by investigating the academic entrepreneur using identity theory, specifically identity centrality and salience. Although a large body of research focuses on psychological perspectives of individual academic scientists, such as motivations (Hayter 2015; Lam 2010), cognition styles and passions (Huyghe *et al.*, 2016), attitudes and belief (Urban and Chantson 2019), few studies provide empirical evidence on the effects of identity centrality and salience in supporting or inhibiting entrepreneurial activities, such as spin-of creation, patenting and licences. Another contribution of this study is the concept of 'hybrid role identities,' which is discussed in depth in chapter two.

The concept of 'hybrid role identity' combines salience and centrality (Stryker and Serpe, 1982). Salience is defined as an individual's commitment to an identity (Stryker and Serpe, 1994). This study identified three role typologies with varying degrees of commitment demonstrated by the study's participants through the development and introduction of "academic entrepreneur typologies" in chapter five. The three typologies((see figure 6.1) ) clearly define academic entrepreneurs as 'Resourceful' Academic Entrepreneur who are equally committed to their roles as an academic and an entrepreneur and bring maturity,

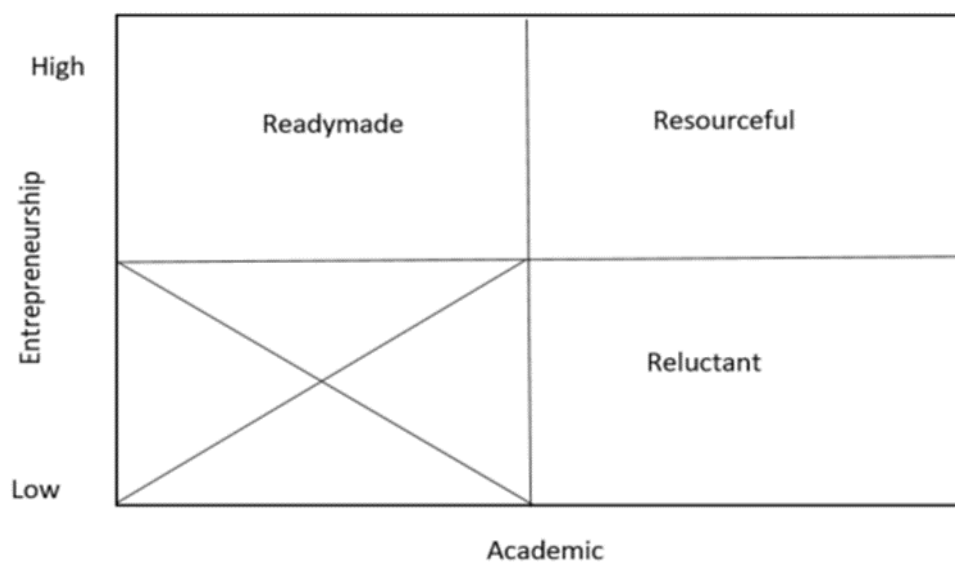
leadership, and quasi-firm (Etkowitz, 2002) attributes to the fore. These academics operate using a dual identity and whilst they acknowledge that paradoxes exist between academic and entrepreneurship they have actioned changes within their environments, resources and structures to manage the paradoxes to yield position outcomes for them and their unit professionally.

The second typology is referred to as 'Readymade.' This academic entrepreneur was academically "born" into an environment where entrepreneurship is an important aspect of the role frame or context. The Readymade academic entrepreneur include a developed peer-to-peer and support network, a closely linked field to entrepreneurship, and sees entrepreneurship as integral to their activities. The 'Readymade' academic entrepreneur also sees the paradoxes that exist between being an academic and entrepreneur but because of their 'readymade' nature they understand how to navigate and leverage systems and structures that support their academic development and progression, which are largely publication and funding driven, while satisfying their need to commercial and innovate.

An exciting dynamic emerged between the 'Resourceful' and the 'Readymade' of the quasi-firm (Etkowitz, 2002). Given that the Resourceful Academic Entrepreneur establishes the Quasi Firm and the Readymade is 'academically' born into the quasi firm, the significance of legitimacy, social norms, and reciprocity of entrepreneurial behaviour emerged. Another gap in the literature is that no studies have been conducted to investigate how micro-social processes

occurring within these environments shape individual attitudes (Bercovitz and Feldman, 2008; Organ, 2013). Organ (2013) introduces the concepts to be investigate, particularly in light of the emergence of the entrepreneurial orientation of the next generation of academics.

The final typology the 'Reluctant' Academic entrepreneur (Ae) saw entrepreneurship as something that inhibited careers (due to publishing restrictions), distracted them from their core role, and they engaged in entrepreneurship as a result of factors that pushed them toward commercialization. These perspectives, which include peer and student influences as well as changes in the research landscape, compel the academic entrepreneur to respond. The 'reluctant' academic entrepreneur' is perhaps the most paradoxical in nature in that they are extrinsically driven toward entrepreneurial action and recognise that this is neither a space or an identity that they wish to occupy in any meaningful way. They defer activities and utilise expertise rather than build their own expertise in the entrepreneurial space.



**Figure 6.1: Typologies of Academic Entrepreneur**

Moving toward the second aspect of role hybridisation, we consider role centrality. Role centrality reflects the relative importance of the focal identity in one's own self (Wang *et al.*, 2021). In considering all three roles from a role centrality perspective, there was evidence in all cases of the centrality of the focal identity of each academic entrepreneur. This resulted in the labelling of each typology as follows:

| Typology    | Label                     | Role Centrality  | Quote  |
|-------------|---------------------------|--|--|
| Resourceful | Academic Entrepreneur(AE) | A dual role centrality where the academic is equally comfortable in academic or entrepreneurial domains. A role that exhibits equilibrium. | <p><i>'It is somewhat of a dark art but you learn when to step into your academic self and then out into your entrepreneurial self and manage both with some internal lines drawn in your lab and indeed in your head' P31</i></p> <p><i>'My role has moved from being an academic to sitting somewhere between academia and entrepreneurship' P11</i></p> |
|             |                           | Role Salience  | Quote  |

|           |                           | Medium – driven by both extrinsically and intrinsic factors to take action. All have multiple examples of actions taken to support entrepreneurial activity  | 'I thrive on being able to solve problems and then take the solutions and create something, I think that's where I and we as a team learn more, there is a strong funding pathway to support the journey too so you are well resourced to take something from idea into a marketable solution- be it a patent, a licence or a spin out' P5    |
|-----------|---------------------------|--|---|
| Typology  | Label                     | Role Centrality  | Quotes  |
| Readymade | academic Entrepreneur(aE) | A role centrality that is more focussed on entrepreneurship than academia and sees entrepreneurship commonplace within their network, work environment and with their students. Commercialisation is the focal identity. | 'From a day to day perspective it is a core part of my role. Our lab is focused on entrepreneurship. My research sits in the public health space, so for me, I work to get my science out there, into labs, into patients. Entrepreneurship is the vehicle that will be used to get it from the lab out of the university into society' (P12) |
|           |                           | Role Salience  | 'Its hand in glove' (P29)   |

|           |                           | High for Entrepreneurship as demonstrated evidence to take commercial action and largely intrinsically driven   | <p>From a day-to-day perspective, it is a core part of my role. Our lab is industry focused, my research sits in the public health space so for me I work to get my science out there, into labs, into patient care. Entrepreneurship is the vehicle that will be used to get it from the lab out of the University into society' (P12)</p> <p>'I was very limited with funding choices based on the research I wanted to do, I wouldn't say forced to apply for commercial funding but it was either apply or stop my research and I still had valuable research to contribute regardless of the commercial aspect' P2</p> |
|-----------|---------------------------|---|---|
| Typology  | Label                     | Role Centrality   | Quotes  |
| Reluctant | Academic entrepreneur(Ae) | <p><i>Role centrality that is more focussed on academia than entrepreneurship and sees entrepreneurship as unavoidable within the institution. Their engagement is the result of push factors, including funding and students. Academia is the focal identity</i></p> | <p><i>'My engagement is driven largely by my students who were hugely interested in taking a prototype they had developed and trying to build a commercial case for it.'</i>(P22)</p> <p><i>'I am to all intents and purposes a reluctant entrepreneur' P30</i></p>   |
|           |                           | Role Salience   | Quotes  |

|  |  |   |  |
|--|--|---|--|
|  |  | Low as largely extrinsically driven to take entrepreneurial action. | 'My students largely drive my engagement, and in particular one group of students who were hugely interested in taking a prototype that they had developed and trying to build a commercial case for it. I was happy to help with the engineering aspects of the project, but once the project developed me needed the support of colleagues in the technology transfer office to look at the business case.'(P19) |
|--|--|---|--|

**Table 6.2: Typologies of Academic Entrepreneur**

The term hybridisation was also used in this study to describe the complexity and duality of being an academic entrepreneur, as well as the various typologies that were developed as a result of this research. However, this researcher observes that Shi *et al.* (2020) introduced the term 'identity harmonisation'. This study responds to this call once more, as it examines the factors that influence how academics harmonise their identities to enhance their performance, but it does so under the term hybridisation. The literature establishes the links between hybridisation, centrality, and salience (Stryker and Serpe, 1994; Jain *et al.*, 2009), but role identity and harmonisation remain largely unexplored in the academic domain.

Shi *et al.* published their paper 'Dr Jekyll and Mr Hyde: How do academic entrepreneurs deal with identity conflict' in November 2020, and two specific limitations were addressed within the study that this study can contribute

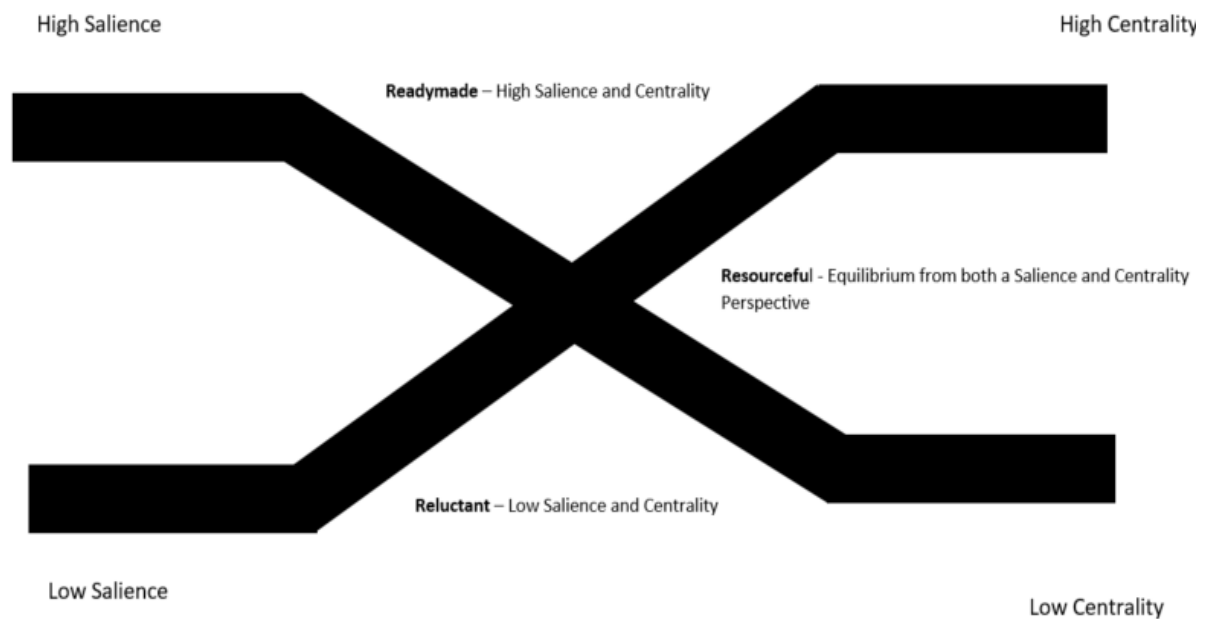
knowledge to. First, the authors acknowledge that the paradox of academic entrepreneurship is still an underexplored area. While they have attempted to fill this knowledge gap, their study does not take into account the factors that influence the hybridisation of identity. This study specifically addresses this request by developing and introducing the Academic Entrepreneur typologies presented in Table 6.3. Furthermore, the authors acknowledge that their data was primarily collected through questionnaires and that it provides promising insights into the identity of academic entrepreneurship (2020), but that it would benefit from additional research to gather more insights into the units of analysis.

Prior research has also proposed that the factors that influence an academic entrepreneur to engage in commercial activities can be classified into two categories: supply and demand (Thornton, 1999; Jain *et al.*, 2009). Individual attitudes and characteristics are the focus of supply-side perspectives, which are related to orientation and agency mechanisms. The 'Readymade' academic entrepreneurs are more predisposed to commercialisation based on attitudes, prior knowledge, and interest, all of which result in them being better able to recognise entrepreneurial opportunities to exploit (Etzkowitz, 1983; Azoulay *et al.*, 2007; Shane, 2000). The contextual conditions that prompt the academic entrepreneur to engage in commercialization drive the demand side perspective. This viewpoint is shared by the 'Reluctant' academic entrepreneur. Changes in the institutional framework (policies and strategic plan directives), changes in the research funding landscape, and student or peer influences are examples of these (Etzkowitz, 2002; Kenney and Goe, 2004; Stuart and Ding, 2006). Both supply and

demand perspectives offer exciting insights into the actions and drivers of the AE typology and contribute toward our understanding of their involvement in academic entrepreneurship endeavours. The 'Resourceful' academic entrepreneur, unsurprisingly, straddles both perspectives. Their attitudes, prior knowledge, and interest, on the other hand, have all catalysed their engagement in academic entrepreneurship, so they lean more towards the supply side than the demand side.

A final contribution put forward by this study is that of role innovation (Fisher, 1990). Role innovation is defined as 'introducing significant new behaviours into a pre-existing role' (West, 1987, p.306). This study has introduced role innovation within the entrepreneurial university, where academic entrepreneurs have adapted to entrepreneurial work requirements by changing their work. The 'Resourceful' Academic Entrepreneur, who has evolved alongside the maturing entrepreneurial university, places a greater emphasis on role innovation. For the 'Reluctant' Academic Entrepreneur, the role innovation has been minimal and fleeting, with them quickly returning to academic duties to reassert their academic role centrality and salience. For the 'Readymade' Academic Entrepreneur their role innovation is low. They have joined a lab or team that has paved the way to create a readymade environment for commercialization. Their role has not evolved or changed significantly, and their role identity salience and centrality is heavily focussed on entrepreneurial engagements and activities.

Gur and Matthias(2021) have developed a theoretical model of entrepreneurial identity tensions which can be used to plot both the salience and centrality of the Academic Entrepreneur. The figure plots salience and centrality by typology as outlined in table 6.3.



**Figure 6.2: Academic Entrepreneur Typologies Mapped By Salience and Centrality**

#### 6.4 The Paradox of the Academic Entrepreneur

‘Paradoxes ... seem to smile ironically at our nicely constructed theories with their clear-cut nicely constructed distinctions and point at an unthought-of of possibility, a blind spot in oppositional thinking (Ybema, 1996: p. 40 in Lewis (2000; p. 760).

Paradox theory offers a powerful framework in this study to explore the impact of plurality and change (Lewis, 2000). This study has recognised that change has not been smooth and linear particularly for the 'Resourceful' Academic Entrepreneur who operated largely in the unknown as the third mission of the university came to the fore. In particular, these academics operate using a dual identity and whilst they acknowledge that paradoxes exist between academic and entrepreneurship, they have actioned changes within their environments, resources and structures to manage the paradoxes. They no longer bear the hangover of the assumptions or beliefs they may have had. The tension between 'old' and 'new' is dissipating and not largely evident in the 'Readymade' Academic Entrepreneur typology. For both typologies, the simultaneous ability to think academically but act entrepreneurially is central to their identity.

The Reluctant Academic Entrepreneur acknowledges that at policy, institutional and student level changes have occurred but they are still driven by their intrinsic desires, which are focussed on thinking academically and acting academically and using buffering and delegation approaches (Jain et al, 2010) to manage the tensions that exist between who they are and the demands of their external environment for entrepreneurial behaviour.

## 6.5 Conclusion

This chapter provided a discussion of the findings outlined in the previous chapter, which addressed the study's research question "How do academic entrepreneurs manage their hybrid role identity in a mature entrepreneurial university environment?" The study considered the context of the academic entrepreneur- the role frame in which the academic sits, how their role identity develops or evolves, and changes, and finally, the chapter outlined the implications faced by the academic entrepreneur as they manage their dual identity within a mature university setting through the introduction of three role identity typologies that are discussed.

The next chapter of this study gives a short reintroduction the overarching aims and objectives of this study. It discusses the study's limitations. The implications of the study from a policy and institutional level is reviewed. This chapter concludes by outlining potential areas for future studies in the academic entrepreneurship domain.

## Chapter 7 Conclusion Chapter

### 7.1 Introduction

This chapter concludes this study. This chapter reintroduces the research study and its findings in general. The study's limitations are then introduced and discussed. The implications of the study from a policy and institutional level are reviewed. This chapter concludes by outlining potential areas for future studies in the academic entrepreneurship domain.

### 7.2 Structure and Content of the Research Study

The opening chapters of this study focussed on introducing the literature on the entrepreneurial university, the academic entrepreneur and their role identity and orientation. Following this, extensive details of the context of the research study were introduced by introducing national innovation systems as a driving force for the entrepreneurial university, as well as the role of EU and national policy in reshaping the academic agenda across Europe. The external environment as well as the case site were introduced in detail. Following that, details of the research methodology were outlined in chapter four of this study. This chapter introduced the study's qualitative design and provided details on the study's research instrument, as well as a broad overview of data collection and analytical processes used to complete this study. The chapter concluded with a discussion of the research's major limitations.

The findings of the study were presented in chapter five. These were effectively captured and organised to present findings that included the context and

perceptions of academic entrepreneurship, the Entrepreneurial Orientation and Role Identity of the Academic Entrepreneur, and finally the Emergence of Academic Entrepreneur Typologies.

Finally, the study's discussion chapter, chapter seven has addressed the study's primary research question and sub questions after being guided by and contrasted with relevant literature as introduced in chapter two. This chapter summarises the key contributions, limitations, and future research areas, and concludes the overall research study.

### 7.3 Limitations of the study

The first limitation relates to generalisation. While the study had 31 participants, the context for the study was a single site. The specific case site was chosen because its organisation structure resembled that of a traditional university and it was in the early stages of its entrepreneurial journey. Given the phenomenon's complexity and how easily observed it was, a large sample size was deemed appropriate (Pettigrew, 1990).

The study was also exploratory in nature. While it is true that the field of academic entrepreneurship is thriving, there is little known about the academic from the standpoint of role identity, as well as the paradoxes and tensions that exist in navigating their entrepreneurial terrain (George *et al.*, 2005; Lam 2010; Shi *et al.*, 2020).

A second limitation of this study is the risk of bias. Firstly, the bias associated with the chosen methodological framework must be considered. The researcher has developed a portfolio of solid evidence to support the research design of the study with studies, noting that 'very little is known about the cognitive and social psychological processes associated with scientists reshaping their career trajectories and pursuing entrepreneurial paths' (Jain *et al.*, 2009, p.922), and most academic entrepreneurship discussions lack a deeper understanding of the involvement of the key actor in the academic entrepreneurship debate (Audretsch and Erdem, 2004). The single case study offers a rich source of insight for both theory development and identifying potential avenues for future work in the field (Eisenhardt 1989).

The final limitation is related to the researcher and their own orientation toward participants at the academic institution. The researcher is a full-time member of staff at the academic institution. Their beliefs, values, and assumptions may adversely affect the investigation of important issues and unduly influence the analysis of the empirical data (Miles and Huberman, 1994). Because the researcher is a critical research instrument in the process, these factors are inextricably linked to it. These issues and concerns were addressed in the research by taking their impact into account throughout the process and employing a systematic protocol described in the research methods chapter. It is important to note that given the methodology used, bias cannot be completely eliminated, and this limitation should be considered.

## 7.4 Study Implications

This study has several implications for both policy and universities. These are outlined in the following section

### 7.4.1 *National Policy Implications*

From a policy perspective, this study has implications for national research funders and national policymakers. From a national funder perspective, funding agencies with a clear focus on entrepreneurship strongly influence universities. They can develop policies to support nascent academic entrepreneurs, particularly regarding role preparation. The first implication for policy makers is focussed on creating a clear career pathway for academic entrepreneurs supporting by learning and development, mentorship and role shadowing.

Funding agencies could create policies that examine best practices in Higher education and create training mechanisms for cross-institutional training and development. A key action in this regard could be to offer similar programmes to the SFI I-Corps programme(which is very limited in terms of applicants and linked to Research Centres) more broadly to build capacity more explicitly.

Universities are expected not only to perform their 'traditional functions' but also undertake newer functions such as innovation and entrepreneurship (Etzkowitz,2006), this needs to be carefully considered from a policy perspective

as all entrepreneurial universities are not created equally, it has implications for funding, talent attraction and retention, full economic costing and students. We do not currently measure entrepreneurial activity, which could inform policy development, especially given the various stages of engagement that different universities have. To action this implication policy makers could broaden their remit to focus on all aspects of academic entrepreneurship and create a framework to build entrepreneurial capacity, which could also take into consideration earlier policy recommendations.

Bottom-up approaches to innovation policy should also be considered by policymakers. This 'collective entrepreneurship' (Etzkowitz and Klofsten, 2005) approach works through collaborating with academics, governments, and companies to develop a support structure for business formation and regional growth and development. As the new economy model evolves, this approach creates a self-sustaining dynamic in which all roles blur. As one paradigm starts to expire (for example, Medtech in the West of Ireland), another is identified for new economic growth, bringing the roles back to the fore and spawning the next wave of innovation (Galvao et al., 2019). Different typologies of academic entrepreneurs could be represented through a collective entrepreneurship

approach to ensure that the approach is sustainable and appropriately supported by academic institutions.

#### *7.4.2 University Implications*

This study has significant implications for organisations that support academic entrepreneurship. First, policies that recognise the dual nature of an academic entrepreneur's role and support their identity and development must be put in place. Policies that recognise entrepreneurship as a contributing factor to workload models and promotional pathways, for example, should be considered. Institutions should promote and recognise academic entrepreneurship work and contributions, as well as assist in developing a positive attitude toward academic entrepreneurship, in order to enhance their entrepreneurial initiative and, indeed, the overall entrepreneurial identity of the institution.

Universities are expected not only to perform their 'traditional functions' but also take part in the functions of others (Etzkowitz, 2006), this needs to be carefully considered from a policy perspective, as all entrepreneurial universities are not created equally, it has implications for funding, talent attraction and retention, full economic costing and students. We currently do not capture the nuances of the academic entrepreneur in any system or structure. This could help to inform policy development, especially given the various stages of engagement that various universities have.

This study considers the role of the institution and its environment. The university

environment promotes role identity and role hybridisation. This is manifested in self-awareness, role modelling, and the development of communities of practice. Such patterns have implications for the institution and how it leverages entrepreneurial engagement to preserve and support the academic entrepreneur's role identity. Academic entrepreneurs can reflect on the findings of this study and consider the typologies and how they might support their own development and growth, and perhaps seek to establish more formal structures to support commercialisation within their own domains. The academic entrepreneur must actively participate in these forums and communities of practice in order to support their identity development and help manage any identity conflicts or paradoxes that may arise.

The internationalisation and blurring of international boundaries must also be considered. As we increase our interaction with other HEIs around the world, each of which operates in its own distinct model of academic capitalism, how can we mediate and manage the complexity that exists across our countries and institutions at the individual level of the academic entrepreneur to maximise the opportunity to collaborate and innovate?

#### *7.4.3 Lessons for Academic Entrepreneurs*

The Academic Entrepreneur is the central actor in this study therefore; there are important implications to consider. Firstly, academic entrepreneurs should leverage their communities of practice to increase their visibility and legitimacy within their institutions to increase support of their entrepreneurial activities.

Greater recognition of entrepreneurial engagement could have positive impacts upon institutional policies and practices from academic workload model to sabbatical leave and to promotion prospects.

Secondly, through the creation of formal structures and supports academic entrepreneurs can better exchange knowledge, support budding student entrepreneurs and apply for capacity building funding to further legitimise and embed entrepreneurship on their respective campuses.

Thirdly, the 'Readymade' and 'Resourceful' academic entrepreneurs should seek to build on any reputational capital to create new programmes and supports for students to further embed the entrepreneurial mind-set in undergraduate and graduate students. Building innovative capacity at the grass roots level will increase opportunities, visibility and the numbers of students who demand access to these critical skills

## 7.5 Future Research

This study attempts to provide a deeper understanding of the academic entrepreneur's subjective experiences and related identity and how they manage the duality of their role and identity in a mature university setting. Prior research has largely oversimplified or underemphasised the nature of these key actions' involvement in the development and sustainability of the entrepreneurial university. As a result, there is a scarcity of research on the entrepreneurial university, but most ignore the academic entrepreneur as a critical agent. This study aims to fill this theoretical and empirical void. This allows us to better understand the academic entrepreneur as an active contributor to the changes

occurring across the higher education landscape.

This study has only considered the concept of role hybridisation from the perspective of the Academic Entrepreneur engaged in more 'sophisticated' entrepreneurial activities at the formal end of the Modes of engagement relating to entrepreneurial academics and academic entrepreneurs set forward by Miller *et al.*, (2018), and discussed in detail in the literature review chapter. A potential area that may warrant a further investigation is to consider role hybridisation from the perspective of entrepreneurial academics, in addition to the academic entrepreneurs researched as part of this study.

The use of language and holding fluency in academic and entrepreneurial languages was noted throughout the interview process. Suddaby and Greenwood (2005) identify a variety of different strategies for using language to shift logic in institutional contexts and for presenting different frames in an attempt to exploit known institutional contradictions. An investigation of language as a mechanism for capturing transformation in the contexts of entrepreneurship and academia would be beneficial. Such studies could look at different levels of seniority or different domains across university sites.

Future research might include additional measures such as the amount of time spent on entrepreneurship activity and duration of engagement to capture the behavioural intensity and persistence of the academic entrepreneur. A second time dimension that may warrant further investigation relates to the change in

motives over time. This study has briefly considered a change in motives; however, it has not thoroughly investigated the change in motives over time, a longitudinal study that considered how academic entrepreneurs might shift from one type to another over the course of their careers. Because we are on the verge of a paradigm shift, the empirical field is primed to produce some fascinating findings in this regard.

A final potential research area entails push and pull factors of academic entrepreneurs. Underlying motivations of academic entrepreneurs are either intrinsic, such as curiosity, or extrinsic such as funding or student driven. Further research could examine these aspects in more detail, particularly the impact of factors such as entrepreneurial education or executive or professional as a driver of academic entrepreneurial engagement (Stuart and Ding 2006).

## 7.6 Conclusion

This section concludes this study. This chapter reintroduced the structure and approach of the study. It has outlined the limitations of the study. It has also considered the implication of the study from a policy and institutional perspective. This chapter concludes with a comprehensive outline of potential areas for future studies in the areas of academic entrepreneurship.

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## Appendix A: Letter of Participation Study

Dear (participant),

I am currently undertaking doctoral research in the area of the role identity of academic entrepreneurs at Trinity Business School, Trinity College Dublin.

My research specifically looks at the role of individual academics and how their academic and entrepreneurial identity develops and evolves within a mature university environment. I hope to gain insights in the role of individual academic entrepreneurs and the factors that support their role development within and beyond the institution. This area of study could provide key stakeholders with valuable information in respect of national and institutional supports and structures.

As a key actor within the academic entrepreneurship ecosystem within the University, I would very much welcome the opportunity to speak with you as part of this research study to elicit your perspectives on the key issues relevant to your engagement in entrepreneurship and how it has impacted upon your role within the institution. The information will be treated in the strictest confidence, with each participant assigned a participant study number within the study. Your participation is valued and very important to the success of the overall study.

Professor Paul Ryan is my doctoral supervisor for my study. Paul is a full time academic staff member within the Business School at Trinity College Dublin. Further information and contact details for Professor Ryan are available at <https://www.tcd.ie/business/people/paul-ryan.php>

Should you have any further questions on my research study please do not hesitate to contact me on 087 2159549 or [walshn12@tcd.ie](mailto:walshn12@tcd.ie). At your convenience I would appreciate if you could let me know if you are available and interested in participating in the study and I can provide some potential meeting dates and times.

I look forward to hearing from you.

Kind Regards

Natalie Walsh



## Appendix B: Interview Schedule

### Interview Schedule

Interviewee has reviewed interview protocol and consent form signed and is happy to proceed with interview.

1. Interviewer: Why did you choose a career in academia?
2. Interviewer: What do you think the purpose of the academic role is?
3. Interviewer: How did entrepreneurship come into your role in the university?
4. Interviewer: Following on from that, what are your thoughts on academics engaging in entrepreneurship?
5. Interviewer: Are there any negatives you see to being an entrepreneur in academia?
6. Interviewer: Next question is, are there any notable academic entrepreneurs on campus that you're aware of?
7. Interviewer: Do you think that's important for a campus to have role models for other academics to see the potential?
8. Interviewer: Do you think you can be entrepreneurial as an academic and have a successful academic career?
9. Interviewer: In terms of your funding portfolio, why did you specifically choose to apply for commercialization grants?
10. Interviewer: Do you think your role has changed from, say, when you first started out to when you started drawing down commercialization funds, how you approach a role or how you manage your role?

11. Interviewer: Being in academic, considering the more traditional role and pursuit of scholarship
12. Interviewer: From your colleagues' perspective, do you think they value entrepreneurship which will be separated into the institution but from the people you have around you, academic colleagues that there's a value placed on being entrepreneurial?
13. Interviewer: Do you think entrepreneurial activity is rewarded differently at NUI Galway within general research?
14. Interviewer: Do you think the university mindset is changing around entrepreneurship? Since your arrival to NUI Galway what differences would you see
15. Interviewer: The last question is for you consider the following typologies at and tell me which one you think you identify with in the first place and then what would be your second best.

- |  |
|--|
| 1. I believe that academia and entrepreneurship should be distinct, and I pursue success strictly in the academic arena  |
| 2. I believe that academia and entrepreneurship should be distinct, but I pursue entrepreneurial links activities mainly to acquire resources to support academic research |
| 3. I believe in the fundamental importance of academic entrepreneurship and I pursue these activities for societal and scientific benefit                                  |
| 4. I believe in the fundamental importance of academic entrepreneurship and I pursue these activities for commercial exploitation  |



## Appendix C: Nvivo Codebook

### Academic Entrepreneur Managing the Paradox and Complexity of their Role Identity

#### Codebook

#### Codes\Phase 1 - Initial Coding and Noting

| Name                      | Description |
|---------------------------|-------------|
| Academia                  |             |
| academic career           |             |
| academic disciplines      |             |
| academic entrepreneur     |             |
| academic field            |             |
| academic freedom          |             |
| academic institution      |             |
| academic investment       |             |
| academic landscape        |             |
| academic lens             |             |
| academic life             |             |
| academic measures         |             |
| academic norm             |             |
| academic outputs          |             |
| academic partners         |             |
| academic pathway          |             |
| academic pedigree         |             |
| academic point            |             |
| academic position         |             |
| academic promotion boards |             |
| academic promotion track  |             |
| academic publications     |             |
| academic ranks            |             |
| academic research         |             |
| academic rigour           |             |
| academic role             |             |
| academic scepticism       |             |
| academic self             |             |
| academic sense            |             |
| academic success          |             |
| academic track            |             |
| academic work             |             |
| academic workload model   |             |
| academic world            |             |
| academically gifted       |             |
| classical academics       |             |
| non-traditional academics |             |
| notable academics         |             |
| Activities                |             |

|                                 |  |
|---------------------------------|--|
| certain activities              |  |
| commercialization activity      |  |
| entrepreneurial activity        |  |
| facing activities               |  |
| general research activities     |  |
| industrial links activities     |  |
| innovative activity             |  |
| supposed research activity      |  |
| university activities           |  |
| Aspects                         |  |
| business aspects                |  |
| business plan aspect            |  |
| certain aspects                 |  |
| common aspects                  |  |
| different aspects               |  |
| engineering aspects             |  |
| focal aspects                   |  |
| grant management aspects        |  |
| important aspect                |  |
| inventive aspects               |  |
| key aspect                      |  |
| novel aspects                   |  |
| priority aspects                |  |
| project aspects                 |  |
| protecting aspects              |  |
| solution aspect                 |  |
| student aspect                  |  |
| teaching aspect                 |  |
| technical aspects               |  |
| translational aspect            |  |
| Commercial                      |  |
| applied commercialization front |  |
| commercial application          |  |
| commercial case                 |  |
| commercial development          |  |
| commercial discovery            |  |
| commercial exploitation         |  |
| commercial feasibility          |  |
| commercial focus                |  |
| commercial gains                |  |
| commercial grants               |  |
| commercial language             |  |
| commercial opportunities        |  |
| commercial outputs              |  |
| commercial pathway              |  |

|  |  |
|--|--|
| commercial potential                   |  |
| commercial projects                    |  |
| commercial research                    |  |
| commercial side                        |  |
| commercial success                     |  |
| commercial teams                       |  |
| commercial viability                   |  |
| commercial world                       |  |
| commercialization activity             |  |
| commercialization fund grant           |  |
| commercialization funding              |  |
| commercialization pathway development  |  |
| various commercialization type schemes |  |
| Funding                                |  |
| attracting funding                     |  |
| available funding                      |  |
| basic bio-sciences grants              |  |
| centre funding                         |  |
| certain funding opportunities          |  |
| classic funding agencies               |  |
| clear funding pathway                  |  |
| comm fund team                         |  |
| commercial grants                      |  |
| commercialisation fund                 |  |
| commercialization fund grant           |  |
| commercialization funding              |  |
| entrepreneurial process                |  |
| entrepreneurial funding                |  |
| entrepreneurial grant                  |  |
| eu funding                             |  |
| feasibility grants                     |  |
| fundamental science funding            |  |
| funded projects                        |  |
| funder alignment                       |  |
| funders requirements                   |  |
| funders value patents                  |  |
| funding instruments                    |  |
| funding landscape                      |  |
| funding mechanisms                     |  |
| funding opportunities                  |  |
| funding perspective                    |  |
| funding policy                         |  |
| funding policy changes                 |  |

|                                     |  |
|-------------------------------------|--|
| funding portfolio                   |  |
| funding source                      |  |
| funding strategy                    |  |
| general research funding            |  |
| generating grant income             |  |
| grant experience                    |  |
| grant management aspects            |  |
| primary research funding agency     |  |
| research funding                    |  |
| research grant category             |  |
| saw funding                         |  |
| substantial grant income            |  |
| traditional research grant          |  |
| translational funding award         |  |
| Industry                            |  |
| industry building skills            |  |
| industry collaboration              |  |
| industry engagement                 |  |
| industry experience                 |  |
| industry lens                       |  |
| industry partners                   |  |
| industry partnerships               |  |
| industry perspective                |  |
| industry training                   |  |
| med tech industry                   |  |
| print mainstream industry magazines |  |
| Innovation                          |  |
| amazing innovations                 |  |
| campus innovators                   |  |
| healthcare innovation               |  |
| including innovation                |  |
| innovation centre                   |  |
| innovation outputs                  |  |
| innovation potential                |  |
| innovation senses                   |  |
| innovative activity                 |  |
| innovative agenda                   |  |
| innovative capability               |  |
| innovative impact                   |  |
| innovative mindset                  |  |
| innovative muscle                   |  |
| innovative processes                |  |
| innovative projects                 |  |
| innovative skills                   |  |

|                            |  |
|----------------------------|--|
| innovative space           |  |
| innovative step            |  |
| medical device innovations |  |
| much drive innovation      |  |
| specifically innovation    |  |
| valued innovation          |  |
| Knowledge                  |  |
| applying knowledge         |  |
| creating knowledge         |  |
| disseminate knowledge      |  |
| knowledge application      |  |
| entrepreneurial knowledge  |  |
| knowledge basket           |  |
| knowledge creation         |  |
| knowledge economy          |  |
| knowledge production       |  |
| knowledge sharing          |  |
| knowledge's sake           |  |
| limited knowledge          |  |
| much knowledge             |  |
| split knowledge            |  |
| technical knowledge        |  |
| Level                      |  |
| certain level              |  |
| individual level           |  |
| institutional level        |  |
| local level                |  |
| macro level                |  |
| senior level               |  |
| technology readiness level |  |
| third level                |  |
| third level student        |  |
| Project                    |  |
| commercial projects        |  |
| delivering projects        |  |
| different projects         |  |
| entrepreneurial projects   |  |
| facing project             |  |
| final year project         |  |
| focused projects           |  |
| funded projects            |  |
| future projects            |  |
| generation projects        |  |
| innovative projects        |  |
| medtech project            |  |

|                                 |  |
|---------------------------------|--|
| next project                    |  |
| next project benefits           |  |
| nice project                    |  |
| potential project               |  |
| project aspects                 |  |
| project management support      |  |
| project manager                 |  |
| project portfolio               |  |
| project team                    |  |
| research project                |  |
| run projects                    |  |
| student projects                |  |
| various project types           |  |
| Research                        |  |
| academic research               |  |
| applied research                |  |
| applied research route          |  |
| applied research schemes        |  |
| basic research                  |  |
| big reward research             |  |
| blue skies research             |  |
| blue-sky research award         |  |
| commercial research             |  |
| commercialise research          |  |
| connecting research             |  |
| different research area         |  |
| early research                  |  |
| general research activities     |  |
| general research funding        |  |
| genuine research question       |  |
| ivory tower type research       |  |
| lab research                    |  |
| large research group            |  |
| little research                 |  |
| practical research              |  |
| pre-clinical research           |  |
| primary research funding agency |  |
| research aligns                 |  |
| research approaches             |  |
| research capacity               |  |
| research centre                 |  |
| research efforts                |  |
| research environment            |  |
| research funding                |  |
| research grant category         |  |

|                                       |  |
|---------------------------------------|--|
| research group                        |  |
| research impact                       |  |
| research interests                    |  |
| research methodology                  |  |
| research office                       |  |
| research opportunity                  |  |
| research philosophy                   |  |
| research project                      |  |
| research question                     |  |
| research realms                       |  |
| research team                         |  |
| research work                         |  |
| significant research                  |  |
| supposed research activity            |  |
| tangential sideline research question |  |
| traditional research grant            |  |
| translating research                  |  |
| translational research                |  |
| translational research facility       |  |
| Technology                            |  |
| de-risk technologies                  |  |
| including technology transfer offices |  |
| massive technology                    |  |
| medical device technologies           |  |
| novel technologies                    |  |
| potential technology                  |  |
| technological advancement             |  |
| technology development                |  |
| technology readiness level            |  |
| technology transfer colleagues        |  |
| technology transfer executives        |  |
| technology transfer offices           |  |
| technology transfer unit              |  |

#### Codes\Phase 2 - Developing Subordinate Themes

| Name   | Description   |
|--|---|
| Awareness of Other Academic Entrepreneurs in the Institution |   |
| Not Aware  | No  |
| Not Recognised by University                                 | References by participants to the university not recognising academic entrepreneurs |

|   |  |
|---|--|
| Should Be Educating Other Academics on Entrepreneurship in Academia | References by participants to notable academics on campus not being given the opportunity to educate other academics about how to be an entrepreneurial academic             |
| Supported by University   | References by participants to staff engaging in academic entrepreneurship being supported by the university  |
| Changes in Approach to Role   |  |
| Always had a Commercialization Fund                                 | References by participants to always having access to some form of commercialization fund throughout their career resulting in no change in approach to role                 |
| Dark Art of Publishing Whilst Having IP to Protect                  | References by participants to learning how and what can be published to maintain publishing and still protect intellectual property  |
| Grown as a Leader   | References by participants to becoming a better leader over time on the back of experience   |
| More Focus on Research than Teaching                                | References by participants to shifting their focus away from teaching and over to research   |
| More Work with Industry   | References by Participants to doing more work with industry since being awarded a commercialisation fund   |
| No More than Other Projects have Changed Approach                   | References by participants to their approach constantly changing and a change in funding has not affected approach more than any other factor changing                       |
| Role Has Expanded But So Has Team and Support Structures            | References by Participants to there now being more roles and responsibilities since being awarded a commercialisation fund   |
| Speak 'Academic' and 'Entrepreneurial' Languages                    | References by participants to having to learn new terminology  |
| Colleagues' Perceptions of Entrepreneurship                         |  |
| Block Resources   | References by participants to colleagues blocking resources for entrepreneurship projects due to not being interested or not support university and commercial collaboration |
| Can't be Easily Done  | References by participants to Colleagues believing academic entrepreneurship is hard to do and difficult to properly implement   |
| Challenge Projects  | References by participants to colleagues challenging aspects of entrepreneurship projects due to not being interested or not support university and commercial collaboration |
| Colleagues Work in Entrepreneurial Academia                         | References by Participants colleagues working in entrepreneurial academia so are mostly positive   |

|   |  |
|---|--|
| Conflict of Interested                                    | References by participants to colleagues viewing entrepreneurship as a conflict of interested due to profit made off the research                          |
| Drawing Funding Away from more Standard Academic Research | References by participants to Colleagues believing academic entrepreneurship is drawing resources and funding away from more traditional academic research |
| High Amount of Ignorance                                  | References by participants to most people outside of academic entrepreneurship not knowing much about the process  |
| Mixed Views   | References by participants to colleagues having mixed views on entrepreneurship with some supporting and some opposing it                                  |
| Neutral   | References by participants to colleagues being neutral on academic entrepreneurship  |
| Younger Colleagues More Open to Entrepreneurship          | References by Participants to younger colleagues being more open and wanting to work in entrepreneurship then older ones                                   |
| Definitions of Entrepreneurship                           |  |
| Creating Social Benefit                                   | References by participants to the their understanding of entrepreneurship as creating social benefit   |
| Creating Wealth   | References by participants to the their understanding of entrepreneurship as creating wealth   |
| Identifying and Fulfilling a Gap in the Market            | References by participants to understanding entrepreneurship as identifying a gap or need in the market and finding a way to supply or meet that gap       |
| Innovation  | References by participants to understanding entrepreneurship as innovating and developing new technologies   |
| Drivers for Entrepreneurial Funding                       |  |
| Always Worked in Applied Research                         | References by participants to always having worked with applied research so applying for entrepreneurial funding was natural to them.                      |
| Commercial Potential                                      | References by participants to applying for entrepreneurial funding as the project had commercial potential   |
| Couldn't do Work Without Entrepreneurial Funding          | References by participants to being unable to do their work in the manner they carry it out currently without the appropriate type of funding              |
| Easier to get Funding                                     | References by participants to it being easier to get funding if you apply for entrepreneurial funding  |

|   |  |
|---|--|
| Funding Leads to Innovation   | References by participants to entrepreneurial funding supporting innovation and driving research forward. The funding allows the researcher to drive this innovation |
| Hire Consultant   | References by Participants to applying for entrepreneurial funding to be able to hire consultants to aid research team   |
| Monetary Reward   | References by participants to monetary reward being a motivating factor when applying for entrepreneurial funding  |
| No Reason not to  | References by participants to applying for entrepreneurial funding as there is no reason not to  |
| Reduced Personal Risk   | References by participants to applying for entrepreneurial funding as funding reduced personal risk off loss due to the project                                      |
| Student Led   | References by Participants to students driving the application for entrepreneurial funding   |
| Drivers of Engagement   |  |
| Easier to Prove a Return on Investment  | References by participants to it being easier to show to funders how there was a return on investment  |
| Global Standards  | References by Participants to global measures of success of a university expanding areas universities are involved in  |
| Individual Desire   | References by participants to a shift towards entrepreneurship in academia due to individual academics curiosity and interest in the area                            |
| Lack of Funding   | References by participants to more research being funded by private business due to a lack of funding  |
| Shift in role of University towards the D side of R and D aligned to Entrepreneurship | References by participants to companies and government looking to universities to do research and development  |
| Student Led   | References by Participants to the push towards entrepreneurship in academia being student led  |
| Entrepreneurship Challenges in Academia   |  |
| Access to Expertise   | References by participants to limited access to expertise  |
| Bureaucracy   | References by participants to a high amount of bureaucracy   |
| Keeping Departments Separated   | References by participants to colleagues wanting to keep departments separated slowing the growth of Universities becoming more entrepreneurial                      |
| Lack of Coherence and Structure   | References by participants to a lack of coherence and structure from the institution as a challenge of entrepreneurship as an academic                               |

|  |   |
|--|---|
| Lack of Recognition and Reward                           | References by participants to a lack recognition and reward from the institution as a challenge of entrepreneurship as an academic                        |
| Lack of Support  | References by participants to a lack of support from the institution as a challenge of entrepreneurship as an academic                                    |
| Lack of Training   | References by participants to a lack of training from the institution as a challenge of entrepreneurship as an academic                                   |
| Not Teaching Academic Entrepreneurship to Students       | References by participants to not teaching entrepreneurship to students to ensure the next generation can innovate and recognise opportunities            |
| Shorter Timeframe  | References by participants to having shorter time frame to complete research projects   |
| Fit between Entrepreneurship and Academia                |   |
| Academia becoming more Entangled with Business           | References by participants to academia becoming more entangled with private business  |
| Always Looked at Research with the Aim of Creating Value | References by participants to always looking at research as applied research to find a solution to a problem as opposed to creating theory                |
| Attracting Funding to Research Projects                  | References by participants to their role attracting funding towards research projects   |
| Commonalities between Academia and Entrepreneurship      | References by participants to entrepreneurship and academia both weighing up risk   |
| Field Closely Related to Innovation                      | References by Participants to their field being aligned to innovation   |
| Improving Patient Care                                   | References by participants to their role improving patient care   |
| Student Driven   | References by Participants to their role in academic entrepreneurship being mostly driven by students and involvement coming from supporting the students |
| Impact of Entrepreneurship on Academic Careers           |   |
| Academic Entrepreneurship Becoming More Relevant         | References by participants to a growing need/demand for academic entrepreneurship due to demand from funders  |
| Desired by Funders                                       | References by participants to academics entrepreneurs being more attractive to funders  |

|  |  |
|--|--|
| Focus on Publishing  | References by participants to it being difficult to be entrepreneurial as an academic due to the focus and pressure put on academics to publish        |
| Personal Financial Benefit                                     | References by participants to it being possible to profit as an academic entrepreneur personally   |
| Success Through Innovation                                     | References by Participants to it being possible to have a successful academic career if the measurement of success is the work done driving innovation |
| Institutional Level Rewards for Academic Entrepreneurs         |  |
| Not Rewarded or Acknowledged                                   | References by participants to entrepreneurial activity not being rewarded or acknowledged by the University  |
| Only Acknowledged if Funding is Very Large                     | References by participants to only getting any acknowledgment if funding is a large amount   |
| Only Acknowledged if Research Results in Licencing Revenue     | References by participants to entrepreneurial activity only acknowledged if research results in licencing revenue                                      |
| Managing Entrepreneurial Grants                                |  |
| Cost Matters More  | References by participants to being more aware and putting more emphasis on how much things cost   |
| Less Publishing Before Patent                                  | References by participants to not as much can be published on an entrepreneurial grant until after a patent has been secured                           |
| More Focus on Getting Funded then Research Project or Findings | References by participants to a greater focus on getting funding then more traditional academic pursuits e.g. findings, methodology                    |
| Very Little Difference   | References by participants to not much difference in managing entrepreneurial grant vs a traditional research grant                                    |
| Motivational Factors for participants to enter academia        |  |
| Ability to do entire Research Projects                         | References by participants to being able to do an entire research project as an academic as appose to part of a research project in industry           |
| Role Model   | References by Participants to being interested in a career in academia due to an academic role model in their life                                     |
| Conducting Research Improved Practice                          | References by participants to research improving ability to do job   |
| Interested from a Young Age                                    | References by participants to being interested in a career in academia from a young age  |

|  |   |
|--|---|
| Means to Enter a Career                                    | References by participants to choosing a career in academia as a means to get into/further a career path  |
| Opportunity Came Along                                     | References by participants to do a PHD leading to a career in academia  |
| Status   | References by participants to choosing a career in academia because of a perceived status in the community that come with the profession                                |
| Vocational Calling   | References by participants to being interested in a career in academia because of a vocational calling  |
| Perceptions of Academic Engagement in Entrepreneurship     |   |
| Academic Integrity Must be Maintained                      | References by participants to academia integrity must be maintained when working with private companies   |
| Academics doing Commercial Development is Unrealistic      | References by participants to it being unrealistic to expect academics with no experience or training to competently undergo commercial development                     |
| Autonomy Important to Pursue Passions and Interests        | References by Participants to autonomy being important in academia so that academics have the freedom in what they research, with what method and what approach to use. |
| Entrepreneurship Distracts from Core Academic Roles        | References by Participants to entrepreneurship distracting from perceived core academic roles such as teaching and research   |
| Focuses Research on Real World Problems                    | References by participants to academics engaging in entrepreneurship pushes research towards finding solutions that improve society                                     |
| Some Fields Better Suited than Others                      | References by Participants to some academic fields being better suited to engage in entrepreneurship then others  |
| Positive and Negative Aspects Entrepreneurship in Academia |   |
| Negative   | Negative  |
| Entrepreneurship not for Everyone                          | References by participants to academic entrepreneurship not being suited to everyone so not all academics should work in the area                                       |
| Not Rewarded by University                                 | References by participants to universities not rewarding academics for entrepreneurship in academia   |
| Some Regulations Stifle Research                           | References by participants to some of the rules of engagement around entrepreneurship stifle research potential   |
| Too Much Emphasis on                                       | References by Participants to too much emphasis being put on research that will benefit business, drawing   |

|  |   |
|--|---|
| Commercial Research  | resources from research that benefits other facets of society   |
| Positive   | Positive  |
| Academic Entrepreneurs Improve Society and Improves Academia | References by participants to academic entrepreneurs improving society and complementing traditional academia not creating conflict of interest |
| Attracts Funders   | References by participants to research in the area attracting funding to the University   |
| Driving New Research   | References by Participants to too entrepreneurship in academia driving research forward into new areas.   |
| Greater Pace of Development                                  | References by participants to development happening faster when working with industry then in a more traditional academic setting               |
| Increased Student Interest                                   | References by Participants to students being more interested in academic projects involving entrepreneurship                                    |
| Reputation   | References by Participants to universities building positive reputation by being involved in entrepreneurial projects                           |
| Research Requires knowledge                                  | Research Requires knowledge   |
| Return on Investment   | References by participants to entrepreneurship in academia giving a return on invested resources to both the University and society at large    |
| Students get to View the World of Industry                   | References by participants to entrepreneurship in academia giving students an opportunity to get insight into industry                          |
| Purpose of Academic Roles                                    |   |
| Academic Rigour  | References by participants to the purpose of the academic role as ensuring rigour   |
| Advancement of Field   | References by participants to advancing and innovating the field under study as the purpose of the academic role                                |
| Education  | References by participants to the purpose of the academic role as education   |
| New Knowledge to Benefit Society at Large                    | References by Participants to the purpose of the academic role being to benefit society at large by bringing new knowledge and Information      |
| Reputational Issues for Commercial Funding                   |   |
| No Issues  | No Issues   |

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|---|--|
| Always Worked in This Area  | References by participants to no issues in terms of professional reputation due to having worked in this area for a long time  |
| Don't Worry about Professional Reputation   | References by participants to being in a position that they don't concern themselves with their professional reputation  |
| Work With Many Types of Projects  | References by Participants to working on many different types of projects so reputation is not affected  |
| Yes Issues  | Yes Issues   |
| Career Inhibited  | References by participants to their career having suffered due to their involvement in academic entrepreneurship   |
| Could Damage Reputation if Moving to Entrepreneurial Research                             | References by Participants to a potential damage to ones reputation if moving from a more classical research model to an entrepreneurial model   |
| Need to Promote Self  | References by participants to promoting them self, using unconventional platform e.g. social media, to counter balance the lack of recognition the comes from working in entrepreneurial academia  |
| Reputational Opportunities for Commercial Funding   |  |
| Advertise Self to Promote Funders Interest  | References by participants to advertising them self in a way to make them more attractive to commercial funders  |
| Entrepreneurial Reputation Opens Doors to New Fields                                      | References by Participants to their reputation giving them new opportunities to work in new fields   |
| Funding aids Reputations  | References by participants to their reputation aiding in attraction of funders   |
| Training Students to Better Understand Business, Research and Innovation working Together | References by participants to training students to better understand how business and research institutions can work together so they will help build a culture of researchers who will accept commercial funding and if the students go into companies or start companies they will fund research |
| Strategies for Overcoming Entrepreneurial Challenges                                      |  |
| Gradually Turn the Ship   | References by Participants to not overcoming the challenges of entrepreneurship as an academic but to slowly change the culture within the University by pushing boundaries  |

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| Learn the Language                                       | References by participants to learning the language of academia and business to gain legitimacy  |
| External Network   | References by participants external networks as drivers of engagement to support entrepreneurial engagement  |
| Personal Brand   | References by participants advertising them self in a manner to make them more attractive to funders and in academic circles                                     |
| Resilience and Persistence                               | References by participants to resilience and persistence to overcome challenges of entrepreneurship as an academic   |
| Reward for Entrepreneurial Research                      | References by participants to universities needing to reward an encourage academics involved in entrepreneurial research   |
| Think like an Independent Researcher                     | References by participants to acting as if they are an independent research not part of an institution to overcome challenges of entrepreneurship as an academic |
| Use Institutions Resources                               | References by participants to using resources available in the university overcome challenges of entrepreneurship as an academic                                 |
| Infrastructure   | References by participants to using Infrastructure available in the university overcome challenges of entrepreneurship as an academic                            |
| Others Knowledge and Experience                          | References by participants to using Others Knowledge and Experience available in the university overcome challenges of entrepreneurship as an academic           |
| Titles and Labels  |  |
| Colleagues Refer to Each other as Academic Entrepreneurs | References by participants to colleagues Referring to each other as academic entrepreneurs   |
| Don't Mind Being Called an Academic Entrepreneur         | References by participants to not minding being referred to as an academic entrepreneur  |
| Hold Multiple Titles                                     | References by Participants to being referred to by many different titles as they fill many different roles not just an academic entrepreneur                     |
| I am an Applied Researcher                               | References by participants to considering them self an applied researcher more so then an academic entrepreneur  |
| Not Often referred to as and Academic Entrepreneur       | References by participants to not often being referred to as an academic entrepreneur  |
| Not Referred to as and Academic Entrepreneur             | References by participants to not being referred to as an academic entrepreneur  |

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|---|---|
| Shows the Value of Different Types of Academics | References by participants to titles such as entrepreneurial academia being positive because they highlight the value of different types of academics |
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### Codes\\Phase 3 - Developing Superordinate Themes

| Name   | Description  |
|--|--|
| Theme 1~ Role Frame and Personal Attitude and Behaviours |  |
| Definitions of Entrepreneurship                          |  |
| Creating Social Value                                    | References by participants to their understanding of entrepreneurship as creating social value   |
| Creating Wealth  | References by participants to their understanding of entrepreneurship as creating wealth   |
| Identifying and Fulfilling a Gap in the Market           | References by participants to understanding entrepreneurship as identifying a gap or need in the market and finding a way to supply or meet that gap |
| Innovation   | References by participants to understanding entrepreneurship as innovating and developing new technologies   |
| Drivers of Engagement                                    |  |
| Easier to Prove a Return on Investment                   | References by participants to it being easier to show to funders how there was a return on investment  |
| Global Standards   | References by Participants to global measures of success of a university expanding areas universities are involved in                                |
| Individual Desire  | References by participants to a shift towards entrepreneurship in academia due to individual academics curiosity and interest in the area            |
| Lack of Funding  | References by participants to more research being funded by private business due to a lack of funding  |
| Shift Towards Universities for Research and Development  | References by participants to companies and government looking to universities to do research and development  |
| Student Led  | References by Participants to the push towards entrepreneurship in academia being student led  |

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| Fit between Entrepreneurship and Academia                |   |
| Academia becoming more Entangled with Business           | References by participants to academia becoming more entangled with private business  |
| Always Looked at Research with the Aim of Creating Value | References by participants to always looking at research as applied research to find a solution to a problem as opposed to creating theory                |
| Attracting Funding to Research Projects                  | References by participants to their role attracting funding towards research projects   |
| Entrepreneurship and Academia both weigh Risk            | References by participants to entrepreneurship and academia both weighing up risk   |
| Field Closely Related to Industry                        | References by Participants to their field being closely related to industry and working closely with industry   |
| Improving Patient Care                                   | References by participants to their role improving patient care   |
| Student Driven   | References by Participants to their role in academic entrepreneurship being mostly driven by students and involvement coming from supporting the students |
| Motivational Factors for participants to enter academia  |   |
| Ability to do entire Research Projects                   | References by participants to being able to do an entire research project as an academic as oppose to part of a research project in industry              |
| Role Model   | References by Participants to being interested in a career in academia due to an academic role model in their life  |
| Conducting Research Improved Practice                    | References by participants to research improving ability to do job  |
| Interested from a Young Age                              | References by participants to being interested in a career in academia from a young age   |
| Means to Enter a Career                                  | References by participants to choosing a career in academia as a means to get into/further a career path  |
| Opportunity Came Along                                   | References by participants to do a PHD leading to a career in academia  |
| Status   | References by participants to choosing a career in academia because of a perceived status in the community that come with the profession                  |
| Vocational Calling                                       | References by participants to being interested in a career in academia because of a vocational calling  |

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| Perceptions of Academic Engagement in Entrepreneurship       |   |
| Academic Integrity Must be Maintained                        | References by participants to academia integrity must be maintained when working with private companies   |
| Academics doing Commercial Development is Unrealistic        | References by participants to it being unrealistic to expect academics with no experience or training to competently undergo commercial development                     |
| Autonomy is Important for Academics                          | References by Participants to autonomy being important in academia so that academics have the freedom in what they research, with what method and what approach to use. |
| Entrepreneurship Distracts from Core Academic Roles          | References by Participants to entrepreneurship distracting from perceived core academic roles such as teaching and research   |
| Focuses Research on Real World Problems                      | References by participants to academics engaging in entrepreneurship pushes research towards finding solutions that improve society                                     |
| Some Fields Better Suited than Others                        | References by Participants to some academic fields being better suited to engage in entrepreneurship then others  |
| Positive and Negative Aspects Entrepreneurship in Academia   |   |
| Negative   | Negative  |
| Entrepreneurship not for Everyone                            | References by participants to academic entrepreneurship not being suited to everyone so not all academics should work in the area                                       |
| Not Rewarded by University                                   | References by participants to universities not rewarding academics for entrepreneurship in academia   |
| Some Regulations Stifle Research                             | References by participants to some of the rules of engagement around entrepreneurship stifle research potential   |
| Too Much Emphasis on Commercial Research                     | References by Participants to too much emphasis being put on research that will benefit business, drawing resources from research that benefits other facets of society |
| Positive   | Positive  |
| Academic Entrepreneurs Improve Society and Improves Academia | References by participants to academic entrepreneurs improving society and complementing traditional academia not creating conflict of interest                         |

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| Attracts Funders   | References by participants to research in the area attracting funding to the University  |
| Driving New Research   | References by Participants to too entrepreneurship in academia driving research forward into new areas.                                      |
| Greater Pace of Development                                  | References by participants to development happening faster when working with industry then in a more traditional academic setting            |
| Increased Student Interest                                   | References by Participants to students being more interested in academic projects involving entrepreneurship                                 |
| Reputation   | References by Participants to universities building positive reputation by being involved in entrepreneurial projects                        |
| Research Requires knowledge                                  | Research Requires knowledge  |
| Return on Investment   | References by participants to entrepreneurship in academia giving a return on invested resources to both the University and society at large |
| Students get to View the World of Industry                   | References by participants to entrepreneurship in academia giving students an opportunity to get insight into industry                       |
| Purpose of Academic Roles                                    |  |
| Academic Rigour  | References by participants to the purpose of the academic role as ensuring rigour  |
| Advancement of Field   | References by participants to advancing and innovating the field under study as the purpose of the academic role                             |
| Education  | References by participants to the purpose of the academic role as education  |
| New Knowledge to Benefit Society at Large                    | References by Participants to the purpose of the academic role being to benefit society at large by bringing new knowledge and Information   |
| Theme 2 ~ Role identity development, evolution or change     |  |
| Awareness of Other Academic Entrepreneurs in the Institution |  |
| Not Aware  | No   |
| Not Recognised by University                                 | References by participants to the university not recognising academic entrepreneurs  |
| Should Be Educating Other Academics on                       | References by participants to notable academics on campus not being given the opportunity to educate   |

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| Entrepreneurship in Academia                      | other academics about how to be an entrepreneurial academic  |
| Supported by University                           | References by participants to staff engaging in academic entrepreneurship being supported by the university  |
| Role models                                       | References by participants to other academic entrepreneurs on campus that are role models to them in relation to their entrepreneurial engagements                           |
| Always had a Commercialization Fund               | References by participants to always having access to some form of commercialization fund throughout their career resulting in no change in approach to role                 |
| Grown as a Leader                                 | References by participants to becoming a better leader over time on the back of experience   |
| Learned to Walk the Line for Publications         | References by participants to learning how and what can be published to maintain publishing and still protect intellectual property  |
| Learning New Language                             | References by participants to having to learn new terminology  |
| More Focus on Research than Teaching              | References by participants to shifting their focus away from teaching and over to research   |
| More Roles and Responsibilities                   | References by Participants to there now being more roles and responsibilities since being awarded a commercialisation fund   |
| More Work with Industry                           | References by Participants to doing more work with industry since being awarded a commercialisation fund   |
| No More than Other Projects have Changed Approach | References by participants to their approach constantly changing and a change in funding has not affected approach more than any other factor changing                       |
| Colleagues' Perceptions of Entrepreneurship       |  |
| Block Resources                                   | References by participants to colleagues blocking resources for entrepreneurship projects due to not being interested or not support university and commercial collaboration |
| Can't be Easily Done                              | References by participants to Colleagues believing academic entrepreneurship is hard to do and difficult to properly implement   |
| Challenge Projects                                | References by participants to colleagues challenging aspects of entrepreneurship projects due to not being interested or not support university and commercial collaboration |

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| Colleagues Work in Entrepreneurial Academia               | References by Participants colleagues working in entrepreneurial academia so are mostly positive   |
| Conflict of Interest                                      | References by participants to colleagues viewing entrepreneurship as a conflict of interest due to profit made off the research                                      |
| Drawing Funding Away from more Standard Academic Research | References by participants to Colleagues believing academic entrepreneurship is drawing resources and funding away from more traditional academic research           |
| High Amount of Ignorance                                  | References by participants to most people outside of academic entrepreneurship not knowing much about the process  |
| Mixed Views   | References by participants to colleagues having mixed views on entrepreneurship with some supporting and some opposing it  |
| Neutral   | References by participants to colleagues being neutral on academic entrepreneurship  |
| Younger Colleagues More Open to Entrepreneurship          | References by Participants to younger colleagues being more open and wanting to work in entrepreneurship then older ones   |
| Drivers for Entrepreneurial Funding                       |  |
| Always Worked in Applied Research                         | References by participants to always having worked with applied research so applying for entrepreneurial funding was natural to them.                                |
| Commercial Potential                                      | References by participants to applying for entrepreneurial funding as the project had commercial potential   |
| Couldn't do Work Without Entrepreneurial Funding          | References by participants to being unable to do their work in the manner they carry it out currently without the appropriate type of funding                        |
| Easier to get Funding                                     | References by participants to it being easier to get funding if you apply for entrepreneurial funding  |
| Funding Leads to Innovation                               | References by participants to entrepreneurial funding supporting innovation and driving research forward. The funding allows the researcher to drive this innovation |
| Hire Consultant   | References by Participants to applying for entrepreneurial funding to be able to hire consultants to aid research team   |
| Monetary Reward   | References by participants to monetary reward being a motivating factor when applying for entrepreneurial funding  |

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| No Reason not to   | References by participants to applying for entrepreneurial funding as there is no reason not to  |
| Reduced Personal Risk                                      | References by participants to applying for entrepreneurial funding as funding reduced personal risk off loss due to the project                        |
| Student Driven   | References by Participants to students driving the application for entrepreneurial funding   |
| Impact of Entrepreneurship on Academic Careers             |  |
| Academic Entrepreneurship Becoming More Relevant           | References by participants to a growing need/demand for academic entrepreneurship due to demand from funders   |
| Desired by Funders   | References by participants to academics entrepreneurs being more attractive to funders   |
| Focus on Publishing  | References by participants to it being difficult to be entrepreneurial as an academic due to the focus and pressure put on academics to publish        |
| Personal Financial Benefit                                 | References by participants to it being possible to profit as an academic entrepreneur personally   |
| Success Through Innovation                                 | References by Participants to it being possible to have a successful academic career if the measurement of success is the work done driving innovation |
| Institutional Level Rewards for Academic Entrepreneurs     |  |
| Not Rewarded or Acknowledged                               | References by participants to entrepreneurial activity not being rewarded or acknowledged by the University  |
| Only Acknowledged if Funding is Very Large                 | References by participants to only getting any acknowledgment if funding is a large amount   |
| Only Acknowledged if Research Results in Licencing Revenue | References by participants to entrepreneurial activity only acknowledged if research results in licencing revenue                                      |
| Managing Entrepreneurial Grants                            |  |
| Cost Matters More  | References by participants to being more aware and putting more emphasis on how much things cost   |
| Less Publishing Before Patent                              | References by participants to not as much can be published on an entrepreneurial grant until after a patent has been secured                           |

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| More Focus on Getting Funded then Research Project or Findings | References by participants to a greater focus on getting funding then more traditional academic pursuits e.g. findings, methodology             |
| Very Little Difference   | References by participants to not much difference in managing entrepreneurial grant vs a traditional research grant                             |
| Theme 3~ Implications in managing a dual identity              |   |
| Entrepreneurship Challenges in Academia                        |   |
| Access to Expertise  | References by participants to limited access to expertise   |
| Bureaucracy  | References by participants to a high amount of bureaucracy  |
| Keeping Departments Separated                                  | References by participants to colleagues wanting to keep departments separated slowing the growth of Universities becoming more entrepreneurial |
| Lack of Coherence and Structure                                | References by participants to a lack of coherence and structure from the institution as a challenge of entrepreneurship as an academic          |
| Lack of Recognition and Reward                                 | References by participants to a lack recognition and reward from the institution as a challenge of entrepreneurship as an academic              |
| Lack of Support  | References by participants to a lack of support from the institution as a challenge of entrepreneurship as an academic                          |
| Lack of Training   | References by participants to a lack of training from the institution as a challenge of entrepreneurship as an academic                         |
| Not Teaching Academic Entrepreneurship to Students             | References by participants to not teaching entrepreneurship to students to ensure the next generation can innovate and recognise opportunities  |
| Shorter Timeframe  | References by participants to having shorter time frame to complete research projects   |
| Reputational Issues for Commercial Funding                     |   |
| No Issues  | No Issues   |
| Always Worked in This Area                                     | References by participants to no issues in terms of professional reputation due to having worked in this area for a long time                   |
| Don't Worry about Professional Reputation                      | References by participants to being in a position that they don't concern themselves with their professional reputation                         |

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| Work With Many Types of Projects  | References by Participants to working on many different types of projects so reputation is not affected  |
| Yes Issues  | Yes Issues   |
| Promotional Challenges  | References by participants to promotional challenges due to their involvement in academic entrepreneurship   |
| Could Damage Reputation if Moving to Entrepreneurial Research                 | References by Participants to a potential damage to ones reputation if moving from a more classical research model to an entrepreneurial model   |
| Need to Promote Self  | References by participants to promoting them self, using unconventional platform e.g. social media, to counter balance the lack of recognition the comes from working in entrepreneurial academia  |
| Reputational Opportunities for Commercial Funding                             |  |
| Advertise Self to Promote Funders Interest                                    | References by participants to advertising them self in a way to make them more attractive to commercial funders  |
| Funding aids Reputations  | References by participants to their reputation aiding in attraction of funders   |
| Reputation Opens Doors to New Fields  | References by Participants to their reputation giving them new opportunities to work in new fields   |
| Training Students to Better Understand Business and Research working Together | References by participants to training students to better understand how business and research institutions can work together so they will help build a culture of researchers who will accept commercial funding and if the students go into companies or start companies they will fund research |
| Strategies for Overcoming Entrepreneurial Challenges                          |  |
| Gradually Turn the Ship   | References by Participants to not overcoming the challenges of entrepreneurship as an academic but to slowly change the culture within the University by pushing boundaries  |
| Learn the Language  | References by participants to learning the language of academia and business to gain legitimacy  |
| Manage my Brand   | References by participants advertising them self in a manner to make them more attractive to funders and in academic circles   |

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| Peer to peer support                                     | References by participants to peer support to overcome challenges of entrepreneurship as an academic   |
| Resilience and Persistence                               | References by participants to resilience and persistence to overcome challenges of entrepreneurship as an academic   |
| Reward for Entrepreneurial Research                      | References by participants to universities needing to reward and encourage academics involved in entrepreneurial research  |
| Think like an Independent Researcher                     | References by participants to acting as if they are an independent research not part of an instruction to overcome challenges of entrepreneurship as an academic |
| Use Institutional Commercial Resources                   | References by participants to using central commercial services such as the technology transfer office(TTO)  |
| Infrastructure   | References by participants to using Infrastructure available in the university overcome challenges of entrepreneurship as an academic                            |
| Lab Knowledge and Experience                             | References by participants to using entrepreneurial knowledge and experience available in their labs to support entrepreneurship and overcome challenges.        |
| Titles and Labels  |  |
| Colleagues Refer to Each other as Academic Entrepreneurs | References by participants to colleagues Referring to each other as academic entrepreneurs   |
| Don't Mind Being Called an Academic Entrepreneur         | References by participants to not minding being referred to as an academic entrepreneur  |
| Wear Multiple Hats at My Career Stage                    | References by Participants to being referred to by many different titles as they fill many different roles not just an academic entrepreneur                     |
| I am an Applied Researcher                               | References by participants to considering them self an applied researcher more so then an academic entrepreneur  |
| Not Often referred to as and Academic Entrepreneur       | References by participants to not often being referred to as an academic entrepreneur  |
| Not Referred to as and Academic Entrepreneur             | References by participants to not being referred to as an academic entrepreneur  |
| Shows the Value of Different Types of Academics          | References by participants to titles such as entrepreneurial academia being positive because   |

|   |  |
|---|--|
|   | the highlight the value of different types of academics  |
| Theme 4 ~ Intrinsic and Extrinsic Factors                     |  |
| Extrinsic Factors   |  |
| Market Value  | References by participants to the their understanding of entrepreneurship as creating wealth and value for a market  |
| Easier to Prove a Return on Investment                        | References by participants to it being easier to show to funders how there was a return on investment  |
| Global Standards  | References by Participants to global measures of success of a university expanding areas universities are involved in  |
| Lack of Funding   | References by participants to more research being funded by private business due to a lack of funding  |
| Means to Enter a Career                                       | References by participants to choosing a career in academia as a means to get into/further a career path   |
| Personal Financial Benefit                                    | References by participants to it being possible to profit as an academic entrepreneur personally   |
| Shift Towards Universities from Research and Development to D | References by participants to companies and government looking to universities to do research with a more sharpened focus on development and commercialisation |
| Status  | References by participants to choosing a career in academia because of a perceived status in the community that come with the profession                       |
| Student Led   | References by Participants to the push towards entrepreneurship in academia being student led  |
| Intrinsic Factors   |  |
| Creating Social Value   | References by participants to the their understanding of entrepreneurship as creating social value   |
| Mindset and curiosity   | References by participants to a shift towards entrepreneurship in academia due to individual mindset and curiosity   |
| Interested from a Young Age                                   | References by participants to being interested in a career in academia from a young age  |
| Vocational Calling  | References by participants to being interested in a career in academia because of a vocational calling   |

#### Codes\Phase 4 - Within and Cross-case Analysis

| Name                       | Description |
|----------------------------|-------------|
| Entrepreneurial Typologies |             |

|                  |   |
|------------------|---|
| Reluctant - Ae   | Reluctant to engage in entrepreneurship, very much pushed toward the activity largely by extrinsic factors    |
| Ready Made - aE  | Born into an academic environment that is focussed on commercialisation of research.                          |
| Resourceful - AE | By nature a senior academic working at Professorial level with full autonomy who is well resourced to engage. |