THE SYSTEMIC ROLE OF UNIVERSITIES IN ENTREPRENEURSHIP:

FROM ENTREPRENEURIAL ECOSYSTEM DYNAMICS TO THE EMERGENCE OF ENTREPRENEURIAL UNIVERSITY ARCHETYPES

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"When we are no longer able to change a situation, we are challenged to change ourselves"

Victor Frankl

Change is the one fundamental constant that paradoxically does not change. Without it, cause and effect would not make sense, time would not happen, and existence as we know it would stop being. Thanks to change, we can have time to live, grow, and basically be human beings. Change is also at the heart of what innovation is and what entrepreneurship seeks, namely changing the status-quo for better business models, products and services. As every organizational science scholar would know, too little change and organizational inertia prevails, but also too much change leads to chaos, disorder, and organizational ruin ensues. Thus, innovation sits at the limits of change, and entrepreneurial endeavors walk that fine line between conventions and eccentricity. During this research journey, I have walked that fine line, pushing the boundaries of inquiry and the limits of my own understanding sometimes to a breaking point that has negatively affected my own wellbeing. Therefore, I have been obliged by circumstances to change myself and consciously limit my research practices and methodologies for the sake of standards and settled collegial knowledge. In short, I am most thankful for the God-given human capacity to self-reflect and change oneself for the sake of self-preservation, scrutinized evolution, and incremental advancement of scientific knowledge.

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Now, for a change, let's get personal. Firstly, I am most thankful to my Thesis Advisor, mentor, friend, and "Dr. Vater" Markus Reihlen. I am grateful for all your support from the very start when you supported my career change from business to university, and then

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Honestly, I cannot believe that I have made it this far and that soon I will be disputing this research work to obtain a doctorate degree. As a marathon runner, I know the physical and mental endurance it takes to keep going even when your legs refuse to keep moving because of that same God-given self-preservation instinct. I cannot find a better analogy than to acknowledge that this has been the marathon of my life, a scientific and soulful marathon, one that has not ended yet. Still, one in which when I cross that finish line, it will be the continuation of a lifelong marathon, of an academic career, not for myself but God-willing to contribute to society and future generations for the greater good.

Johann Bronstein in Lüneburg, October 2021

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SYNOPSIS

"The only real mistakes are the ones from which we learn nothing."
– Henry Ford

My research interest in the fields of entrepreneurship and higher education awakened after my own bitter experience as an entrepreneur. Following a fruitful professional start as brand manager for important international companies in various countries, I embarked on a lone entrepreneurial endeavor that ended with an unexpected failure. As a firm believer in the value of knowledge, a curious spark within me led me to search if I could have avoided failure by preparing myself in entrepreneurship or using any available support mechanism provided by universities. Therefore, after a period of in-depth reflection, I decided that I needed to understand how entrepreneurs succeed and especially how universities could groom entrepreneurs for success and provide support for entrepreneurial endeavors.

After becoming scholarly acquainted with the research field of entrepreneurship and higher education, I can certainly understand what my mistake was. Contrary to what some popular myths might depict, entrepreneurship is not a lonely warrior endeavor in an isolated desert island. Also, it is not about born heroes or a David versus Goliath confrontation. But after years of research, I have realized that entrepreneurship is about ordinary people using already available resources such as helpful knowledge, business networks, accessible financial means, skilled human resources, and existing support infrastructure. All this is done in a novel way to navigate unexplored competitive territory that can provide breathing ground for value creation and sustainable competitive advantage for the entrepreneur. Specially, I learned that applied knowledge provides an entrepreneurial edge. This is intrinsically linked to higher education, since the university is the natural institutional home for knowledge in this day and age.

Now, it is through these written manuscripts compiled as a comprehensive dissertation that I am pleased to share the conceptual frameworks, empirical findings, theoretical contributions, and practical tools that my co-authors and I have discovered. Besides the primary purpose of theory development within the research field, this scholarly work aims to directly or indirectly serve practitioners, innovators, and future entrepreneurs with the necessary foreknowledge that I lacked when I embarked on my entrepreneurial journey. Of course, specific scientific contributions and the academic relevance of this dissertation will be further expounded in this synopsis and detailed throughout each of the research articles.

ENTREPRENEURSHIP AND THE SYSTEMIC ROLE OF UNIVERSITIES

In recent decades, knowledge has increasingly been viewed as the core engine of economic progress, while innovation has been acknowledged as the driving force behind the wheel. Likewise, the knowledge base of a regional economy is vital for the generation of new technologies and firms capable of successfully competing in an increasingly global economic sphere (Dolfsma & Soete, 2006). In this context, the rapid formation of new knowledge, the ease of access to information, and the increased technological capacity to compile and apply this knowledge are all features that spread economic efficiency, innovation, quality of goods and service, as well as economic growth and increased welfare (Foray, 2004). Furthermore, the significance of entrepreneurship as a key mechanism for innovation, new business generation, and economic development has been widely acknowledged, becoming the focus of researchers, policymakers, and practitioners alike (Peris-Ortiz et al., 2017). Specifically, an essential contributor to sustainable economic expansion, and regional development, has come to be innovation generated within universities and knowledge transfer initiatives between university and industry. In this regard, governments have had to actively engage in designing policies and incentives schemes to encourage university-industry cooperation, reflecting evidence that it is not a natural strategy for any of these actors (van der Sijde et al., 2004). Furthermore, universities have engaged in efforts to institutionalize processes that foster innovation, academic entrepreneurialism, and knowledge transfer by setting up organizational schemes and structures that formally support these activities while also engaging in entrepreneurial strategies to promote innovation and entrepreneurship.

Since the advent of universities as institutions, they have been regarded as the principal nest of knowledge. Similarly, in this day and age, the university has become the natural dwelling place for knowledge-based innovation and, correspondingly, for knowledge-based entrepreneurship. In this context, the concept of the entrepreneurial university has emerged (Erdil et al., 2018). As knowledge capital becomes more important in the 21st-century economy, the entrepreneurial university is called to play a more preponderant role in today's society, reaching beyond the traditional mission of teaching and research, with an increased influence on economic and social development (Wissema, 2009).

Clark's (1998) concept of the Entrepreneurial university manifests at the organizational level in a dual way. On the one hand, it portraits universities as enablers of innovation, knowledge transfer incubators for future entrepreneurs, since these entrepreneurial universities establish learning methods for their students that facilitate entrepreneurial behavior and a greater chance of success. On the other hand, it also manifests in a more literal way defining

the university as an active entrepreneurial actor itself, which fully intervenes in the discovery and implementation of new business opportunities as well as technology transfer by means of cooperation with business, the creation of university spin-offs, and the direct involvement of professors and departments in entrepreneurial endeavors (Peris-Ortiz et al., 2017). University-based entrepreneurship plays a central role in enabling the healthy development of an entrepreneurial ecosystem. Higher education institutions can stimulate enterprise creation by more than merely teaching and research activities.

The transformation of universities into functional entrepreneurial actors requires changes in the existing structures, strategies, practices, and, most importantly, culture and mindset changes. For most universities, this change is not easy, making it challenging to adapt to the changes in the external environment (Unger & Polt 2017). This evolutionary process implies that the innovation ecosystem is becoming more entrepreneurial, and universities cannot be immune to this progress (Erdil et al., 2018). Entrepreneurial ecosystems are becoming increasingly complex, requiring integrated and commercialized knowledge isolated in some way in the university system.

Understanding that entrepreneurship can be better modeled from a systemic point of view is a primordial aspect that determines the important role of universities in entrepreneurial ecosystems. What makes the ecosystem approach a valuable tool for understanding social systems is that, from a holistic perspective, their behavior seems to have emerging characteristics. The impact of this "research object" can only be revealed through interrelated causal chains similar to the behavior of natural ecosystems (Mars et al., 2012). Therefore, the entrepreneurial ecosystem concept provides a unique perspective that complements previous studies on networked economic activity with a clear focus on the systemic elements that support entrepreneurship, and an emphasis on policy agendas that promote the entrepreneurial process.

UNIVERSITIES AS THE CORE OF ENTREPRENEURIAL ECOSYSTEMS

A growing body of academic literature considers universities as having a primordial role in entrepreneurial ecosystems (Brown & Mason 2017; Miller & Acs 2017). These distinguish the concept of an entrepreneurial ecosystem from the competitive approach in economics, business administration, and organizational studies (Mason & Brown, 2014; Zahra & Nambisan, 2012; Kshetri, 2014; Stam, 2015). Few of the studies paid enough attention to integrating the existing literature on business ecosystems. That is, the available research on the entrepreneurial ecosystem is still very scarce and fragmented. In previous studies, the definition of the field of the entrepreneurial ecosystem depends on the objectives of the research and it is

not theoretically grounded on strong conceptual foundations. Moreover, the interrelationship between the multiple roles of universities in the entrepreneurial ecosystem and their multiple roles in society has not been fully considered; for example, as a source of basic research, innovation, education and business activities (HuangSaad et al., 2016). Therefore, researchers have proposed that university-based business and entrepreneurial ecosystem models should be approached in a more holistic way (Nicholls-Nixon et al., 2021). To address this gap in the literature, we build our analysis on the conceptual model of the entrepreneurial ecosystem that we have developed from the matrix structure of Isenberg (2011). The first part of this dissertation contributes to the field by broadening the latter framework, namely by adding two more domains, an outer and an inner dimension, which portrait the complex interplay between the internal-external elements of the ecosystem. We then shed light on the ecosystem dynamics and possible paths toward the development of entrepreneurial universities.

Reihlen, Seckler & Werr (2017) describe two approaches to conceptualizing the entrepreneurial ecosystem. The first is a network of economically interconnected participants with shared business goals who interact in complex ways. The second method emphasizes the geographic and cluster aspects of the system. Similarly, according to Colombo et al. (2019), there are two ways to describe the entrepreneurial ecosystem constellation: bottom-up and top-down approaches. Although many studies on entrepreneurial ecosystems are implicitly based on these two aspects, most works focus on one dimension or the other. They tend to ignore the complex interactions between the system's macro or external and micro or internal aspects. The ecosystem approach proposed in this doctoral thesis considers the interactions and mutual influences on the entire ecosystem from the university's perspective as the focal point of the internal ecosystem.

Also, in the second paper of this work, my co-author and I advocate for the relevance of human capital to entrepreneurial success and performance. Moreover, we depict the fundamental role that universities play in the entrepreneurship ecosystems by enabling, empowering and supporting the human capital dimension and individual entrepreneurs. In developing countries, this role is fundamental during the incipient and developmental stages of an ecosystem life-cycle, where other actors do not usually actively participate or engage in the promotion and support of entrepreneurial activity.

We start from the axion that human capital has a strong relation to the skills, level of education, trained abilities and knowledge- base of an entrepreneurial ecosystem (Fairlie & Robb, 2009). Moreover, the human capital domain of an entrepreneurial ecosystem is influenced by a range of contingent elements that can be broadly characterized as social,

cultural, and material (Spigel, 2017). Along these lines, we can notice that the level to which an entrepreneurial culture flourishes within the ecosystem will depend on how actors in and around the university behave according to entrepreneurial values and beliefs (Greenwood & Hinings, 1996). In other words, these entrepreneurial attributes will be determined at the most basic level by socio-cultural factors and broader cultural beliefs toward entrepreneurship in a region. Our conceptual framework is based on the aforementioned basic principles by considering contextual elements associated to infrastructure, human capital, culture, business and markets. Meanwhile, it focuses on universities as seminal actors in enabling human capital when regional entrepreneurial ecosystems are deficient. In the empirical section of the second article, we describe the implementation of our framework to a real-life case in the city of Maxixe in Mozambique, where one of the authors is actively engaged in applying our proposed model, and in developing a university-based entrepreneurial ecosystem, together with a local university called the Unisave Entrepreneurship HUB.

FROM ENTREPRENEURIAL ECOSYSTEMS TO THE INSTITUTIONAL EMERGENCE OF ENTREPRENEURIAL UNIVERSITY ARCHETYPES

The essential aspiration of the ecosystem paradigm is that in a networked environment that transcends single players, synergetic forces bestowed from the ecosystem allow actors to expand their capabilities beyond their boundaries, thereby transferring knowledge embedded through the ecosystem into innovation (Adner, 2006). Therefore, in order to be successful, potential entrepreneurs need a conducive environment that allows them to innovate and access markets that support their business models in a sustainable manner. Miller and Friesen (1983) emphasized the importance of the organizational environment by pointing out that companies need to constantly update their strategies and adapt their structures regularly in order to cope with contingencies imposed by the institutional field. Along these thought lines, entrepreneurship can also be understood as a social institution based on specific social values, norms, and social order (Brandl & Bullinger, 2009; Jennings et al., 2013).

In particular, my co-authors and I regard higher education entrepreneurship in the third paper as a strategic choice to participate in innovation and entrepreneurial activities in response to changing social and cultural expectations. Namely, this strategic choice starts with the willingness to be up to the new role of modern universities in the wider society and within the broader economic context. It ends with the university actively engaging as an entrepreneurial actor; that is its emergence as an entrepreneurial university. This business drift of higher education is closely related to the rise of management education. What is coined as the rise of

managed education in our third study is based on the cultivation of an autonomous and competitive market ideology, leading to policy changes in the university arena and the reform of the higher education system in most Western countries (Reihlen & Wenzlaff, 2014).

At the macro level, very little research has been conducted on the specific institutional conditions, historical context, change processes, and practices that have led to the emergence of entrepreneurial universities. The third article of my dissertation stands as an important transition between the external entrepreneurial environment and the internal entrepreneurial ecosystem in universities, as it elucidates the institutional and historical context that led to the advent of the entrepreneurial university phenomenon, specifically in Germany. We do this by illustrating a unique case of one of the most radical transformations of a university in the German postwar period, bridging the research gap by empirically elucidating how a more traditional public university is turned into an entrepreneurial one as a strategic response to institutional change.

In response to recent changes in higher education's institutional field, the university has become entrepreneurial both in its internal dynamics and in its interactions with external stakeholders; this is particularly visible in the transfer of knowledge produced at the university for economic and social utility (Etzkowitz , 2003). Consequently, Rothaermel et al. (2007: 691) describes the transformation of the university as the transition from a "closed innovation system" to a practice-oriented "open innovation system". One of the core themes in prior research is the question of what organizational characteristics best portrait the entrepreneurial university. Existing literature tends to reduce these characteristics to capitalization and commercialization activities (Yusuf & Jain, 2010). Notwithstanding this neglect, my co-author and I argue in the fourth article that this perspective neglects the multidimensionality of Entrepreneurial Universities, which, in addition to engaging in knowledge transfer activities, implement entrepreneurial approaches at all institutional levels (Clark, 1998; Etzkowitz, 2004; Hannon, 2013).

Based on our literature review, Prof. Reihlen and I propose in the fourth article of this doctoral work that entrepreneurship is the act of seeking and exploiting opportunities beyond currently available means, not only in individuals but also in organizations such as companies or government agencies (Bull & Willard, 1993; Shane & Venkataraman, 2000). These opportunities to use future goods and services are not simply used but are created through new organizational attributes and interactions at the micro, meso and macro institutional levels (Reihlen & Werr, 2012); thus, resulting in many new organizational configurations that tend to converge into a few distinctive archetypes (Greenwood & Hinings, 1988). Therefore, in our

study, we start from the basis that the boundaries of an entrepreneurial university and its relevant characteristics can be included in a wide-reaching definition, which would come closer to the original essence of the term entrepreneur. Namely, we understand an entrepreneurial university as one that responds strategically to field logic changes by acquiring and employing resources in an innovative manner, underpinned by an integrated entrepreneurial culture that provides support structures to fulfill its strategic goals.

Clark's (1998) pioneering research on entrepreneurial universities aimed to identify common elements among his five case studies. In other words, his methodology aimed to determine the empirical principles generalizable to universities with similar characteristics. When trying to identify and define new phenomena through unprecedented empirical research, Clark's approach makes sense. Nevertheless, his method tends to "homogenize what is actually a plural phenomenon" by discovering unified themes and principles to downplay the versatility brought about by entrepreneurial universities (Glynn et al., 2000). In contrast to this approach, my fourth research article aims to find empirical heterogeneity within Clark's homogeneous but general framework, provided that organizational differences in higher education are favored by deregulation and entrepreneurial changes in the institutional environment. The main issue with Clark's framework is that the empirical case studies that we looked at shows evidence that the differences Various types of universities are described as entrepreneurial universities, although in reality, their organizational characteristics are quite different.

Therefore, this research should contribute to the existing literature on entrepreneurial universities by generating a more refined framework, which streams from a common institutional framework sprouting after empirically observed commonalities. These common qualities originate from specific organizational characteristics that we identified through a qualitative metanalysis of existing case study literature on entrepreneurial universities, which in turn derived the four entrepreneurial university archetypes that we identified.

PATHS THROUGH THIS WORK

This dissertation presents a dual scientific account of the entrepreneurship phenomenon in universities. The work is divided into two equal parts, each of which is composed of two research papers. The narrative of the first half takes on a macro perspective view, consisting of one theoretical and one empirically-based conceptual case study. This part conceptually depicts a systematic approach to entrepreneurialism in higher education, namely an ecosystems perspective. The second half concentrates on the meso- and micro levels of study from the university's point of view, comprising of a case study as historical account for the emergence

of the entrepreneurial university, and of a metasynthesis of empirical case studies in entrepreneurial universities, which serves as the basis for the development of entrepreneurial university archetypes. This later part treats the university itself as an emergent entrepreneurial actor embedded in an institutional and historical setting that triggers its evolution, hence contextualizing and expanding Clark's (1998) seminal work on entrepreneurial universities. It can be observed that each half correspondingly mirrors the overall structure of the dissertation, namely a dichotomy that portraits a deductive path from the general (first and third article) to the specific (second and fourth article). Comprehension of this structural pattern is key to understanding the nominal order of each research article and the overall narrative structure of the dissertation as a comprehensive scientific treaty on the role of universities in entrepreneurship ecosystems. Table 1 gives an overview of the four articles.

TABLE 1 - Article Overview

Article	Title	Authors	Publication	Status
1	Entrepreneurial Ecosystem Dynamics. A university centered conceptual framework modeling the external-internal dimensions and mapping the paths toward entrepreneurial universities.	Johann Bronstein	Journal of Business Venturing	In preparation for submission 2022
2	Toward a Framework for University-Based Entrepreneurial Ecosystems and Human Capital Development in Sub-Saharan Africa.	Johann Bronstein and Shaun Bissett	*Resilience, Entrepreneurship and ICT* (pp. 31-56). Springer, Cham.	Published 2021
3	Institutional Change in Higher Education in Germany and the Emergence of the Entrepreneurial University.	Markus Reihlen, Ferdinand Wenzlaff and Johann Bronstein	1st Annual EFMD Higher Education Re-search Conference, Zürich, 14.-15. February 2012	Published in Conference Proceedings and Leuphana University of Lüneburg Website. 2012
4	Entrepreneurial university archetypes: A meta-synthesis of case study literature.	Johann Bronstein and Markus Reihlen	*Industry and Higher Education*, *28*(4), 245-262.	Published 2014

In the first article of my dissertation, *Entrepreneurial Ecosystem Dynamics. A university centered conceptual framework modeling the external-internal dimensions and mapping the paths toward entrepreneurial universities.*, I write a theoretical study that provides a multilevel systems perspective of entrepreneurial ecosystems having the university at its core, thereby becoming the center of analysis for a separate internal ecosystem interacting with its external ecosystem. In the paper, I inquire into the dynamics present in entrepreneurial ecosystems by conceptualizing and explaining fundamental ecosystem constituents and presenting a theoretical model with practical implications. Also, I describe the internal-external interrelations by way of a liaison matrix which illustrates how four different types of ecosystems arise based on binomial static-dynamic interactions. Toward the final section, the article presents practical examples of the different paths that, according to the matrix, a university might take toward its entrepreneurial transformation.

The first article serves as a theoretical basis and conceptual framework for the ecosystem perspective presented in the dissertation, which leads the way to the following article that focuses more on the bottom-up emergence of university based entrepreneurial ecosystems and their development over time. Hence, we can say that the main goal of this conceptual paper and of the first half of the dissertation is to provide researchers in the field with a multilevel systems perspective of entrepreneurial ecosystems that has the university as the core of analysis. This holistic approach highlights the systemic role universities play in entrepreneurship, specifically by addressing the interdependence between the institutional environment and the internal organizational structures, systems, and strategies, thereby grasping unexplored territory in the literature on entrepreneurial ecosystems and entrepreneurial universities. In this way, the first half of this scholarly work can serve researchers to better understand the dynamics of innovation ecosystems in order to develop theory in the field further, as most studies on the subject of entrepreneurial ecosystems are descriptive case studies and existing concepts are dependent on specific research goals (Mack & Mayer 2016). Also, the single-author paper can provide practitioners with a comprehensive model that operationalizes the dynamic process of interactions between the external and internal ecosystems supporting the development of entrepreneurial universities by providing a strategic roadmap toward the achievement of a dynamic, more evolved, and sustainable entrepreneurial ecosystem. Likewise, the matrix model provides university managers and policymakers with a practical tool that operationalizes the interactions between external and internal elements of entrepreneurial ecosystems as well as its dynamic evolution over time.

Throughout the second article of this dissertation, *Toward a Framework for University-based Entrepreneurial Ecosystems and Human Capital Development in Sub-Saharan Africa: The Unisave Entrepreneurship HUB @ Universidade Save, Mozambique.*; my co-author Shaun Bisset and I present readers with an understanding of the entrepreneurial ecosystem as a university centered emergent phenomenon that evolves from an embryonic stage to a maturity phase, especially when considered in the context of an underdeveloped region without an already existing entrepreneurial ecosystem infrastructure. This article aimed to serve as a conceptual basis for developing university-based entrepreneurial ecosystems in underdeveloped countries, particularly in the Sub-Saharan African context. We begin the paper with a short review of relevant literature on university-based entrepreneurial ecosystems, human capital, and the intricate relationship between these subjects in order to build the basis of our conceptual model. Then, we propose a dynamic framework that highlights the role of universities in enabling human capital for entrepreneurship, especially in places with insufficient top-down planning and established mechanisms that would typically drive such an ecosystem. The proposed framework is composed of a dynamic model that assumes an inexistent or very rudimentary ecosystem (as in the case of Mozambique). The model consists of three evolutionary stages: Incipient (embryonic), Development (growth), Mature (accomplished). Based on Isenberg (2010), we include four main ecosystem actors (University, Human Capital, Business, Government). Later, we provide a case study that illustrates on a practical level how a nascent entrepreneurial HUB is enabling the development of human capital in the city of Maxixe, Mozambique, serving as a catalyst for a nascent entrepreneurial ecosystem in the region. Thereby we show in a practical manner throughout the case study how a number of incipient entrepreneurial initiatives have evolved from simple entrepreneurial training and collaborations within the university into the implementation of a development plan that has laid the foundations for the transition into the expansion phase of the ecosystem.

It is only through innovation and entrepreneurship that underdeveloped cities and regions in Sub-Saharan Africa can develop their human capital and leverage their vast natural resources in order to become more sustainable and resilient (Beugré, 2016). This is essentially achieved by nurturing the human capital available that will engage in entrepreneurial activity and serving from conception until fruition as lead orchestrator and central hub during the evolution of the ecosystem. I believe that my second research paper of this dissertation provides a unique perspective of university-based entrepreneurial ecosystems and the development of human capital for entrepreneurial activity. Although each ecosystem depends on the environment in which it is embedded, the conceptual framework that we have developed

provides readers with a novel conceptualization of the primordial role of universities as human capital enablers for entrepreneurship, especially in underdeveloped regions in developing countries. Also, the paper serves researchers in the field with a conceptual model and practitioners with a heuristic framework that will contribute to the better understanding, development, and implementation of university-based entrepreneurial ecosystems in underdeveloped regions.

The third article of the dissertation serves as a transition from the ecosystems view of entrepreneurship to the university-centered micro-level view, which portrays the university as an entrepreneurial actor responding to institutional field-level changes in an era that my co-authors and I have defined the era of managed education. In this research paper Markus Reihlen, Ferdinand Wenzlaff and I develop a narrative that offers a historical account of the institutional environment in higher education leading to the emergence of the entrepreneurial university in Germany. We employ a theoretical framework of organizational institutionalism that provides a better understanding of the strategic response to external pressures from university, which leads to the emergence of a new archetype – an entrepreneurial university that adopts innovative strategies and entrepreneurial approaches to field-level changes. Since education systems show path-dependency, we wanted to understand how the institutional field changes that unfolded in Germany after the war until today evolved through different systems of beliefs, norms, and practices. In order to reach this objective, we developed a conceptual typology of institutional eras composed of a unique interplay of logics, actors, and governance systems. The German system of higher education, as we argue, departed in the post-war period from an era of professional dominance (1945-68), which was replaced by an era of federal involvement and democratization (1968-1998), later evolving into an era of managed education (since 1998). Managed education has strong implications for the role of the state, which plays an active role in orchestrating competition between educational institutions in the name of academic excellence and efficiency (Münch, 2006).

Organizations react to institutional pressures by adopting different strategic responses (Oliver, 1991). From an institutionalist perspective, the rise of different entrepreneurial forms and practices in higher education shows testimony that universities under a regime of managed education do not follow universal field-level isomorphic pressures but rather display heterogeneous responses. Scholars have suggested an entrepreneurial response as represented by Clark's (1998) Entrepreneurial University or more recently by Wissema's (2009) Third Generation University. The entrepreneurial response frames the university as an opportunity-seeking and exploiting institution (Shane & Venkataraman, 2000). With managed education, a

new type of university emerged as a strategic response to the institutional pressures of the marketization of science. We described this emerging type as the entrepreneurial university and illustrated this with the case of Leuphana University of Lüneburg, offering readers empirical insights and practical examples of an actual entrepreneurial transformation in the German higher education context. The illustrative case of Leuphana explored the main events leading to the conception and restructuring of a different type of university. Our case study showed how the strategic response taken by Leuphana was facilitated by the changing institutional context of managed education in Germany and by the state of Lower Saxony. In addition, the unique history of the University of Lüneburg favored a more radical organizational change. Furthermore, this new scope of strategic actions was constructively used by developing and implementing unique entrepreneurial strategies in teaching, research, and knowledge transfer, some of which we expound throughout the case study.

In the fourth article of this dissertation, my co-author Markus Reihlen and I expand on the concept of the entrepreneurial university. Based on an inductive qualitative analysis of twenty-seven case studies, we develop a taxonomy of emergent university archetypes, which provides a more comprehensive understanding of the presently evolving entrepreneurial structures, processes, and strategies in higher education institutions. The empirical study draws on configuration and archetype theory in organizational studies as the theoretical framework in order to synthesize the diverse and complex structures of universities, aiming to find discrete clusters of configurational schemes that serve as idealized types for comparability, design, and predictability (Greenwood & Hinings, 1996; Miller, 1996). Our approach follows a recent call from Rauch et al. (2014) to use "a systematic synthesis of case studies to aggregate qualitative research findings." By analyzing patterns of organizational forms and practices from numerous case studies, our qualitative meta-synthesis facilitates the integration, clustering, and reflection of earlier case-based research into idealized types of entrepreneurial universities, defined as archetypes, which allows for a detailed and generalizable classification from empirical cases in the field.

The underlying assumption of the last research paper of this dissertation is that there is no single model or one best way to the entrepreneurial university. Instead, its environmental contingencies, path dependency, and unique structures, systems, and cultures affect the emerging type of entrepreneurial university. Therefore, we argue that just like other groups of organizations in particular institutional fields, we expect to see entrepreneurial universities converge into a few differentiated archetypes that display similar organizational attributes. Hence, by describing aggregate generalizable patterns, this study helps overcome some of the

context-dependency and non-generalization issues associated with single-case studies. Additionally, archetypes could serve as conceptual tools for practitioners in designing, steering, and foreseeing organizational development in their organizations

Consequently, the fourth study contributes to a more comprehensive understanding of the nature of the entrepreneurial university. In summary, identifying entrepreneurial-university archetypes provides a more comprehensible understanding of the elements, structures, and strategies that shape emergent higher-education institutions. We identified four differentiated archetypes of entrepreneurial universities, naming them by their underlying strategic intent: 'research-preneurial' or research driven; 'techni-preneurial' or industry driven; 'inno-preneurial' or service-innovation driven; and 'commerce-preneurial' or knowledge-commercialization driven. Finally, in the discussion part of the article, we also reflect on the research implications, contributions to the field, and limitations of our study.

In summary, this dissertation contributes to an in-depth understanding of Entrepreneurship in universities regarding its systemic qualities and archetypal characteristics of entrepreneurial universities. It argues for an ecosystem's perspective on the phenomenon of entrepreneurial activity, highlighting the fundamental role that universities play as the heart of entrepreneurial ecosystems. Also, it provides the research field with theoretical understanding and a conceptual model that bridges the gap between the macro-, meso- and micro levels and reflects the complex interactions between the internal and external dimensions of entrepreneurial ecosystems. By using institutional theory, this dissertation explains the field-level influences that led to the emergence of the entrepreneurial university in a new era of managed education, specifically in the German and European context. Furthermore, this doctoral research expands on the novel concept of the entrepreneurial university by using extensive case study literature to empirically identify distinct archetypes that better reflect the diverse reality of how universities engage as entrepreneurial actors by way of differentiated entrepreneurial structures, systems, and strategies.

CONCLUDING REMARKS

> The meter of chronological clock time that has underscored our industrial, social and cultural institutions, and has been the temporality through which we have made sense of the world, is being supplanted by a digitally compressed temporality [that is, chronoscopic time] . . . Through the increasing density of data networks and human interconnectivity we are in the process of creating a whole new temporal ecology based on the constant now.
>
> (Hassan, 2003: 111)

In this fast-paced day and age, it has become extremely difficult in the university setting to see or even hear of an academic reading a book, let alone a dissertation, when not in an examiner's role. For the activity of reading a book calls for a certain duration of time that requires a slow-paced dedication, which allows the reader to comprehend the book's narrative, understand the author's arguments, and reflex upon them in order to form a unique position with regards to the main tenets of the book (Barnett, 2010).

As knowledge is commoditized and reduce to mere data in this speeded-up temporal milieu, space for contemplative thought and even reflexivity evaporates. Thus, in-depth constructive learning as in the German concept of *Bildung* is diminished (Levy, 2007). Instead, as is common ground in today's higher education and academia, constructive knowledge for learning and understanding often gives way to the commoditization of knowledge as a force of production (Barnett, 2010).

> Time becomes human time to the extent to which it is organized after the manner of a narrative; narrative, in turn, is meaningful to the extent that it portrays the features temporal existence. (Paul Ricocur, 1990: 3; in Barnett, 2010)

Were this dissertation to achieve the sole purpose of being reflectively and thoughtfully read as a comprehensive academic narrative by a broad audience, would its *raison d'être* be achieved. Moreover, were this dissertation to realize the objective of contributing to theory building and empirically-based knowledge dissemination in the field of entrepreneurship and higher education, would its primary contribution be accomplished. Furthermore, were this manuscript to serve a wider audience, such as policy makers, practitioners, students and entrepreneurs, either directly or indirectly as a means for practical purposes, would its extended goals be reached, and its *raison d'être et d'avoir* would be completely fulfilled.

Finally, in my mother tongue Spanish, the verbs "to know" and "to taste" do not only come from the same root but are literally the same word (*Saber*). This is not an accidental coincidence but a fundamental idiomatic fact revealing the essence of the human action of "knowing". "Knowing" is in fact a more elevated form of "tasting". Hence, I invite you as a reader of this dissertation to taste the flavors of entrepreneurship in universities and develop your own taste, according to your unique palate. May you then uncover new dishes that will reveal more essential flavors for other elaborated palates to taste.

"There are not more than five cardinal tastes,
yet combinations of them yield more flavors than can ever be tasted."
Sun Tzu, The Art of War

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ENTREPRENEURIAL ECOSYSTEMS DYNAMICS:

A UNIVERSITY CENTERED CONCEPTUAL FRAMEWORK MODELING THE EXTERNAL-INTERNAL DIMENSIONS AND MAPPING THE PATHS TOWARD ENTREPRENEURIAL UNIVERSITIES

Abstract: Since the advent of a knowledge-based economy, universities have played a more preponderant role in establishing structures and systems that facilitate the entrepreneurial process as an engine for growth. This fact is highlighted in the academic literature dealing with innovation, entrepreneurial ecosystems, and entrepreneurial universities. Nevertheless, current models tend to be static and do not reflect the dynamic dimension of the entrepreneurial process. Moreover, the interactions between the internal and external entrepreneurial ecosystems have been overlooked. This conceptual study provides a multilevel systems perspective of entrepreneurial ecosystems having the university at its core, thereby becoming the center of analysis for a separate internal ecosystem that interacts with its external ecosystem. The paper graphically depicts internal-external interrelations by way of a liaison matrix which illustrates how four different types of ecosystems arise based on binomial static-dynamic interactions. Also, the article presents practical examples of the different paths that, according to the matrix, a university might take on the way toward its entrepreneurial transformation. This framework can serve scholars to understand the dynamics of innovation ecosystems better and further develop theory on the subject. The matrix model also provides university managers and policymakers with a practical tool that operationalizes the interactions between external.

Keywords: entrepreneurial ecosystems, university, entrepreneurship, innovation, pathways

INTRODUCTION

"It is not the strongest species that survive, nor the most intelligent, but the ones most responsive to change."

Charles Darwin

Understanding that entrepreneurship can be better modeled from a systemic point of view is a primordial aspect that determines the important role of universities in entrepreneurial ecosystems. Since the advent of the knowledge economy, researchers and policymakers have increased interest in the role of innovation and entrepreneurship as contributors to the overall economy. Likewise, universities have attracted the eyes of industry, academia, and policy makers as contributing factors to innovation schemes that foster entrepreneurship. Hence, researchers have increased their interest in studying entrepreneurship within the context of ecosystems and universities as catalysts for knowledge transfer and entrepreneurial activity.

The role of universities in entrepreneurial ecosystems can be twofold. Firstly, it can be defined in terms of the external environment, which bestows a role to the university within the overall ecosystem, by exerting top-down pressures that test the institution's organizational capacity to respond to demands from the entrepreneurial ecosystem. Secondly, on the one hand, it can be defined in terms of the internal elements of the university, fostering innovation and entrepreneurial activity through an expanded developmental periphery (Clark, 1998). On the other hand, it can be considered in terms of its strategic capacity to catalyze entrepreneurialism by employing bottom-up transfer schemes that trigger an entrepreneurial change in the external ecosystem.

Scholars in entrepreneurship and higher education have tried to study the central role of higher education institutions (HEI) at the macro-, meso-, and micro-level of analysis. Some literature concentrates at the meso organizational level, thus exploring the university as a single unit of study in terms of its entrepreneurial structures, systems, and practices that define the entrepreneurial dimension of HEI, such as the entrepreneurial university (Clark, 1998); adaptive universities (Sporn, 2001); and the third-generation university (Wissema, 2009). Other researchers have tried to address the phenomenon from the macro-level perspective. Among these, we can highlight concepts such as the triple-Helix model (Etzkowitz & Ranga, 2010); and University-based Entrepreneurial Ecosystems (Mason & Brown, 2014; Stam & Spiegel, 2017). Moreover, some studies look at the micro-level in terms of the internal entrepreneurial structures of HIE, such as university incubators (Guerrero, Urbano, & Gajón, 2017), technology transfer offices (O'Kane et al., 2020), start-up centers, and spin-offs (Schillo, 2018). Nevertheless, there has been a tendency to overlook the internal entrepreneurial dimension of

HIE, namely to study the university as a 'standalone ecosystem' that is coupled through complex interrelations with the external entrepreneurial ecosystem. Hence, there is a need in the entrepreneurial ecosystem's literature for a multidimensional perspective that reflects the holistic nature of the interactions between universities' external and internal entrepreneurial ecosystems (Maroufkhani et al., 2017).

This conceptual paper aims to provide stakeholders in the field with a multilevel systems perspective of entrepreneurial ecosystems with the university as the core of analysis. This holistic approach lets us address the process of interdependence between the institutional environment and the internal organizational structures, systems, and strategies; thereby grasping unexplored territory in the literature on entrepreneurial ecosystems and entrepreneurial universities.

The achievement of this chief objective derives a number of contributions. Firstly, scholars in the field will have a conceptual framework for much-needed theory development as most articles on the subject are descriptive case studies, and definitions depend on the research goals (Mack & Mayer 2016). Secondly, this research aims at contributing to the existing literature by conceptualizing and describing the internal and external aspects of entrepreneurial ecosystems while graphically depicting systemic interactions between the university and its environment. Thirdly, the article provides a dynamic model that portraits the process leading to the university's transformation into an entrepreneurial organization. Last but not least, practitioners and policy makers can make practical use of the proposed framework when applying strategies aiming at developing the entrepreneurial capacity of universities and innovation ecosystems.

The manuscript develops as follows. The next section provides the theoretical and conceptual foundations for the framework. The following segment presents the entrepreneurial ecosystems model used for the framework and thoroughly explains each factor, such as actors, domains, and elements. Section 3 graphically depicts the dynamics within the model through a liaison matrix and illustrates how four different types of ecosystems arise based on the static-dynamic interactions shown in the matrix. Lastly, the article presents the different paths that according to the matrix a university might take on its way toward an entrepreneurial transformation. These pathways are then expounded using two practical examples from universities that have followed separate pathways.

THEORETICAL BACKGROUND AND BASIC CONCEPTS

Ecosystems: from natural to social sciences

The natural sciences provide a helpful allegory to study social phenomena. Population ecology and ecosystems have long been used as useful lenses by social scientists to make sense of economic and sociological principles. According to Zhao and Frank (2010) "an ecosystem is an open and dynamic system, with things constantly entering and leaving. Ecosystems are complete with all the necessary components for function and survival over the long term, and they have the tendency or ability to achieve internal equilibrium (homeostasis)". More specifically, the ecosystem metaphor is well suited to draw upon dynamic patterns among organizations and systemic changes in structures, systems, and strategies at different environmental levels of analysis (Mars, Bronstein, & Lusch, 2012).

Socio-economic phenomena can be explained as a collection of individual agents within an environment (individualism) or as macro structures composed of groups of embedded actors (holism), depending on ontological assumptions. We have systemism as a middle way between these two poles, embracing individuals and organizations as embedded in a broader socio-economic framework. This approach views effects as emerging from a collection of structures, systems, and strategies integrated into society, which are neither totally independent of, nor entirely determined by, their delimited environment (Reihlen, Klaas-Wissing, & Ringberg, 2007).

What makes the ecosystems approach a valuable tool to understand social systems is that their behavior appears to have emergent characteristics from a holistic point of view. The effects of this "object of study" only become apparent through interlinked chains of cause and effect that resemble how natural ecosystems behave. For instance, let us compare species and organizations: both are made of several actors that are interlinked and interdependent; these actors knowingly or unknowingly conform themselves into similar groups; systemic interactions are created by flow of resources and information; correspondingly, the flow of information varies according to the outcome of the interaction (e.g. Mutually or unilaterally beneficial or antagonistic) (Mars, Bronstein, & Lusch, 2012).

Entrepreneurial Ecosystems: an evolving perspective

The concept of Entrepreneurial Ecosystems (EE) was first introduced by Moore (1993) and then further developed by Isenberg (2010), describing it in relation to natural sciences. Even though it is an embryonic field, the study of EE offers theoretical and practical insights into the nature of entrepreneurialism (Shwetzer, Maritz, & Nguyen, 2019) and more specifically, the

role of universities. Most studies of EE include a set of networked actors within a region with several factors that contribute to and limit the trajectory and evolution of entrepreneurial activity. At one end of the spectrum, some scholars such as Cohen (2006) base their definitions in terms of its constituents such as government agencies, universities, research institutions, capital sources, and professional support services. Others take a more systemic approach and describe ecosystems as a supportive environment enabling the development of new ventures (Spiegel, 2017). At the other end of the spectrum, researchers like (Brown & Mason, 2017) follow a holistic method of analysis and concentrate on the system's dynamics, processes, and institutions.

As previously stated, there is little agreement on a definition of EE and its reach and application depend on the type of research, the level of abstraction and the extend of the region to be included in the study. For the purpose of this study, we shall consider a definition that reconciles the two opposite views, emphasizing the systemic nature of the EE concept. Therefore, as we build the conceptual framework of this paper, the working definition will be as follows: An **Entrepreneurial Ecosystem** is a dynamic set of interconnected actors displaying emergent properties such as institutionalized strategies, structures, and practices; all influenced by various ecosystem domains and having an entrepreneurial purpose, that allows them to partake within a Shared Entrepreneurial Space, which is embedded across an internal-external ecosystem environment that has a set of constrains.

Even though the ecosystems approach is well suited to the study of entrepreneurialism as a social phenomenon at different levels of analysis, this approach does not come without its shortcomings. The complexity of the networked relations and interdependence among actors makes it difficult to fully comprehend EE's dynamics. Moreover, there is a misconception that the main focus of the literature is only on high-grow startups leading to the misunderstanding that only these are conducive to innovation and economic growth (Mason and Brown, 2014). Furthermore, it is partly a challenge to measure the degree of success of EE due to a lack of commonly agreed performance indicators. However, specific elements such as network density, connectivity, fluidity, and ecosystem diversity have been measured (Shwetzer, Maritz, & Nguyen, 2019), the complexity, diversity, and qualitative nature of the inter-relations in the EE pose a significant challenge when trying to define measurements.

Dividing between internal and external entrepreneurial ecosystems

According to Ratten (2020a), “The ecosystems metaphor was first used by Moore (1993) to describe the competitive marketplace in terms of predators and prey. This language

was a way of understanding the strengths and weaknesses of firms in the economic environment." In Ratten's eyes, academia has tended to focus on individual organizations rather than the interactions among groups of firms and the contextual environment. This work tries to overcome the bias mentioned above by applying a multilevel perspective to the ecosystems approach.

Let us consider a natural ecosystem such as a forest where many organisms live, compete and cooperate. Various species cohabit within the same geographical space (or region), but each inhabits its own domain in which we might say that the 'inner purpose' (or will) of a single species best coalesce with: on the one hand, the 'inner purpose' of other species; and on the other hand, the fitness of the species as a whole to the set of resources and constrains imposed by the forest.

The forest in this analogy can be thought of as an external ecosystem that provides nourishment while also posing threats to the realization of the organism's 'inner purpose'. Likewise, the so-called 'inner purpose' is no more than the expression of the internal needs and desires of that particular organism 'internal ecosystem', which behaves analogous to the external forest but at a lower scale. Therefore, in this example, we can define the forest as the **External Ecosystem** and the particular species 'inner composition' as the **Internal Ecosystem**.

A wide range of entities populates both the external and internal entrepreneurial ecosystems, some of which are interdependent and essential to each other. These entities are hierarchically positioned in the overall entrepreneurial ecosystem depending on many factors such as innovation capacity, economic power, political influence, technical expertise, and reputation, among others. Since some entities are in a stronger position of power, they have more influence (Ratten, 2020b) and facilitate mutual collaboration within a common entrepreneurial space. According to Stam & Spigel (2016) an entrepreneurial ecosystem progresses in different ways depending on the needs of its members. Some have a more participatory governance system that enables them to enterprise more frequently and produce more market-relevant innovations.

Bridging the gap between ecosystems: Universities at the heartland

A body of literature in the field views higher education institutions as fundamental for studying entrepreneurial ecosystems (Brown & Mason 2017; Miller & Acs 2017). However, there has not been given adequate consideration to the interrelationships between the multiple roles that universities have in entrepreneurial ecosystems and their various roles in society; for instance, as sources of basic research, innovation, education, and as living laboratories for

entrepreneurial activity (e.g., Huang-Saad, Fay and Sheridan, 2016). Hence, researchers have raised the need to consider university-based entrepreneurial ecosystem in a more holistic manner (Nicholls-Nixon et al., 2020). A critique brought forth by Nicholls-Nixon et al., (2020) pinpoints the fact that even though the embryonic literature in the field of entrepreneurial ecosystems has centered on the composition of individual elements and their systemic interactions, not enough attention has been given to the localized nature, system-level dynamics and especially the evolution of ecosystems over time coupled with changes in external conditions. The multi-layered ecosystem framework proposed in this article helps overcome the issues previously raised. It also provides entrepreneurialism and higher education researchers with a platform for a more detailed study of the mechanism that enables the interactions among different elements of the ecosystem.

Now going back to our forest example, let us concentrate on the space within the forest in which the 'inner purpose' of different species coalesce. We should see this space as a 'shared domain' in which the expression through action of the 'inner purpose' of diverse species unite to find a balance that best befits the resources available, and the constraints imposed by the forest. This so-called 'shared domain' is analogous to a dynamic space in which different species with a 'shared purpose' enter and leave, compete and collaborate. They do that for their own benefit and to attain that 'shared purpose', which can be seen as a 'common good'. This thought experiment serves as an analogy to understand another notion for the conceptual framework that will be explained more in detail in the next session. That concept is the **Shared Entrepreneurial Space**, which was represented by the 'shared domain' within the forest in the previous example. This space can be imagined as a 'bridge between the external and internal entrepreneurial ecosystems' where information flows, interaction occurs, and shared meaning is established. Consequently, the Shared Entrepreneurial Space can be visualized as the dimension where the interactions among entrepreneurial actors coalesce to fosters entrepreneurial activity, facilitating an evolutionary process of variation, selection, and retention of entrepreneurial initiatives that will be briefly touched upon further in the paper.

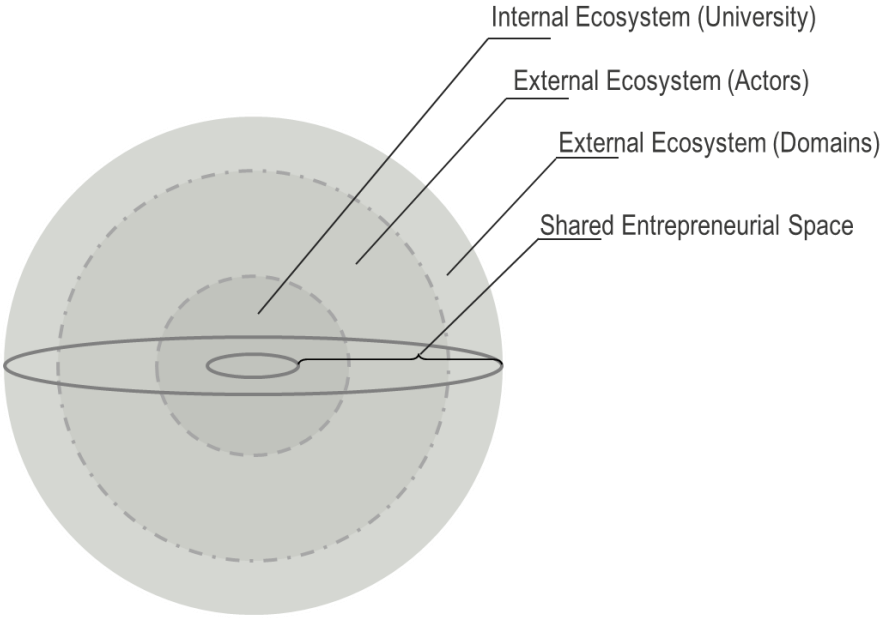

Figure 1. Multilayered View of University Entrepreneurial Ecosystems

This research article constitutes an attempt to model how universities sit at the heart of the entrepreneurial ecosystem, thus becoming the center of analysis for the Internal Ecosystem. This is illustrated in Figure 1. Likewise, the substance of the Shared Entrepreneurial Space is the 'common entrepreneurial purpose', and the backbone of the whole entrepreneurial ecosystem are the entrepreneurs, start-ups, and established firms engaging in entrepreneurial activity. Finally, it can also be seen in Figure 1 that the core of the External Ecosystem is composed of a body of actors that actively affect or transform the overall ecosystem. For instance, markets, industry, government, and human capital. Together with the ecosystem domains, these actors become the essence of the conceptual framework delineated in the following sessions.

MAPPING AND MODELING THE ENTREPRENEURIAL ECOSYSTEM DYNAMICS

The external ecosystem: actors, domains and dynamics

Etzkowitz and Klofsten (2005) argue that knowledge-based innovation stems from creating what they call an "Innovating Region", which includes interconnected actors such as government, industry, and university embedded within a consciously designed geographical entity. They contend that once such a region has been effectively established, it should have the capacity to provide fertile ground for innovation and to foster entrepreneurial activity. This so-called "innovating region" is analogous to the "external entrepreneurial ecosystem" that will serve as conceptual basis for this paper's dynamic entrepreneurial ecosystem framework.

Reihlen, Seckler & Werr (2017) write about two ways of conceptualizing entrepreneurial ecosystems. First, as a network of economically interconnected actors interacting in complex ways and with a common entrepreneurial purpose. The second approach emphasizes the geographical and clustering aspects of the system. In a similar manner, according to Colombo et al. (2019), there are two ways of portraying the constellation of entrepreneurial ecosystems: the bottom-up approach and the top-down approach. Even though much of the entrepreneurial ecosystems literature draws implicitly on both aspects, most works focus mainly on one dimension and neglect the complex interdependencies between the system's macro or external and micro or internal aspects. The ecosystems approach proposed in this work considers these interactions and the reciprocal effects on the ecosystem as a whole from the university's perspective as focal point for the internal ecosystem.

We should consider Isenberg's model of entrepreneurial ecosystems (Isenberg, 2011) as the starting point for establishing the two main dimensions of the external ecosystem and its constituents. These main dimensions are the external ecosystem domains and the external ecosystem actors. The external ecosystems domains and actors, together with their respective constitutive elements, are shown as part of figure 2, and they will be explained in the next paragraph.

Firstly, domains can be defined as environmental areas of influence of the external ecosystem that are necessary to sustaining an entrepreneurial space in which entrepreneurial activity flourishes and evolves. Although an entrepreneurial ecosystem consists of numerous interconnected constituents, in order to prioritize and structure the external ecosystem dimensions, we can consolidate the external ecosystem domains into four basic elements: policy, culture, support infrastructure, and knowledge networks.

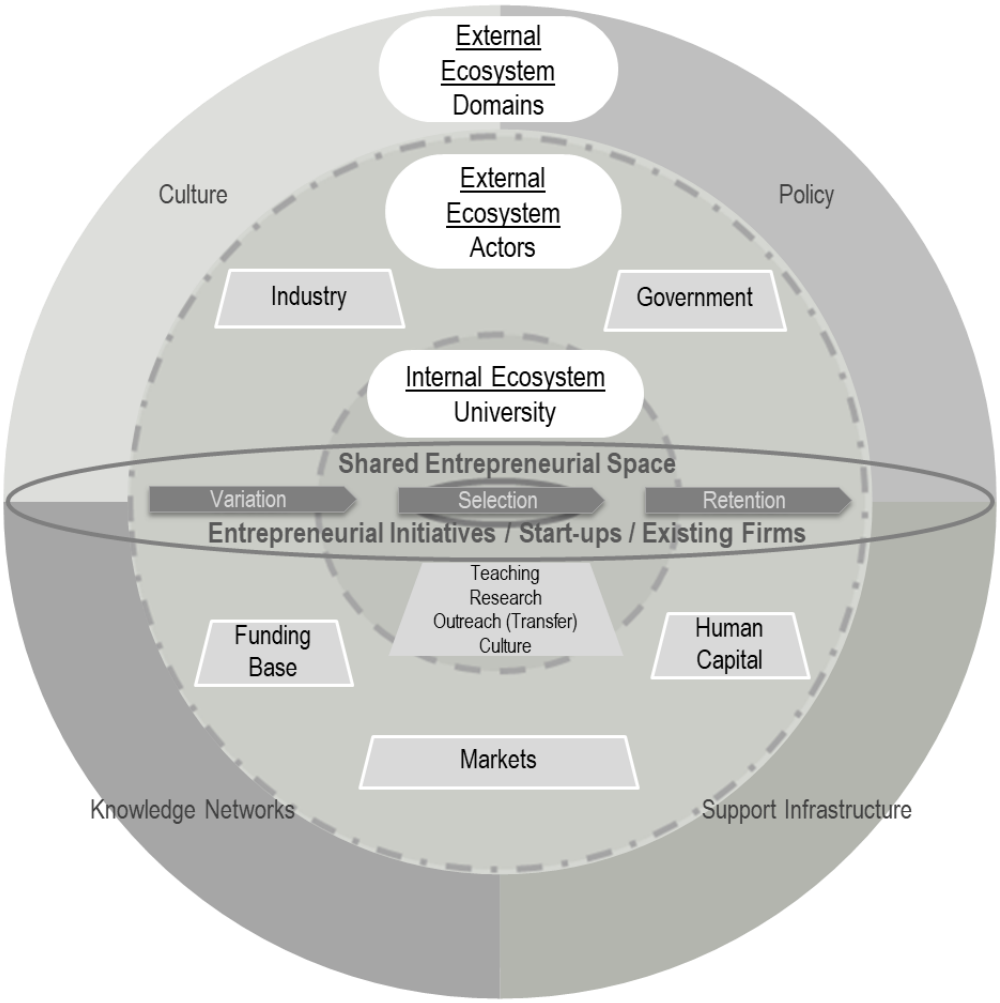

Figure 2. Detailed View of Internal and External University Entrepreneurial Ecosystems

Policy: starting with the assumption that entrepreneurial ecosystems are open systems in which interactions take place and resources flow either top-down or bottom-up, we can then consider the policy element to be the top-down governance mechanism by which stakeholders and policymakers define the boundaries of the system, delineate the nature of the interactions, and influence resource flow towards specific types of entrepreneurial initiatives. The role of government is crucial with regards to the policy domain. For example, Isenberg and Onyemah (2016) highlight several aspects of governmental legislation pertaining the policy domain such as regulatory framework, financial incentives and tax benefits, along with venture friendly policies and direct investment schemes.

Culture: analogous but opposite to the policy domain, the cultural aspect can be considered a bottom-up governance mechanism, by which interactions are defined and entrepreneurial initiatives are facilitated through values, beliefs, practices, and norms pertaining a socio-culturally delimited area. For instance, cultural aspects such as risk aversion, openness,

perceptions on self-employment, and fear of failure impact the nature, quality, quantity, and type of entrepreneurial initiatives while simultaneously shaping the nature of interactions among ecosystem actors in a bottom-up manner.

Support Infrastructure: this domain is crucial in providing fertile ground, nourishment, and sustenance to entrepreneurial initiatives. We can consider two aspects of this domain: on the one hand, physical infrastructure such as commercial real estate, office space, communications, roads, railways, airports, and more specifically, science parks, incubators, co-working spaces, and accelerators (Sternberg et al., 2019); on the other hand, support professions such as technical experts, investment bankers, legal, accounting and management advisors (Isenberg & Onyemah, 2016).

Knowledge Networks: the primary function of this domain is to enable information and knowledge to be exchanged and resources to be accessed. Networks are predicated on the assumption of reciprocity, and they have a relational nature as they depend on members' interactions (Ratten, 2020b). Networks allow actors such as firms, entrepreneurs, universities, as well as public research institutions to interact and exchange knowledge and resources that lead to entrepreneurial activity. According to Sternberg et al. (2019), important dimensions of this domain include the strength of ties, number and quality of connecting events, and network density.

Secondly, external ecosystem actors can be defined as stakeholders or specific groups with a differentiated invested interest in the ecosystem, each of which takes an active part in the entrepreneurial process as seen from the central perspective of the university as core of the ecosystem. Therefore, the internal ecosystem pertains only to the university and its internal entrepreneurial structures, and all other actors of the ecosystems are defined as belonging to the external ecosystem. In the same manner, as with the domains, we have to consolidate all stakeholders in few identifiable actor groups for the purpose of building a practical model. Hence, there are five external ecosystem actors as illustrated in Figure 2: Government, Industry, Human Capital, Funding Base, and Markets.

Government: as already previously highlighted when defining the policy domain, governments are essential actors regarding the regulatory framework of the system and the top-down flow of resources. The role of government in directing and executing macroeconomic policies has a systemic impact on the external ecosystem as well as a direct influence on the actions of other players. Similarly, public sector presence in the entrepreneurial ecosystem is fundamental to its functioning, for instance by creating and funding research institutes, universities, science parks, and project-based entrepreneurship funding schemes (Isenberg,

2010). Also, public infrastructure such as roads, airports, railways, telecommunication, and utility networks depend directly or indirectly on government execution.

Industry: in general, it comprises a variety of interconnected business actors concentrated in related sectors, specialized suppliers, and service providers, all of which facilitate and support entrepreneurial activity through competition or cooperation. Together with government and university, industry is one of the pillars of Etzkowitz & Leydesdorff's (2000) triple-helix model of innovation. As such, industry plays a fundamental role in the production and implementation of entrepreneurial initiatives and the development of new entrepreneurial ideas and business models. Business actors are closer to market and have the practical insights and market expertise required to successfully implement new product ideas, services, and business models.

Human Capital: access to a highly skilled and educated talent pool is essential to start-ups and entrepreneurial activity in general. Hence, human capital is strongly related to the level of education, training, and developed technical expertise within the ecosystem, as well as to the local accessibility, disposition, and availability of skilled human resources as employed workforce. Also, the entrepreneurial quality of human capital is enhanced by practical experience within the ecosystem and exposure to knowledge networks. Leadership also plays a fundamental role since entrepreneurial initiatives have to be led by motivated visionary leaders with long-term invested interest in the success of the entrepreneurial activities (Sternberg et al., 2019). Leaders can also serve as mentors, investors and main hubs of networks. Furthermore, leaders play a pivotal role in establishing success stories, best practice benchmarks, and "entrepreneurial myths", thereby attracting highly skilled and motivated young entrepreneurs that further enhance the ecosystem's human capital.

Funding Base: availability of financial resources is essential for entrepreneurial activity. A healthy funding base comprises a diversified range of players willing to fund high-risk enterprises that will provide them with future high returns on their investments. Among these players, we have public and private venture capital funds, government grants and subsidies, banks, business angels, crowdfunding, and business accelerators, among other sources of capital. Also, mainline institutional funds from supranational, national, regional, and local government agencies of various sectors and university and industry project-based funding are essential sources of income for entrepreneurial initiatives.

Markets: innovations need access to an open, dynamic, and reactive group of customers that can provide proof of concept to new business models and sustainable demand to entrepreneurial endeavors over the long term. Innovations flourish, develop and mature when

large enough groups of influential early adopters lead the way for new products and services to enter a wider pool of customers. Although the potential markets' geographical extend and monetary size for an entrepreneurial initiative can vary in form and magnitude, and they are not confined to the boundaries of the external entrepreneurial ecosystem, distribution channels within the ecosystem provide efficient access to internal and external markets.

After having thoroughly described all constituents of the external ecosystem, we will proceed to explain the internal ecosystem in the upcoming session. As core of the entrepreneurial framework, the university must manage an ecosystem that is the outcome of increased interdependence among all actors involved in the entrepreneurial process, both internal and external to the university (Curley & Formica, 2012). Therefore besides being at the heart of the model, it is necessary to understand the university as an equal actor, namely having the same degree of importance to the overall ecosystem as all external actors. This will be clarified in the following paragraphs before diving into the specific components of the internal ecosystem.

The internal ecosystem: Universities at the heartland

As previously stated, we shall study universities as the core of the entrepreneurial ecosystem, serving as mediators between the layers beyond its boundaries and the internal ecosystem that is embodied within the university's entrepreneurial activities. However, it is necessary to point out that neither is the university a primary component nor the external ecosystem a secondary one. On the contrary, they are both together, along with the 'shared entrepreneurial space', the three fundamental elements of the ecosystem as a whole.

In a similar manner to the hub and spoke model of innovation ecosystems in which a single firm or individual, such as the entrepreneur, acts as the center or leader of the ecosystem (Nambisan & Baron, 2012), the framework that we are building is based in a diametrical relationship between two entities. Yet in contraposition to the hub-based innovation ecosystem, the relationship in this model is not dialectical or oppositional but synthetical or synergetic; meaning that instead of opposing each other by terms of its relationships and synergetic interactions towards a common purpose, these two entities depend on each other and mutually define themselves. Therefore, although the university sits at the core of the ecosystem and is fundamental in this framework, it is nevertheless not primary, and neither is the external ecosystem secondary. Hence, the internal and external ecosystems are essential to the overall framework as the shared entrepreneurial space in which entrepreneurial initiatives are born,

evolve, live and dye through a process of selection, variation, and retention of new start-ups and innovative products and services from established firms.

Universities can be seen as knowledge creators and disseminators. However, these 'knowledge assets' need to be adequately channeled to become valuable innovations that can be commercialized and serve the wider society (Shattock, 2008). Although the way in which universities channel their innovations can be manifold, these can be grouped into an umbrella term that describes their essence, such as 'entrepreneurial initiatives'. These entrepreneurial initiatives can, in turn, be undertaken in any of the three main missions as defined by Clark (1998) in his seminal book on entrepreneurial universities: teaching, research, and knowledge transfer. However, as Clark (1998) also points out, entrepreneurial endeavors in these three main mission areas cannot be fully realized unless they are supported by an institutionalized entrepreneurial culture that encompasses the whole organization, engrained in entrepreneurial values and beliefs and practices. Therefore, it is essential to the proposed model to include culture next to teaching, research, and outreach (transfer) as one of the four elements that constitute the internal ecosystem. Subsequently, we will explore how each of these essential elements of universities manifests within the internal entrepreneurial ecosystem.

Teaching: universities, as the heartland of entrepreneurial ecosystems, are tasked with developing an internal ecosystem that fosters the entrepreneurial spirit in people within the organization (Diaz-Casero et al., 2017). This mission includes entrepreneurial education and the training of students and the workforce, but it is not restricted to this activity only. As recognized by Clark (1998), an entrepreneurial university should respond to changes in its external ecosystem by encouraging an entrepreneurial culture, which embraces organizational learning, innovation, creativity, and critical thinking to foster intrapreneurship (Garzón-Castrillón, 2011) and enable entrepreneurial initiatives to flourish inside and outside the organization.

Entrepreneurship education is a holistic concept that reaches far beyond traditional teaching and curriculum design. In its conceptual sense, it refers to "how university systems provide the tools necessary to teach business creation and management through syllabuses, in particular increasing understanding of the entrepreneurial spirit and entrepreneurial actions" (Ferreira, Fernandes & Ratten, 2007). Nevertheless, as necessary as the teaching of entrepreneurial skills can be, the cultivation of experienced-based learning in which experiential and theoretical knowledge are linked through joint actions with external actors is paramount for the internal ecosystem (Kazakeviciute, Urbone, & Petraite, 2016); for example, engaging in a start-up creation, consultancy activities, and new product development. This all-encompassing

entrepreneurial education philosophy permeates the whole organization. It provides all university stakeholders with the conceptual and practical skills necessary to think creatively, identify entrepreneurial opportunities, start new businesses, develop networks, and most importantly, ignites an enterprising spirit that fosters the development of an entrepreneurial culture.

Some forms of university entrepreneurial education embedded within the internal ecosystem are practice-oriented programs, joint curriculum design and delivery, workshops, business accelerator programs, internships, incubators, lifelong learning activities, and student mobility programs.

Research: the second mission of a university is essential to the entrepreneurial ecosystem. To facilitate understanding and promote entrepreneurial activity, researchers have to reach beyond the university boundaries and collaborate with practitioners, businesses, policy makers, potential entrepreneurs, and all other participants in the entrepreneurial ecosystem. Hence, researchers and academics who are motivated by curiosity and intrinsic motivation should, in an ideal entrepreneurial ecosystem, combine their efforts and innovative research project with the *doers*, meaning entrepreneurs and business actors who are mainly driven by extrinsic goals and external market forces (Curley & Formica, 2012). Therefore, from an academic entrepreneurial perspective, innovation in research projects and their outputs positively contributes to incubating entrepreneurial initiatives emerging from the internal ecosystem, which, combined with the input of external actors, converge into an entrepreneurial space. It is within this space where entrepreneurial initiatives incubate, flourish and evolve according to external factors pertaining to the aforementioned domains, and actors of the external ecosystem.

Being an entrepreneurial university with regards to its second mission (research) does not only relate to the aspect of collaborating with industry and actively commercializing innovations from research findings, but it also pertains to the whole organization. As Mc Innis (2001) points out, while entrepreneurialism is commonly associated with individual effort, an entrepreneurial university exhibits an integrated entrepreneurial culture, which is engrained in the academic heartland and that involves innovative research and serious risk-taking in order to meet the challenges of a demanding and ever-changing external ecosystem. In this regard, Etzkowitz (2003) describes the governance of such entrepreneurial universities as “quasi-firm-like” concerning the nature of collaborative research projects and entrepreneurial initiatives.

Collaborative research between academics, practitioners, and other ecosystem actors provides an empirical basis and grounded understanding to entrepreneurs, businesses, policy

makers, and scientists; which in turn serve as basis for insightful innovation and knowledgeable entrepreneurial action. Among these collaborative activities, different areas of entrepreneurial research have been identified in literature. As pointed out by Davey, Hannon & Penaluna (2016); these include large scale joint-research projects, contracted research, spin-off firms, consulting, patenting, licensing and temporary in-residence industry-field-research work. Amid the latter example, we can find joint publications with firm scientists/researchers and co-funding praxis-based PhD students and industrial PhDs (Galan-Muros & Davey; 2019).

Outreach (Transfer): the constant transfer of knowledge from within the university to the external ecosystem is fundamental for a healthy entrepreneurial ecosystem. Correspondingly, a continuous cooperation between business and academia allows both sides to access an entrepreneurial space in which praxis and theory can be coupled to create applied knowledge to be used for the development of new technologies and marketable entrepreneurial initiatives. This ongoing process of reaching beyond the confinement of university boundaries can be defined as the 'outreach' dimension, and it is an essential characteristic of what constitutes an entrepreneurial university. Several cooperation structures facilitate outreach and transfer activities by internal university stakeholders and external ecosystem actors. Among these cooperation structures, the most common are technology transfer offices (TTOs), science parks, industry, and business centers, as well as hybrid research institutes, patenting offices, incubators, innovation HUBs, and other public-private organizations that support entrepreneurship, innovation, and technology transfer (Good, Knockaert & Soppe, 2019). In tandem, the following activities make use of the previously listed structures: patenting; licensing; spin-offs; academic entrepreneurship; student start-ups; project-based cooperation for high-tech innovations as well as joint R&D; knowledge transfer through commercialization of professional services, consultancy, training, and counseling; start-up accelerator programs; and other public-private innovation and entrepreneurship support schemes.

Financial resources are critical for universities that desire to transfer technology and build up the necessary support structures for market-oriented entrepreneurial activities and external players. Also, highly skilled human resources that understand both the culture of academic research, as well as that of business and entrepreneurs, are essential; because they serve as a bridge for companies that want close collaboration with academics and scientists with the intent to support the development of marketable innovations, start-ups, and initiatives that further develop the entrepreneurial ecosystem.

Culture: a university with an entrepreneurial culture can be thought of as one that values entrepreneurialism and beliefs that knowledge-based innovation can be first planted within its

heartland, then gardened in collaboration with external partners, and finally harvested into the markets for the benefit of all ecosystem stakeholders. These values and beliefs may be initiated top-down by strong leaders or originated bottom-up by individual or collective organizational practices. In Clark's (1998) words, "as ideas and practices interact, the cultural or symbolic side of university becomes particularly important in cultivating institutional identity and distinctive reputation". In other words, over time, an entrepreneurial university develops an open culture that embraces change and translates it into dynamic practices fostering innovation and entrepreneurial initiatives.

The entrepreneurial cultural dimension is expressed as well in the internal ecosystem's infrastructure and knowledge transfer activities. Since these two elements of the internal ecosystem intermingle with the external ecosystem's network of actors (Agrawal and Cockburn, 2003), the external cultural domain asserts its influence upon the borders that separate both ecosystems. Hence, the university's internal and external cultural dimensions influence each other and materialize in the form of start-up formation, marketable innovations, and various entrepreneurial initiatives through what was previously termed the 'shared entrepreneurial space'. Thus, A more dynamic and engaging entrepreneurial culture would translate into more significant innovation and new enterprise formation. We will subsequently briefly explore the concept of shared entrepreneurial space and touch upon the process of variation, selection, and retention of entrepreneurial initiatives.

The shared entrepreneurial space

The entrepreneurial space is the realm in which entrepreneurial initiatives live. Borrowing from Schumpeter's famous definition, it is the non-localized place where "creative destruction" occurs, triggering an evolutionary process of variation, selection, and retention of entrepreneurial initiatives. As seen from our internal ecosystem perspective, this space is somewhat analogous to Clark's (1998) "Expanded Developmental Periphery" of an entrepreneurial university. Suppose we try to understand it from our external ecosystem's perspective. In that case, it is similar to Moore's (1993) 'ecology of competition' in which innovations, start-ups, and other entrepreneurial initiatives are subject to predatory pressures forces in an ecology where cooperative and competitive interdependencies (Hannan and Freeman, 1989) along with the organizational ability to adapt and evolve (Carroll and Hannan, 2000) determine long-term survival of new products and companies.

Although entrepreneurship has been historically seen as a local phenomenon (Spiegel, 2017), the ecosystems approach views entrepreneurship as a multi-actor dynamic process of

heterogeneous nature (Motoyama and Knowlton, 2017), in which entrepreneurial initiatives are in constant evolution, partaking in the process of variation, selection, and retention. This research further portrays a multi-level view in which the interactions between the internal and external dimensions of the ecosystem are paramount. Correspondingly, within this 'shared space', the limits are drawn between the university as the internal and the wider external ecosystems. Likewise, paradoxically, the Shared Entrepreneurial Space serves as a union or bridge and as a kind of fluid boundary that enables the flow of entrepreneurial activity between the internal and external ecosystems.

According to Aldrich and Ruef (2006), from an ecological perspective, variation occurs via start-up formation and new product developments; selection would result from the fit between the new products or firms and market forces; retention of entrepreneurial initiatives is subject to both external pressures as well as organizational adaptions to environmental changes. Although the model presented in this paper acknowledges the importance of the process mentioned above as an essential part of the evolution of innovations happening in the entrepreneurial space, the details of these three stages escape the scope of this research article.

ENTREPRENEURIAL ECOSYSTEMS LIAISON MATRIX

Static vs. Dynamic

The entrepreneurial ecosystems liaison matrix offers a graphic conceptualization of the interactions between the external and the internal entrepreneurial ecosystems. As illustrated in Figure 3, both dimensions are divided into two possible states: dynamic or static. Following Aldrich and Ruef's (2006) perspectives on organizations concerning evolutionary theory, these states are defined for the internal ecosystem by the relative variation of entrepreneurial initiatives; a higher variation leads to a dynamic internal ecosystem and a lower to a static one. Likewise, for the external ecosystem the states are defined by the relative retention of innovations or new firms. The term 'relative' is used as the quantitative definition of variation or retention of entrepreneurial initiatives is beyond the scope of this article; thus, it is left to the readers to operationalize these measures.

Additionally, a selection rate can be calculated by dividing the retention of initiatives by the variation of entrepreneurial endeavors. This selection rate can be used as an indicative measure for the degree of evolution or 'maturity' of the ecosystems as a whole. For instance, in theory, a perfectly evolved ecosystem in which ten entrepreneurial activities are initiated and ten are retained would have a selection rate value of one. So, in real life, the closer this rate gets

to a value of one, the more entrepreneurially efficient the ecosystem is, and it could be called a more evolved ecosystem than one with a lower retention rate.

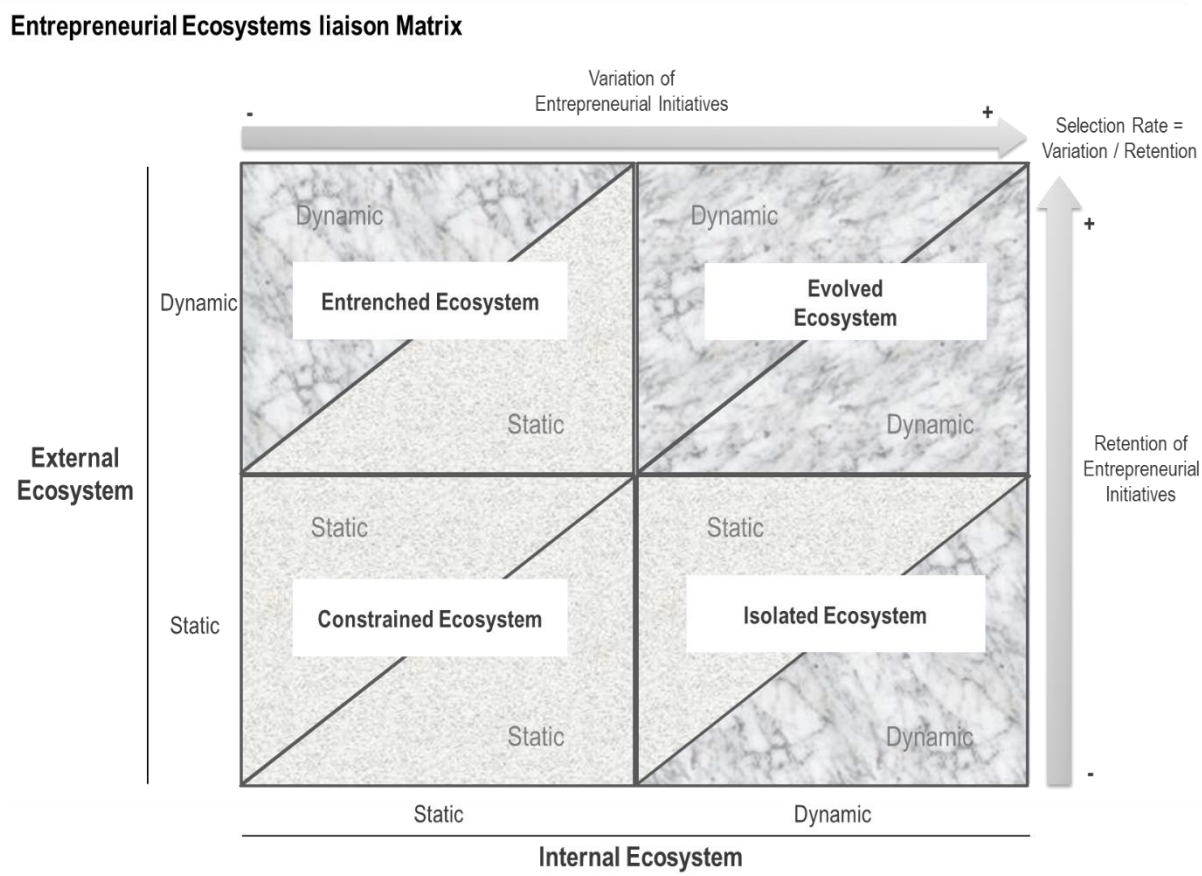

Figure 3. Entrepreneurial Ecosystems Liaison Matrix

Leading to separate quadrants in which all eight states interlace, four differentiated ecosystems can be distinguished. Firstly, we find a *Constrained Ecosystem* having a static internal and external ecosystem. There are very few entrepreneurial endeavors being initiated from university and a correspondingly low number of innovations and new businesses being adopted by the external entrepreneurial ecosystem. Then, on the lower right corner of the matrix, we find an *Isolated Ecosystem* where despite the entrepreneurial character of the university and the high number of variations of new firms and business models being initiated from the core, the external ecosystem is not conducive to the adoption and retention of market novelties. The upper right quadrant has been named *Entrenched Ecosystem* because although the external ecosystem is highly dynamic and friendly start-ups and new product. The core of the internal ecosystem is deeply fixed in the ways of a traditional university that does not concern itself and even sees the commercialization of its research activities and the application of findings to new products and start-up creation reluctantly. Lastly, the *Evolved Ecosystem* is located diametrically opposed to the constrained ecosystem. In the upper right quadrant, the

ecosystem above portrays many start-up variations, applied inventions, and new product development, such as incremental innovations originating from either university's core or its developmental periphery. In addition, this latter ecosystem has an external environment that initiates entrepreneurial endeavors and retains both incremental and disruptive innovations at a relatively high rate compared to all other quadrants.

University types and pathways towards the entrepreneurial university

The entrepreneurial ecosystems liaison matrix provides a practical tool for the classification of different university types according to the ecosystem quadrant in which the organization is located as well as for the identification of possible 'pathways' or 'intermediate stages' that a traditional university might follow towards the transformation into an entrepreneurial university. Figure 4 shows the application of this concept as a heuristic device for identifying university types and planning possible pathways towards the transformation of traditional universities into more entrepreneurial organizations and the embeddedness of the internal entrepreneurial ecosystem into a highly dynamic *Evolved Ecosystem*.

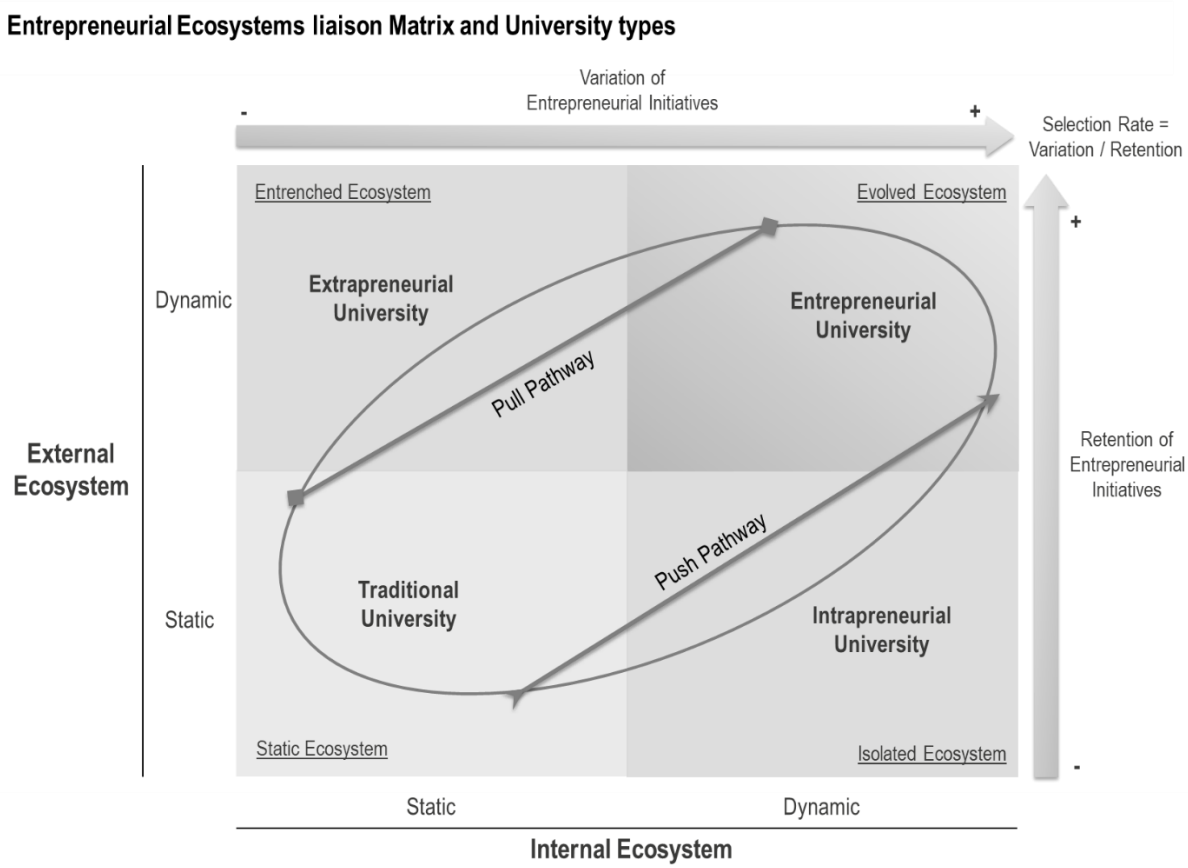

Figure 4. Entrepreneurial Pathways and University types according to the liaison Matrix

The liaison matrix shows two possible paths in the way of transformation from a traditional university into an entrepreneurial one, starting at the lower-left corner and ending at the upper right quadrant. These pathways include intermediate stages in which two particular types of universities can be identified, on the upper left quadrant, the *Extrapreneurial University,* and on the lower right one, the *Intrapreneurial University*. This paper's goal is not to define what either a traditional or entrepreneurial university is, but subsequently, the two pathways with their corresponding university types (as seen in Figure 4) will be described and clarified with illustrative examples.

Pull Pathway: as its name suggests, this particular pathway pulls the university from without into a more dynamic environment. Starting with static internal and external ecosystems, as the external ecology becomes more dynamic and innovative, the university is dragged along into a more entrepreneurial environment. Thus, the whole ecosystem becomes more innovative and conducive to entrepreneurial initiatives, slowly forcing the core of the ecosystem to change from within until the university becomes more entrepreneurial. At this point, a traditional university would first become an *Extrapreneurial University* in its path towards an entrepreneurial university. That means the university would have a relatively static entrepreneurial ecosystem, and most innovations and star-up initiatives would be started from the external ecosystem actors. Meanwhile, since the external domains such as policy, culture, support infrastructure, and networks become so dynamic and entrepreneurially conducive, the university starts to strengthen its internal support mechanism for entrepreneurship and to expand its developmental periphery. Thus, allowing for the university's core to match the external dynamism and become more entrepreneurial as time progresses, continuing the path towards an entrepreneurial university within an evolved entrepreneurial ecosystem (upper-right quadrant in Figure 4).

A representative example of the pull pathway is that of the Leuphana University of Lüneburg. Lüneburg is a small city in Northern Germany, and it officially belongs to Hamburg's metropolitan area. In 2009 a public project was initiated to raise the regional economy's innovation capacity and competitiveness. The project was co-financed by the European Union and the Federal State of Lower Saxony with an approved volume of EUR 98 Million. This project, called the Lüneburg Innovation Incubator, is according to Kempton and Hofer (2013), "an excellent example of how public intervention to boost regional innovation through investment in university research, knowledge bridges and the absorptive capacity of firms is capable of stimulating economic growth and diversification given a sufficient scale and

flexibility of support". Overall, this initiative has contributed to developing a dynamic, networked and creative environment that is conducive to entrepreneurship and innovation.

The Lüneburg Innovation Incubator provided a platform to attract and develop innovative people, entrepreneurial firms, innovation projects, start-up networks, and infrastructures (Kempton & Hofer, 2013). The project was embedded within the structures of the Leuphana University of Lüneburg, and its management and implementation were carried out by the organization.; Yet, the fact that the overall external scheme was university centered served as a catalysator that propelled an entrepreneurial transformation from within the university's internal ecosystem; even though Leuphana is a medium-sized university of roughly 7,500 students without the classical faculties that have a certain affinity with entrepreneurship, such as engineering, basic industrial research and the likes. Today, the university can be identified as an *Extrapreneurial University* embedded in a dynamic external ecosystem that is pulling the internal ecosystem in its path towards an evolved entrepreneurial transformation.

Push Pathway: this pathway starts out as an internal transformation within the university while it becomes more dynamic and begins to support entrepreneurial endeavors from its core activities of teaching, research, and outreach. The internal ecosystems also start to reach out to external actors, expanding its developmental periphery into a relatively static external ecosystem where outside university boundaries support little entrepreneurial action. Therefore, we can say that the organization pushes itself through an isolated external ecosystem by becoming an *Intrapreneurial University* (lower-right quadrant in Figure 4) in its path towards an entrepreneurial university.

Arizona State University (ASU) and its surroundings in the Phoenix area make for an interesting case of a push pathway because the entrepreneurial change of both ecosystems originated within the university's boundaries, expanding with time to the external ecosystems by attracting entrepreneurial actors and influencing all four environmental domains.

Arizona State University is one the youngest and fastest-growing entrepreneurial universities in the United States, enrolling more than 64,000 students. Phoenix is a former agricultural and mining region that, thanks to innovative initiatives of ASU, stating at the end of the first decade of this century and continuing until this time, has advanced significantly in developing its regional entrepreneurial ecosystem (Shermer, 2013). The construction of the downtown ASU campus in 2006 initiated the entrepreneurial revitalization of the city and attracted other initiatives, such a community development group created in 2013 called Downtown Phoenix Inc.

In general, the entrepreneurial transformation of ASU can be said to have started with the arrival of a new president, Michael Crow, a former professor of science and technology that started to redefine the university's role in the Phoenix metropolitan region. For example, by opening several new research institutes in fields where the region's leaders hoped to influence the Phoenix economy (e.g. sustainability and biosciences) such as the founding of the ASU Biodesign Institute in 2003 as well as the already mentioned downtown campus in 2006, which added several buildings to the downtown areas (Mack & Mayer, 2016).

According to Crow (2008), to foster ASU's entrepreneurial potential and innovative capacity, the organization instituted several policies promoting entrepreneurship. These facilitated the innovative process of moving from ideas into action more effectively by executing a comprehensive strategy that improves core processes and implements systems that lead to creative output, technology transfer, and intellectual property commercialization. The university is also testing the implementation of faculty entrepreneurship incentives, assigning funding faculty staff that want to implement inventions and start companies (Crow, 2008).

Crow initiated a systems innovation approach labeled "University as Entrepreneur." The principal objective was to achieve long-term institutional innovation by inspiring, empowering, and enabling students, faculty members, and external entrepreneurial actors to innovate and generate new enterprises. In the words of Crow (2008): "This system approach instead of just teaching courses in entrepreneurship that would reach all of the disciplines, aims to embed entrepreneurial opportunities and learning environments within each of them, so our nursing college now has an innovation and entrepreneurship center. Our journalism school has a major industry-funded center for innovation in the news media. In every school and discipline, there is now a set of dynamic mechanisms for making innovation something that lives habitually within the context of the discipline."

Today, Arizona State University has contacts and working alliances with entrepreneurs and industries and external actors related to entrepreneurship and innovation. Thus, according to the liaison matrix, ASU can be said to be a highly networked *Extrapreneurial University* with its own expanded internal ecosystem having pulled through a relatively static external ecosystem (as per lower-right quadrant in Figure 4), currently influencing its external ecosystem's dynamic transformation towards an entrepreneurially evolved ecosystem.

According to the ecosystem liaison matrix, we have explored in an illustrative way the two paths a university might take in its entrepreneurial transformation. The conceptual framework presented in the paper also allows for a theoretically possible third path, namely a transformation in which a static ecosystem becomes an evolved one, in a direct change where

both the internal and the external ecosystem simultaneously become more dynamic. In such a theoretical possibility, a traditional university would become an entrepreneurial university through a sort of leap without going through any of the two intermediary stages that we previously illustrated. However, in a practical sense, an entrepreneurial transformation is either originated from the external ecosystem or from within the university itself. Therefore, for simplicity and practicality, only these two possible entrepreneurial paths have been presented in this work.

CONCLUSION

We have inquired into the dynamics of entrepreneurial ecosystems by conceptualizing and explaining fundamental ecosystem constituents and presenting a theoretical model with practical implications. We have enlarged this model through a liaison matrix that operationalizes the static-dynamic interactions between the internal and external ecosystems. Finally, we have explored the two paths, with their correspondent intermediate stages, that a university might follow in its way toward an entrepreneurial transformation.

Entrepreneurial Ecosystems have emerged amongst scholars and practitioners alike as one of the preferred approaches for understanding entrepreneurialism, supporting entrepreneurial actors, and encouraging entrepreneurial activities in specific geographical regions. Specifically, public policy and local decision-makers can benefit from the recent but vast body of academic literature available on the subject in order to use it to write effective policy, as well as to make informed decisions leading to the design and successful execution of more efficient and long term oriented entrepreneurial ecosystems.

In general terms, this research article constitutes an attempt to model how universities sit at the heart of the entrepreneurial ecosystem, thus becoming the center of analysis for a separate internal ecosystem that relates to and interacts with its external ecosystem, forming a broader overall entrepreneurial ecosystem. The present study should clear some of the conceptual roads for researchers to develop theories that the complex concept of entrepreneurial ecosystems needs. The paper can provide practitioners with a comprehensive model that operationalizes the dynamic process of interactions between the external and internal ecosystems supporting the development of entrepreneurial universities by providing a strategic roadmap toward the achievement of a dynamic, more evolved, and sustainable entrepreneurial ecosystem.

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TOWARD A FRAMEWORK FOR UNIVERSITY-BASED ENTREPRENEURIAL ECOSYSTEMS AND HUMAN CAPITAL DEVELOPMENT IN SUB-SAHARAN AFRICA:

The Unisave Entrepreneurship HUB @ Universidade Save, Mozambique

Abstract: Most research on entrepreneurial ecosystems employs static models which oversee its dynamic evolution. Additionally, empirical studies tend to be confined to developed regions with well-established ecosystems with existing structures and well-defined actors. Such an approach can often neglect the understanding of the ecosystem as an emergent phenomenon from the embryonic phase to maturity, especially when considered in an underdeveloped region. This article aims to serve as a conceptual basis for developing university-based entrepreneurial ecosystems in the Sub-Saharan African context. We propose a dynamic framework that highlights the role of universities in enabling human capital for entrepreneurship, especially in places with insufficient top-down planning and established mechanisms that would typically drive such an ecosystem. The case study illustrates on a practical level how a nascent entrepreneurial HUB is enabling the development of human capital in the city of Maxixe, Mozambique, thereby catalyzing a nascent entrepreneurial ecosystem in the region. Emulating the HUB, the article brings together theory and praxis, believing that optimal practical action is rooted in analysis and conceptual understanding, transforming academic research into the means from which to solve real-world needs.

Keywords: strategic initiative, evolutionary organization theory, sustainability

INTRODUCTION

"If you look at where innovation – defined as ideas, not as commercial product – tends to live, the university system is remarkably innovative."

— Steven Johnson

The institutional role of universities in society is no longer limited to conventional research and education but is increasingly that of serving as an innovation-promoting knowledge hub for regional development and entrepreneurial activity. The study of entrepreneurialism in underdeveloped regions and universities' role in enabling entrepreneurial activity is a subject of interest for scholars, practitioners, and policymakers alike. Nowadays, it becomes imperative for universities to establish structures, systems, and practices that fully incorporate entrepreneurship initiatives aligned with the surrounding innovation ecosystems and all actors involved.

This article aims to provide a unique view of university-based entrepreneurial ecosystems in the Sub-Saharan African context based on a dynamic model of the process leading up to the emergence of the entrepreneurial ecosystem, from that of a local incipient stage to an expanded mature phase. The goal is to shed light on the inner workings of university-based entrepreneurial ecosystems in the Sub-Saharan region, conceptually and practically. More specifically, to serve as the theoretical basis for the action-based operation of a university entrepreneurship HUB in Mozambique that can contribute to the local entrepreneurial ecology, particularly by fostering human capital development where there is a lack of it.

Throughout our theory sections, we will review relevant literature on university-based entrepreneurial ecosystems, human capital, and the intricate relationship between these subjects to construct a conceptual framework that would stand as a blueprint for implementing a university-based entrepreneurship HUB located in Maxixe, Mozambique. The proposed framework is composed of a dynamic model that assumes an inexistent or very rudimentary ecosystem (as in the case of Mozambique). The purpose is to provide a design mechanism for implementing and developing the ecosystems in developing countries. The dynamic model consists of three evolutionary stages: Incipient (embryonic), Development (growth), Mature (accomplished). Based on Isenberg (2010), we include four main ecosystem actors (University, Human Capital, Business, Government). The ecosystem's interactions occur under the influence of six domains: Markets, Business, Culture, Finance, Policy, and Support Infrastructure.

Our focus will then shift to the present-day entrepreneurial environment found in the Sub-Saharan African region, precisely that of Mozambique. Here we review an economic

system that is still reeling from anti-free market post-colonial economic policies, resulting in decades of stagnant entrepreneurial activity. It is only in recent years that minimal conditions have been created for an entrepreneur to engage the market freely and safely. We assess how this novice and still uncertain market environment has contributed to the domination of informal entrepreneurship over formal entrepreneurship and the large percentage of entrepreneurs characterized as "necessity" entrepreneurs as opposed to "opportunity" entrepreneurs. In this environment, initiatives such as the entrepreneurship HUB and the emergence of an entrepreneurial ecosystem will look to promote a more dynamic and resilient approach to entrepreneurship capable of contributing to real economic growth.

Subsequently, we will describe the actual implementation of this conceptual model in our case study, which shows on a practical level how a nascent entrepreneurial HUB has enabled the development of human capital in the city, thereby catalyzing a nascent entrepreneurial ecosystem in the region. Our empirical data has been obtained using the action research approach that has allowed one of the authors to produce unique contextual insights into the internal operations of the nascent entrepreneurial ecosystem that are not available to outsiders (Coglan & Brannick, 2005). The author's insider status derives from his direct involvement in the planning, design, and execution of the Unisave Entrepreneurship HUB in Mozambique. Based on our proposed dynamic framework for the development of university-based entrepreneurial ecosystems, we will describe systematically throughout the case study how the incipient entrepreneurial initiatives have evolved from simple entrepreneurial training and collaborations within the university into the implementation of a development plan that has laid the foundations for the transition into the expansion phase of the ecosystem.

Concluding with our discussion section, we are able to shed light on the fundamental importance of university entrepreneurial structures and how these shape the emergence of an incipient ecosystem by enabling the development of human capital at the local level, especially in countries and regions where such structures are undeveloped such as in Mozambique. Additionally, our research and case study can serve as a conceptual and practical reference for our readers in the higher education, public and private sectors; thereby providing a heuristic framework for the strategic design, structure, and implementation of University Entrepreneurship HUBs in Sub-Saharan Africa and other developing countries.

UNIVERSITIES AS AN ENABLING FACTOR FOR ENTREPRENEURSHIP

Since its modern emergence as an academic discipline, the field of entrepreneurship and the term 'entrepreneurial' have been characterized by a lack of agreement on precise definitions and key terms. The most widely accepted definition of the term entrepreneur is from Austrian economist Joseph Schumpeter (1936), which emphasized its innovative nature, defining an entrepreneur as a person who carries out new combinations, causing discontinuity in the market, thereby creating and adding value to it.

We share that view and understand entrepreneurship's conventional essence as generating and arranging innovative combinations of factors of production and methods of accomplishing a goal (Bygrave and Hofer, 1992). Likewise, it involves the exploitation of opportunities beyond means that are currently available. These chances to exploit future goods and services are not simply taken but created (Venkataraman, 1997; Reihlen et al., 2009) through innovation, novel business models, and social interactions (Vygotsky, 1978). In this context, the role of modern universities regarding entrepreneurial activity is to enable actual and potential entrepreneurs to innovate or exploit these opportunities by establishing structures and systems that facilitate the entrepreneurial process (Jennings and Hindle, 2004).

Most research on the entrepreneurial dimension in universities focuses on specific organizational designs that facilitate the commercialization and transfer of knowledge. These studies mainly look separately at structures, systems, practices, and contingency factors fostering entrepreneurialism in higher education institutions but oversee the interactions among these factors at the organizational level and the interdependence with the macro environment (Rothaermel, Agung, & Jiang, 2007). Reviews of the literature (Yusof & Jain, 2008; Guerrero-Cano & Urbano, 2010) display an emphasis on strategic context (where) and content (what), thereby neglecting the core of the entrepreneurial process itself, that is, the entrepreneur as business creator and innovator. Namely, an important question that has not yet been addressed is how entrepreneurs as the human capital factor are enabled and supported by internal university structures when the entrepreneurial ecosystem is embryonic or inexistent, such as in underdeveloped countries as in Sub-Saharan Africa.

The fundamental role of Universities within the Entrepreneurship Ecosystem

Higher education scholars are increasingly interested in understanding how universities use their organizational capacity to initiate change in its local environment and the internal factors that strengthen the entrepreneurial capacity to respond to environmental changes (Fumasoli & Lepori, 2011; Jarzabkowski, 2005; Shattock, 2000). Academic studies on higher

education have addressed some of these questions by looking at the macro environment fostering entrepreneurial change. Other studies have centered their efforts at the meso-level, namely by trying to understand the emergent entrepreneurial structures, systems, and practices that have led to novel organizational configurations such as the entrepreneurial university (Clark, 1998; Etzkowitz, 2003; Kirby, 2005); adaptive universities (Sporn, 2001); the third generation university (Wissema, 2009); the triple-Helix model (Etzkowitz and Ranga, 2010); and University-based Entrepreneurial Ecosystems (Mason and Brown, 2014; Stam and Spiegel, 2017).

There is wide variation in the capacity of local and regional actors to support entrepreneurial activity. These variations are confined to location, and historical conditions as the established patterns of behavior and structures tend to reinforce themselves over time due to inertia and cultural drag (Alvedalen & Boschma, 2017). Universities' important role in shaping the social, economic, and cultural environment at the local and regional levels highlights its characteristic as a fundamental part of the Entrepreneurial Ecosystem.

Using concepts from biology and ecology in social science, economics, and entrepreneurship studies to describe the various phenomena in these disciplines is not new. In the same manner, as an ecosystem in a natural environment can be described as a balanced, interdependent, homeostatic community of organisms sharing a common space; so is the concept of entrepreneurial ecosystems underpinned by the systemic interaction among entrepreneurial actors, tangible and intangible factors of production (i.e., Capital, Innovation Capacity, Creativity) and socio-economic structures within a geo-political boundary, all of which are conducive to entrepreneurial activity, new firm creation and innovation (Stam, 2015). This ‘ecosystem’ can also be described as a network of social interactions, communication, physical infrastructure, and entrepreneurial attitudes and behaviors of different communities (Isenberg, 2010).

According to Isenberg (2011), entrepreneurship ecosystems are intrinsically self-sustaining and consist of six domains, which, regardless of the overall common framework, portray unique characteristics and remain independent regardless of the degree of interdependence within the ecosystem. These six domains are Policy: government, leadership and policymakers; Support: infrastructure, public and private institutions, and support professions; Human Capital: entrepreneurs, labor and educational institutions; Markets: early and potential customers, networks; Finance: financial capital; and Culture: success stories and societal norms.

Each domain influences actors in their degree of entrepreneurial activity, propensity, and contribution to the system, adding layers of complexity and an emergent uniqueness to the particular ecosystem related to contextual conditions and socio-demographic circumstances.

Our conceptual framework is based on the aforementioned fundamental principles by considering contextual elements associated with infrastructure, human capital, culture, business, and markets; while mainly focusing on universities as seminal actors in enabling human capital when regional entrepreneurial ecosystems are deficient or inexistent; such as in Sub-Saharan Africa and more specifically in the case of Mozambique.

UNIVERSITY-BASED ENTREPRENEURIAL ECOSYSTEM AND HUMAN CAPITAL

University-based entrepreneurship plays a central role in enabling the healthy development of an entrepreneurial ecosystem. Higher education institutions can stimulate enterprise creation by more than merely teaching and research activities. For instance, praxis-based teaching techniques using best practices to learn from failure (Naia et al., 2014) and offering specialized training in opportunity identification and business model adaptation to cultural contexts (Blenker et al., 2012). Likewise, university-led HUBs, incubators, networks, co-working spaces, and camps are considered catalysts for developing sustainable entrepreneurial ecosystems (Dahms & Kingkaew, 2016).

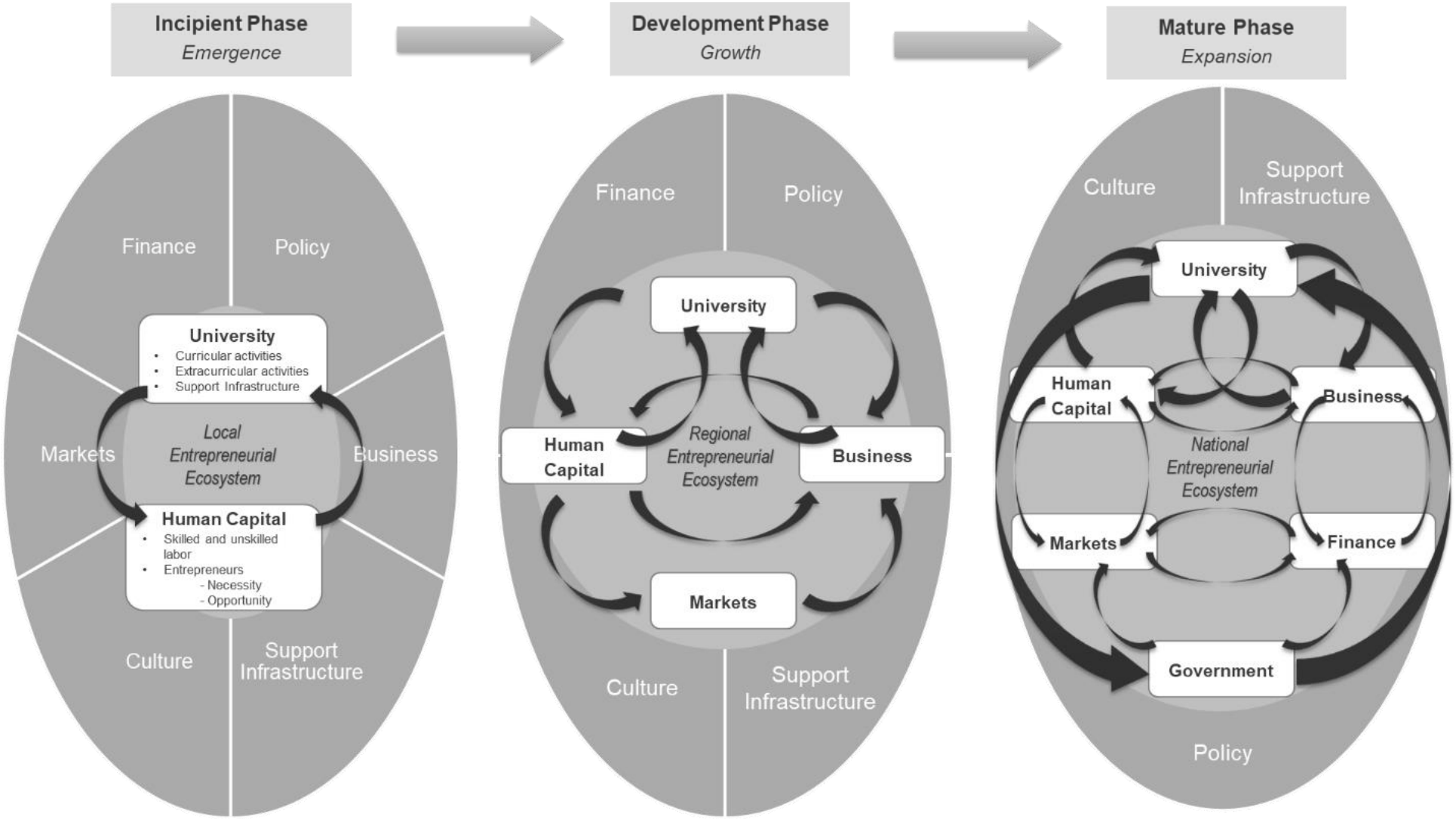
A university-based entrepreneurial ecosystem can be understood as one that bestows the central role of enablers and primary drivers of entrepreneurship activity in the higher education sector. Neck, Greene, and Brush (2014) define it as “university-led activities that support entrepreneurship development through various multidimensional initiatives related to teaching, research, transfer, and outreach". This conceptualization places the university as the primordial actor being an interconnecting hub among all the stakeholders in the ecosystem. In this view, the dynamism of the university system supports the entrepreneurial processes, empowers human capital, and fosters innovation by developing the region's knowledge base (Fauzi et al., 2019).

This research paper aims to construct a conceptually grounded basis for developing a university-based entrepreneurship ecosystem in a poorly designed area in Mozambique, thus providing a significant theoretical contribution with practical implications. The proposed framework is composed of a dynamic model that assumes an inexistent or very rudimentary ecosystem (as in the case of Mozambique). The purpose is to provide a design mechanism for implementing and developing the ecosystems in developing countries.

The dynamic model (see Figure 1) consists of three stages: Incipient (embryonic), Development (growth), Mature (accomplished). There are four Main Actors (University, Human Capital, Business, Government). The ecosystem's interactions occur under the influence of six domains (based on the Isenberg model): Market, Culture, Finance, Policy, and Support. The three stages unfold as follows:

- Incipient: we start with two actors only and mainly two domains that interact within the emergent ecosystem (Markets and Business)
  - University
    - Curricular Activities
    - Extra-Curricular Activities (training, camps, etc.)
    - Infrastructure (Incubators, HUBs, Co-Working Spaces, Office Space)
  - Human Capital
    - Entrepreneurs
      - Necessity
      - Opportunity
    - Students
    - Skilled and Unskilled Labor
- Development: business and markets become main actors of the growing regional ecosystem
  - University
  - Human Capital
  - Business: Start-ups, Small and Medium-Sized Enterprises, Established Firms
  - Markets: new and established markets are reached at a local and regional level
- Mature: a fully-fleshed self-sustaining entrepreneurial ecosystem emerges with four actors and five domains (Policy and Support become part of the ecosystem)
  - University
  - Human Capital
  - Business (in addition to the former three elements, Large Firms and Corporations are attracted to and participate in the ecosystem)
  - Markets: new and mature markets are reached at a regional, national and international level
  - Government: Policy, Physical Infrastructure
  - Finance (government programs, tax incentives, Private and Business Investors etc.)

Figure 1: Dynamic Framework for University-based Entrepreneurial Ecosystems



University HUBs as enablers of Human Capital for entrepreneurship

There can be no entrepreneurship without entrepreneurs. Thus, when considering the ecosystem at the micro-level, the central role of sine qua non is at the entrepreneur's hands. Therefore, in most entrepreneurial ecosystem's frameworks, the entrepreneur and labor, both as human capital, play a central role as either catalyst for action and creator of new ventures or as skilled labor to empower and support the start-ups (Isenberg, 2010; Stam and Spiegel 2017).

Human capital theory describes knowledge development, innovation, and opportunity recognition as a function of human capital. We can define human capital as the stock and level of education, experience, skills, and intelligence of an individual or a group of individuals available to be employed for a determinate socio-economic endeavor (Østergaard and Marinova, 2018). Beker (1993) suggests that education and skills gained through experiential training form the basis of human capital development. Through entrepreneurship education, this conceptual understanding, technical skills, and social and practical knowledge for new ventures can be learned and enhanced in universities.

Besides the role of the entrepreneur as a central player in the ecosystem, other individual actors that can be classified within the human capital domain also play an important role: mentors, advisors, investors, and role models among others (Isenberg and Onyemah 2016; Stam and Spigel, 2017). These actors play a resource allocation and supporting role that is generally considered routine and act as crucial gatekeepers and enablers of certain types of entrepreneurial activities (Blake, 2006).

We can argue that the key domain in entrepreneurship ecosystems is essentially related to human capital, making it the key underlying factor that drives entrepreneurial activity and performance in a region (Chatterji, Glaeser, and Kerr, 2013). Moreover, the local supply of individuals with entrepreneurial inclinations and skilled workforce to support new business creation is associated with the level of training and general education of the human capital available to a specific region (Nicotra et al., 2018; Stam, 2015).

The availability of skilled labor with entrepreneurial potential is a structural precondition for developing university-based entrepreneurial systems (Bresnahan, Gambardella, & Saxenian, 2001). Thus, entrepreneurial clusters are more likely to arise wherever universities provide a talent pool of skilled human capital and wherever entrepreneurial education clusters with support infrastructure are located. Also, opportunity-driven entrepreneurial activity is strongly related to local income levels (Radosevic & Yoruk, 2013), which relates to the level of education and capabilities of the human capital in a region. In turn, it positively affects the purchasing power and quality of life of the population in a

region, strengthening the potential market for new firms and increasing the success likelihood of entrepreneurial endeavors (Florida & Mellander, 2014).

The human capital domain of an entrepreneurial ecosystem is influenced by a range of contingent elements that can be broadly characterized as social, cultural, and material (Spigel, 2017). Social elements refer to the role of social networks within the ecosystem and the extent and quality of their connectedness and interaction with other entrepreneurial ecosystems. Cultural elements can be associated with the attitudes towards entrepreneurship which can encourage or discourage entrepreneurial activity; for instance, risk adversity, role models such as successful entrepreneurs, and cultural support mechanisms in case of failure. Among these lines, we can notice that the level to which an entrepreneurial culture flourishes within the ecosystem will depend on the degree to which actors in and around the university behave following entrepreneurial values and beliefs (Greenwood and Hinings, 1993). In other words, these entrepreneurial attributes will be determined at the most basic level by socio-cultural factors and broader cultural belief attitudes toward entrepreneurship in a region (Bronstein and Reihlen, 2014). Finally, material elements concern place-specific physical support infrastructure and regional organizations and private or public institutions that provide support to the ecosystem either through financial means or government-sponsored programs and public policies conducive to facilitating the entrepreneurial activity.

In this paper, we advocate for the relevance of human capital to entrepreneurial success and performance and the fundamental role that universities play within the entrepreneurship ecosystems by enabling, empowering, and supporting the human capital dimension and the individual entrepreneurs. Especially during the incipient and developmental stages of an ecosystem life-cycle in developing countries, where other actors do not usually actively participate or engage in the promotion and support of entrepreneurial activity. Subsequently, we describe how we implement our conceptually based framework to a real-life case in the city of Maxixe in Mozambique, where one of the authors is actively engaged in applying our theoretical learnings by developing a university-based entrepreneurial ecosystem together with a local university called the Unisave Entrepreneurship HUB.

ENTREPRENEURSHIP IN SUB-SAHARAN AFRICA

The Context

A walk through the downtown market of any Sub-Saharan African city will unveil the creativity and industriousness that lies at the heart of African entrepreneurship. It is here in the urban markets of places such as Harare, Accra, Maputo, and Nairobi where innovation and

ingenuity are practiced as a means to survival, and the pursuit of opportunity results in entrepreneurial initiatives as distinctive as anywhere in the world. With the International Labor Organization estimating that 66% of the Sub-Saharan African population draws its livelihood from the informal entrepreneurial sector and a recent African Development Bank by stating that up to 22% of the working-age population is setting up formal businesses (Herrington, M., & Kelley, D. 2012). It goes without saying that entrepreneurship will have a tremendously important role to play in fostering economic growth and wealth creation (Beugre, 2016) as well as the development of a modern and open economy in the Sub-Saharan African region (Wennekers & Thurik 1999; Garavan & O'Cinneide 1994).

Historical Development

Any discussion of the current Entrepreneurial situation in Sub-Saharan Africa requires an understanding of what came before it. With increased interest in Entrepreneurship from the academic community, there is growing attention to the research of entrepreneurial (historical) development (Audretsch, Keilbach and Lehmann 2006; Lee and Peterson 2000). Through research in Entrepreneurial development, we further our understanding of how entrepreneurship has developed historically in different contexts (Barringer and Ireland 2016). Despite this increased awareness of entrepreneurial development from researchers, our understanding of the developing world's historical context and entrepreneurial development, including Sub-Saharan Africa, remains limited (Amoah, 2018). Given that the 46 countries of the Sub-Saharan region are anything but identical in their history, culture, and socio-economic status, it is always unwise to make any generalizations about the region. With that being said, we have found that many of the countries have indeed followed a similar trajectory in terms of their market evolution. For this reason, we will generalize the Sub -Saharan African postcolonial entrepreneurial evolution by the following 3 periods :

1. Immediate post-colonization dominated by nationalization and creation of state business limiting access by private actors.
2. Destabilization and chaos dominated by civil armed conflicts and absence of property rights and other business protections required to inspire entrepreneurial confidence.
3. Adoption of free markets, contemporary reform and globalization creating fertile ground for a new generation of entrepreneurs.

Necessity vs. Opportunity Entrepreneur

Our discussion begins in the third phase of the development of Africa Entrepreneurship, the adoption of an open market where entrepreneurs can act freely. Here, amidst the adoption of a free market, we find the emergence of two types of entrepreneurs, namely the "necessity" entrepreneur vs. the opportunity entrepreneur. The distinctive contrast between these two types of entrepreneurs being that the necessity entrepreneur is forced into entrepreneurship due to the lack of other income-generating options in the market, whereas an opportunity entrepreneur engages the market through the recognition of business opportunity (Fairlie, Fossen 2017).

While opportunity entrepreneurs are most likely to be employed or at least financially stable, a necessity entrepreneur has limited or no job options and turns to the market to survive. As expected, in Sub-Saharan Africa, one finds that the proportion of necessity entrepreneurs far outweighs that of opportunity entrepreneurs. Kayizzi-Mugerwa (2016) claims that for there to be any significant rise of opportunity entrepreneurs in the African context, there would require a medium per capita income of $7300. While the accuracy of this figure is entirely contextual, given the fact that the average medium per capita income in Sub-Saharan Africa is less than 2000$, it goes without saying that if the status quo remains, that it will be generations before we find a sufficient number of opportunity entrepreneurs to result in any meaningful economic growth. Hence, concerted efforts must be put forth to empower entrepreneurs and create functioning entrepreneurial ecosystems capable of supporting and facilitating the entrepreneurial process.

University-based Entrepreneurial Education in the Region

Before making our case for creating locally based Entrepreneurial Ecosystems founded and cultivated by local university-based Entrepreneurial Hubs, we will briefly consider the common approach of university-based entrepreneurial education initiatives seen across Sub-Saharan Africa. Despite sporadic efforts across the region, entrepreneurship education in institutes of higher learning is still lagging (Beugre, 2017). Efforts towards Entrepreneurship education at the university are primarily based on the idea that the region must instill a mindset amongst its graduates as job creators as opposed to job seekers (Adom, Chiri, Quaye, Awuah-Werekoh, 2017).

With this underlying sense of urgency, it is with this underlying sense of urgency to produce graduates that can become self-employed that is at the root of so many of the university-based entrepreneurial initiatives. Such initiatives are varied and could take the form of requiring all students to take an entrepreneurship class regardless of their area of study as

seen in *The Eduardo Mondlane University* in Mozambique or could extend to a university-wide approach that integrates entrepreneurial concepts into all university programs such as found at *The Kenyatta University* in Kenya (Robb, A., Valerio, A., & Parton, B., 2014). And while entrepreneurial education becomes increasingly commonplace in the university setting, critics have begun to ask questions regarding the outcome of such efforts and investment. The fundamental question being asked is, are these students going on to become entrepreneurs? With such little follow-up by universities regarding post-graduation student employment status, it is exceedingly difficult to accurately determine these university-led initiatives' outcomes.

The Rise of Entrepreneurial Hubs in the Region

Beyond the classroom-based entrepreneurial education and training, another entrepreneurial initiative of universities worldwide, including Sub-Saharan Africa, is the creation of Entrepreneurial Hubs. In getting to the core of what constitutes a HUB, we look to Toivonen & Friederici in their article; It's Time to Define What a Hub Really Is (Stanford Social Innovation Review, Apr 7, 2015). It is here where the four "core features" of a HUB are put forth as:

- It builds collaborative communities with entrepreneurial individuals at the center
- Attracts diverse members with heterogeneous knowledge.
- Facilitates creativity and collaboration in physical and digital space
- Localizes global entrepreneurial culture.

Hubs that began to embrace these values became more prominent in the SSA landscape starting around 2010 (Toivonene & Frederieci, 2015). These HUB's tapped into the worldwide excitement regarding grassroots entrepreneurship and technological and social innovation (Jimanez & Zheng, 2017), as well as the increased availability, speed, and availability of the internet along with the sense of possibility that the digital world has provided (Hopkins, 2016). With Nigeria and South Africa both with over 100 Hubs operating in the innovation and tech space followed by Kenya and Ghana, which are approaching 50 Hubs, it is evident that the spirit of entrepreneurism and innovation is vibrant, particularly among young, globally-minded, cosmopolitan Africans. Significant funding, particularly for tech-focused initiatives, has provided financial support and transparent partnerships with like-minded foreign organizations, which has contributed to the success shown by many of these hubs.

Entrepreneurship Evolution in Mozambican Recent History

Within two years of gaining its independence from Portugal in 1975, following 475 years of colonization, Mozambique descended into a 15-year civil war responsible for taking the lives of a million Mozambicans and saw upwards of 5 million people displaced. Under the post-colonial governance of a socialist single-party regime, Mozambique spent the better part of 3 decades as one of the poorest countries in the world. In 1994 Mozambique had its first democratic elections and soon after began its shift from a socialist government to one adhering to free-market principles. Consequently, it is only towards the final years of the ’90s that Mozambique took its first steps as a peaceful nation and fledgling free market system looking to participate in the globalized economy. To this day, arguably, the most significant challenge faced by Mozambican society is how to break the cycle of poverty, continuously made more complex by rapid population growth. With a steadily growing population of 32 million and a medium age of 17, employment and economic growth are fundamental determinants of the future of this Sub-Saharan African nation.

With this history in mind, it is understandable that Mozambique is lagging in private sector development. At present, the Mozambican economy is dominated by a few large firms, a massive informal business sector, and a minimal SME sector. Due to the lack of meaningful economic growth amidst a weak SME sector, both governmental and non-governmental organizations are constantly implementing initiatives to stimulate and assist the drivers of the SME sector, entrepreneurs. Countless efforts by both governmental and non-governmental actors aimed at facilitating and building the capacity and skills of Mozambican entrepreneurs have been implemented over the years, all yielding mixed results. Such initiatives as low-interest credit lines, grants, mentorship, and training are all theoretically available to the Mozambican entrepreneur. How inclusive these initiatives are for all population groups and the real, measurable impact resulting from such efforts is a topic of much debate.

EMERGENCE, DEVELOPMENT, AND EXPANSION OF THE UNISAVE ENTREPRENEURSHIP HUB

Incipient Stage

In 2014, one of the authors of this paper, Shaun Bissett, began to integrate concepts of entrepreneurship into the English Communication Techniques class he taught at the Universidade Save in Maxixe, Mozambique. This class was taught to a group of students majoring in English Language Teaching. Shaun, who, besides teaching is also the founder of three businesses, believed that with the right encouragement, many of his students could also

go on to become successful entrepreneurs. With the wealth of both written and audio-visual material regarding entrepreneurship at their disposal, the students enjoyed the dual learning experience of English language learning while simultaneously exploring the basic principles of entrepreneurship. During this experience, Shaun began to notice an excitement towards learning in his students that he had never seen before, which would eventually lead to Shaun's recognition of both the need and potential of entrepreneurship education for university students in Maxixe.

A serial entrepreneur, one of Shaun's businesses is a private primary school whose model is based on the concept of high-quality bilingual education at a price that the working class can afford. At present, the school has almost 350 students in grades 1-6. Seeing the opportunity to incorporate Entrepreneurial mindset teaching into the curriculum, Shaun began to create teaching modules that would aim to sow the seeds of the entrepreneurial mindset with the children. Within the context of a Mozambican educational system that is based on a traditional approach of rote learning with very little regard to the development of soft skills such as self-efficacy, perseverance, and teamwork, the entrepreneurial mindset training allowed the students to explore a part of themselves that was always ignored within the school context. For Shaun personally, this experience continued to solidify the impact that entrepreneurship education could have amongst Mozambican students.

Developmental Stage

While pleased with what he had accomplished regarding entrepreneurship teaching, Shaun knew that finding like-minded collaborators would be critical if he wished to bring entrepreneurship education to a larger audience. Shortly after Shaun began his search for such a partnership, he came across the YEEES project, a German DAAD-funded university project looking to create a network of German and African universities to promote sustainable entrepreneurship and develop solutions to urban challenges through innovation. YEEES (Yields of Evocative Entrepreneurial Approaches on Environment and Society) created a network of Entrepreneurial minded scholars and students from The University of Vechta in Germany, Nelson Mandela University in South Africa, The University of Namibia, and The Universidade Pedagogica in Mozambique (now known as the Universidade Save). Inspired by the opportunity to engage like-minded entrepreneurs from international universities, Shaun immediately took a proactive approach to the collaborative efforts of the Yeees project, which soon earned him the position of Coordinator of the Africa Entrepreneurship Training Center. This role allowed him to delve into the field of Entrepreneurship education in the African context further.

Participation in the YEEES project further solidified Shaun's belief that Entrepreneurship teaching had the potential to become a tremendously impactful endeavor in Maxixe. The arrival of the YEEES project in Maxixe was exciting for all those involved, as the university community had never previously been exposed to a project centered on entrepreneurship. Engaging with an international group of international students and faculty on entrepreneurial initiatives rooted in innovation and sustainability was an incredibly motivating and transformational experience for all the participating Mozambican students. Students who participated in the YEEES project would later describe their experience as a feeling of becoming "unleashed", where they now possessed a "sky's the limit" mentality where they too could go on and be creators of change. During the four years of the YEEES project, there were two Entrepreneurship training initiatives, the Entrepreneurship Camp and the STEP Program, which would serve as tremendously influential to the creation of the Entrepreneurship HUB.

Entrepreneurship Camps: Based on the concept of the SCHUB Camp held at Leuphana University in Germany, the Yeees project offered students of its partner universities the opportunity to participate in an Entrepreneurship Camp during each of its four years of the project duration. The first camp was held in Germany in 2017, followed by Mozambique in 2018, South Africa in 2019, and Namibia in 2020. Six students from each partner university would participate in the 3-week camp. Students' applications to the camp were based on their past entrepreneurial experience and their commitment to seeking innovative approaches to achieve sustainable change in their fields. The Camp structure was based on the following model. An opening event where the participants would meet relevant local actors involved in sustainable entrepreneurship. A period dedicated to students developing their ideas together with local experts and with the Yeees training team. A testing and implementation phase to see the viability of the idea in the local context. A final event where they would present their ideas to local stakeholders and potential partnering entrepreneurs.

The Maxixe Camp experience was highly memorable for both the camp participants as well as the local community. As a small southern Mozambican city, Maxixe has a very small international community, and the novelty of having international students created an exciting environment for everyone involved. The Camp participants divided themselves into three groups: one group created an entrepreneurial mindset program for primary school-age children; one group created an easy to use accounting and bookkeeping scheme for the informal vegetable sellers; one group created a recycling and reuse program for those that make a living in trash related activity.

Student Training for Entrepreneurial Promotion (STEP): The STEP program is an innovative approach to Entrepreneurial training which was uniquely designed for university students who are enrolled in non-business-related courses (Frese et al., 2016). The STEP training program employs theory and scientific evidence as the basis for its learning program and the fundamental belief that "action" is the real driver of entrepreneurship and that action principles must be an essential component of the training (Melyoki, Gielnik & Lex 2018). Based on the belief that effective Entrepreneurial training is based on both the development of soft skills such as persistence, networking, and creativity as well competency in hard skills such as business planning, accounting, managerial skills (United Nations, 2014), the STEP program includes both skill areas in its action-based training program. Beyond the classroom learning, simultaneously, students establish micro-business activities where they confront the entrepreneurial experience in a real-life simulation (Melyoki, Gielnik & Lex 2018). Through this "wise" and short term (Frese et al., 2016) training package of action and theory (Melyoki, Gielnik & Lex 2018) STEP aims to contribute to the development of entrepreneurial mindsets with the initial basis of the soft and hard skills necessary to start a firm (Frese et al., 2016).

Two German Step Trainers arrived in Mozambique in mid-2019 as Maxixe had been chosen as the Mozambican university to host the STEP program. The STEP trainers began by conducting a 4-day intensive Train the Trainer course. 13 University professors, looking to capacitate themselves as Entrepreneurial trainers, participated and successfully graduated from the Train the Trainer course. After completing the course, the trainers then went on to provide an entrepreneurial training course to 80 non-business major students. The training course lasted two months, each trainer taking on the responsibility of teaching one module of their choice (i.e., bookkeeping, marketing etc.). During the months of the training course, the students formed startup groups, were given 100$ startup capital, and asked to start-up micro-business where they would implement the skills being learned simultaneously in the course. Upon receiving the money, students were told that it must be returned following the completion of the course, while the profits may be kept. Through this coming together of classroom learning and action-based "real life" experience, students were exposed to an intensive entrepreneurial learning experience that would inspire and prepare them for future entrepreneurial endeavors.

Towards the Expansion Phase. The Introduction of the Entrepreneurship HUB

Inspired by the positive outcomes of the YEEES project and buoyed by its continuing collaboration with the contacts made during its realization, the University Save Entrepreneurship HUB is currently in the incipient stage of its creation. The initial interest

created with the announcement of the nascent Entrepreneurship HUB project, an initiative dedicated to collaborating with aspiring and early to advanced-stage entrepreneurs, was far more than anyone could have been expected. Following the initial university flyer posting soliciting student volunteers to create the HUB, the Hub was flooded with 340 student applications, about ten times more than their initial forecast. Such overwhelming interest shown by the university community demonstrates the high level of interest in entrepreneurship that had been engendered during the YEEES project and its effect on the university community.

Committed to embracing the best practices developed by other university-based entrepreneurial initiatives, both Mozambican and international, and considering the vast wealth of information that can be found in the area of entrepreneurship education, research and outreach, the Unisave HUB finds itself in a privileged position from which to begin. Two essential factors, both common to underdeveloped societies, lead the HUB founders to believe that "the university" is the most qualified candidate to house an effective and productive Entrepreneurial HUB in the context of Maxixe. The first is based on the high concentration of Human Capital potential present at the university compared to that found outside the university. With less than half the population having finished primary school and a 47% literacy rate, the university presents itself as having an incomparable wealth of human capital in relation to its surroundings. Perhaps because of the sentiment of exclusivity brought on by this contrast, Unisave suffers from the "Ivory Tower " syndrome and therefore has an extremely limited approach to outreach-type activities and thus creates little impact in its region. The second is the university's unique position as the catalyst of a regional Entrepreneurial Ecosystem. Considering the environment created by the convergence of Human Capital present, accommodating university infrastructures, reverence, and good standing of the university at a societal level, we see the university as the most well-equipped candidate to house an entrepreneurship Hub.

While the Unisave Entrepreneurship HUB's physical location is the university, it is extremely outward-looking as it recognizes its potential to inspire economic growth in the larger Maxixe region. On top of this, as the self-proclaimed catalyst of a larger entrepreneurial ecosystem in the region, the HUB's ability to work with both internal (university) and external actors will be essential to its success. Therefore, it is necessary to identify these actors and analyze their roles within the HUB.

Internal (university) Actors

- **University Board:** positive relations and the full backing of the university board are essential to the Hub's success. It is essential that the HUB prioritizes clear communication with the board regarding the benefits and impact upon the university community due to the HUB's initiatives. The HUB aims to inspire the creation of an entrepreneurial culture at the university, and the board's enthusiasm in such an ambitious effort is essential.
- **Professors:** academic and university personnel will be encouraged to implement entrepreneurial modules into their teaching. Curriculum development workshops and training sessions for professors will be held to this effect. Like the board, encouraging the professors to embrace the entrepreneurial culture that the HUB intends to promote is the challenge and goal of the HUB. University professors are a key element of the "Human Capital" element that the Hub hopes to be able to effectively leverage, and therefore the recruitment and the involvement of the professors in the HUB is crucial.
- **Students:** university students will serve as the motor of the HUB. Training sessions, workshops, incubation, accelerator programs, and research opportunities will be available to them through the HUB's programs. Students who wish to take on more active roles in the HUB's activities will have opportunities to work directly with external actors in the wide-ranging HUB initiatives.

External Actors

- **Local Government:** arguably, no one is more invested in the favorable outcomes of the entrepreneurship HUB than local government. As one of the outcomes of the HUB's initiatives is regional economic growth, the government will certainly be hopeful that the entrepreneurial HUB can positively impact the local entrepreneurial environment. Through the synergy created by the affinity between the objectives and goals of the HUB and local government, the HUB is counting on local government partnership.
- **Regional Business Associations:** regional business associations such as the Chamber of Commerce and Confederation of Trade Associations are critical partners to the Entrepreneurial Hub. Committed to entrepreneurship, these associations will have a vested interest in the outcomes of the HUB, which will inspire collaboration through mutually beneficial joint projects.

- **NGO's:** national non-governmental organizations and non-profit institutions with projects committed to the economic growth and stability in Mozambique will be interested in the work of the HUB. As the HUB is committed to research in entrepreneurship and other issues affecting the local economy, these results will also prove relevant for NGO's. Initiatives such as entrepreneurship training in the community and accelerator and incubation programs will also be of interest to NGO's invested in the economic growth of the greater Maxixe region.
- **International Partners:** the HUB continues to count on international cooperation in its efforts. Partnerships forged during the period of collaboration with YEEES have secured a strong foundation of partners both on the African Continent and abroad. Continuing with these partnerships and their opportunities will be critical towards the HUB's success.
- **Local Entrepreneurs:** the HUB aims to be a resource for all local entrepreneurs, including those aspiring to enter the world of entrepreneurship. Numerous initiatives such as training courses and workshops, incubation, and acceleration courses will all be designed with the local entrepreneur in mind.

The Unisave Entrepreneurship HUB Physical Space/ Activities

- **Physical Infrastructure:** the HUB will have its own co-working space located at the main campus of the Unisave campus. The space is quite ample (a former classroom) and, at capacity, could seat comfortably up to 40 people. The layout will be "open space" as several workstations facilitate the possibility of having multiple groups simultaneously working. For larger meetings, tables can be brought together. Motivational visuals on the walls will characterize the space as one belonging to entrepreneurs. The space will aim to create an environment that is comfortable, friendly, and conducive to focused result-driven work. The space is only steps away from the university copy center, where all printing may occur. It is also near the university café. Free University WIFI is available at the HUB to all visitors.
- **Activities:** the hub activities will be rolled out in phases to ensure excellence as well as ensure that the proper review process can be completed regarding one activity before starting with another. The HUB wants to be seen as an exciting, cutting edge, and innovative entity within the university context and will constantly be rolling out new entrepreneurial-based activities for both the university community and the Maxixe community at large. HUB activities will be divided up into activities that

are a) Curricular: initiatives that are meant to complement or add to existing university curriculum b) Extracurricular those that will be available to students outside of their regular classes and c) Community Outreach: activities that are offered to the non-university community.

- **Curricular:** one of the HUB aims is to create university-wide excitement regarding entrepreneurship and ultimately work towards a cultural shift in making all of those connected to the university more "entrepreneurial". One of the ways the HUB intends to accomplish this is by encouraging university professors to include concepts and principles of entrepreneurship in their teaching. Through a series of curriculum design workshops for professors and administrators, the HUB will orient nonbusiness subject professors on techniques that will facilitate the integration of entrepreneurial concepts with the class' traditional curricular content. Another strategy to integrate entrepreneurship in non-business university classes is to include a separate entrepreneurship module, taught separately from the normal course content, where entrepreneurial principles are connected to the course content.

The challenge of convincing professors of the importance of integrating entrepreneurial concepts into their teaching, particularly in non-business subjects, will certainly be a challenge. The university board will be crucial at this junction as their commitment to making the university more entrepreneurial will go a long way toward influencing professors. It is upon the HUB to create an environment where professors will recognize the benefits of integrating entrepreneurial concepts into their teaching. Through a university-wide campaign titled "Para uma universidade mais empreendedora" (Towards an Entrepreneurial University), the HUB hopes to inspire the creation of an all-encompassing entrepreneurial environment at the university where entrepreneurship is welcome in everything the university does both in and outside of the classroom.

- **Non-Curricular:** these activities will play a significant part in the HUB's output. Such activities can be divided into two categories: activities promoting entrepreneurship such as entrepreneurial training workshops, incubation, acceleration, and idea creation sessions and the second category is geared to research and scientific production. Activities such as those indicated in category one will both contribute to the entrepreneurial environment of the university as well as offer opportunities to students who wish to engage with entrepreneurism. The HUB is

committed to having a full lineup of activities where students will constantly have opportunities to sharpen their entrepreneurial skills, further develop their ideas and take steps towards opening their own businesses.

Research and scientific production are also fundamental outputs of the HUB. Research areas of the HUB include the local entrepreneurial environment (i.e., access to capital, ease of doing business), outcomes of entrepreneurial curricular work at the university (i.e., mindset shift, action-based approach) as well as general research into local business and economy (market opportunities, economic growth). As part of an international network of entrepreneurial researchers, the HUB aims to contribute relevant, insightful research to the larger field of Entrepreneurship in Sub-Saharan Africa. The HUB intends to establish itself as a knowledge center of regional economic issues that can contribute to both the discourse regarding economic issues and entrepreneurship at a local level and become a voice on the topic of African entrepreneurship at the university level.

Community Outreach

The HUB is committed to establishing itself as the catalyst for creating a larger, regional Entrepreneurial Ecosystem. Due to factors such as the preponderance of Human Capital at its disposable, the physical infrastructure at the university lending itself to events of all size and the "political freedom" the university holds in its ability to engage all groups and sections of society, we believe that the university is in a unique position to play the role of the catalyst of this regional ecosystem. The HUB will aim to connect all the internal and external actors through various initiatives to improve the regional entrepreneurial environment. Some of the possible activities to be implemented by the HUB to foster the entrepreneurial ecosystem are:

- Organized meeting bringing together the public and private sector
- Guest lecturers by business-minded experts
- Networking events aimed at inspiring future collaborations
- Trimestral newsletter highlighting the collaborative efforts of various stakeholders
- Coordinating joint initiatives amongst the actors

The HUB will also focus considerably on working with local entrepreneurs, engaging them through training sessions and other related activities. The HUB aims to serve as a resource for aspiring, initial stage, and even experienced entrepreneurs. Through accelerations and incubation-type events, the HUB will generate excitement in the entrepreneurial community

and provide much-needed assistance to those projects with the potential to succeed. Through training sessions, workshops and courses, the HUB will provide a foundation for future and acting entrepreneurs who dream of pursuing an idea but perhaps lack the basic skills needed to succeed. Through a collaborative effort of university/community the HUB aims to serve as a catalyst for the local entrepreneurs to create a productive and supportive community.

DISCUSSION: UNIVERSITY AS ENABLER OF HUMAN CAPITAL FOR ENTREPRENEURIAL ENDEAVORS AND CATALYST FOR THE DEVELOPMENT OF ENTREPRENEURIAL ECOSYSTEMS IN SUB-SAHARAN AFRICA

Throughout our previous sections, we have followed a line of argument that is based on two essential maxims: first, the fundamental role that universities play in establishing the basis for the development of entrepreneurial ecosystem. More specifically, in Sub-Saharan Africa, where there is little to non-interaction among the actors and insufficient planned mechanism in place that would drive the ecosystem, the enabling factor of human capital through all stages of evolution of the entrepreneurial ecosystem. But more importantly, at the embryonic phase, the empowering feedback loop between the university and the human factor becomes the seeding mechanism of a nascent entrepreneurial ecosystem in regions where structures are not in place, such as in the case of Universidade Save in Maxixe, Mozambique. Moreover, we have shown in our case study that, in practice, the nascent entrepreneurship hub indeed provides a starting point to empower and support actual and potential entrepreneurs and their employees while at the same time serving as director and orchestrator of a broader university-based entrepreneurial ecosystem encompassing various actors and domains.

Entrepreneurship involves human agency, which in turn is provided by the human capital factor. Individuals or groups of individuals start businesses; they are not formed by market characteristics, opportunities, legal frameworks, macroeconomic conditions, or local geographic attributes. Even though these factors are influential, the entrepreneurial activity will only be started because people are motivated and prepared to act; and more importantly, trained and educated to develop, initiate and implement a new enterprise (Beugré, 2016)

We can deduct from our literature review that the concept of human capital strongly relates to the skills, level of education, trained abilities, and knowledge of an individual (Fairlie and Robb, 2009). Also, practical experiences, exposure to networks, and embeddedness in a productive environment are essential factors that influence and enhance human capital and entrepreneurial disposition. Consequently, an important number of entrepreneurship

researchers have been interested in the relationship between human capital and entrepreneurial behavior and success (Marimuthu et al., 2009). For instance, Ployhart and Moliterno (2011) have shown that the level of education, previous business endeavors, training, skill development, and exposure are key factors that enable and contribute to entrepreneurial activity and success. On the other hand, some studies argue in favor of the thesis that entrepreneurs are not made but born, such as Adom and Williams (2012). They say that innate ability and individual traits are most crucial to entrepreneurial behavior and that they are the "differentiators" which separate successful from unsuccessful entrepreneurs. Nonetheless, we base our view on several studies that contend that formal education and training (besides environmental and contingency elements) are crucial factors determining entrepreneurial endeavors' success or failure (Wanigasekara et al. 2010).

Even though most entrepreneurs in Mozambique and Sub-Saharan Africa engage in necessity-based entrepreneurship, recent efforts indicate that young people in Sub-Saharan Africa are likely to embrace entrepreneurship as a viable career option. Recently, there has been an increase in entrepreneurial education offered at universities and workshops, fellowships, and seminars organized that focus on youth entrepreneurship (Beugré, 2016). In this regard, our study presents empirical evidence supporting the role of university-based entrepreneurship education in enabling human capital for entrepreneurial activity. At the same time, it facilitates the emergence and guiding the development of entrepreneurial ecosystems in an undeveloped region where there is no existing formal support for potential entrepreneurs and entrepreneurial activities, such as in the case of Maxixe in Mozambique.

It is only through innovation and entrepreneurship that underdeveloped cities and regions in Sub-Saharan Africa can develop their human capital and leverage their vast natural resources to become more sustainable and resilient (Beugré, 2016). In this article, we have argued for the fundamental role universities play in enabling the development of entrepreneurial ecosystems in Sub-Saharan Africa. This is essentially achieved by nurturing the human capital available that will engage in entrepreneurial activity and by serving from conception until fruition as lead orchestrator and main hub during the evolution of the ecosystem. We acknowledge that although each ecosystem depends on the environment in which it is embedded, the conceptual framework we develop and its empirical implementation in our case study provides general guidelines and serve as heuristic tools that could pave the way for each country and region in Sub-Saharan Africa to implement its own university-based entrepreneurial ecosystem.

CONCLUSION

This research paper provides a unique perspective of university-based entrepreneurial ecosystems in the Sub-Saharan African context based on a dynamic model of the process leading up to the emergence of the entrepreneurial ecosystem, from a local incipient stage to an expanded mature stage. The actual implementation of this conceptual framework during the creation of the Entrepreneurial HUB in Maxixe has allowed us to inform our research and refine our understanding, allowing us to provide the readers of this article with a novel conceptualization of the primordial role of universities as enablers of human capital for entrepreneurship.

In our previous sections, we have researched relevant literature on university-based entrepreneurial ecosystems, human capital, and the intricate relation between these subjects to construct and propose a conceptual framework that would serve as a blueprint for implementing an entrepreneurship HUB in a university in Maxixe, Mozambique. Along these lines, we have described in our case study how a nascent entrepreneurial HUB has enabled the development of human capital in the city, which in turn has catalyzed a nascent entrepreneurial ecosystem in the region. We have described how this ecosystem has passed through the first two stages of our dynamic framework. Thereby, laying the implementation plans for a transition into a mature stage of the ecosystem in which Shaun and his collaborators are already working. In follow-up research articles, we are confident that a developed entrepreneurial ecosystem will be fully operational, contributing to establish Maxixe as a more resilient city with sustainable long-term competitive advantage derived from vibrant entrepreneurial endeavors and innovation.

More than just another research article, the inspiration for the writing of this article was to serve both as a reflection of how the Unisave Hub came to be and as a blueprint of where it intends to go moving forward. The article serves as both a conceptual foundation to the existence of the Unisave Hub and a practical guide for its future development. Through the discussions and conclusions found in this article, the HUB will characterize itself as it strives towards meeting its lofty ambitions. Similar to the HUB itself, this article brings together the theoretical and the practical, believing that optimal practical action is rooted in theoretical analysis and that theoretical research is most valuable when used to solve a practical need. Through this praxis-theory union, the HUB defines and employs itself as a guiding principle in everything that it does.

We conclude by acknowledging the necessity for more widespread support to this type of initiative in Sub-Saharan Africa from other actors such as governments, private businesses,

consortia, NGOs, and other relevant stakeholders at the local, regional and national levels. We also call upon researchers and academics to double-up the increasing interest in the region and capitalize on the embryonic stage's learning potential in which entrepreneurial ecosystems' development finds itself. As Nelson Mandela once said: “Vision without action is just a dream, action without vision just passes the time, and vision with action can change the world.” Our vision is a vibrant range of entrepreneurial ecosystems spread all throughout Sub-Saharan Africa, each contributing to the development of untapped human capital potential within its own region, driven by the action of entrepreneurial actors embedded in an ecosystem that paves the way to more resilient cities and sustainable regions across the continent.

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INSTITUTIONAL CHANGE IN HIGHER EDUCATION IN GERMANY AND THE EMERGENCE OF THE ENTREPRENEURIAL UNIVERSITY

The Case of Leuphana University of Lüneburg, Germany

Abstract: Within the last 60 years, the German system of higher education has transformed gradually from professional dominance inspired by the Humboldtian model of a rule-governed community of scholars based on values of free inquiry, academic autonomy, and self-regulation into a new regime of managed education. On the macro level, we contribute to the very little research, synthesizing existing findings into a broader, longitudinal analysis of the institutional changes that have unfolded during the postwar period. We develop a better understanding of the societal and managerial issues of the transition and change by employing a theoretical framework of organizational institutionalism by identifying three eras of educational systems in post-war Germany: the era of professional dominance, the era of federal involvement and democratization, and the era of managed education associated with the rise of the entrepreneurial university. We expound on the characterizing institutional logics, actors and governance systems, and the mechanisms or events that triggered change for each era. On the micro level, very little empirical research has been conducted on the specific institutional conditions, change processes, and practices of entrepreneurial universities in the German context. By illustrating a unique case of one of the most radical transformations of a university in the German postwar period, we contribute to the research gap of how a more traditional public university is turned into an entrepreneurial one as a strategic response to institutional change.

Keywords: Entrepreneurial University, Higher Education System, Institutional Change in Germany, Managed Education, Leuphana University Lüneburg

INTRODUCTION

"The secret of change is to focus all of your energy, not on fighting the old, but building on the new."
Socrates (470-399 BC)

Institutional changes in the German system of higher education are remarkable. Within the last sixty years, the system of professional dominance inspired by the Humboldtian model of a rule-governed community of scholars (Olsen, 2007; Scott, 2006) based on values of free inquiry, academic autonomy, and self-regulation has gradually transformed to a new regime of managed education (Münch, 2011). The reasons for this shift are manifold. With the rise of mass education in the late 1960s and 1970s coupled with more fundamental reforms in university governance, the Humboldtian model was already in decline. With mass education, the Humboldtian model of a co-production of teaching and research was increasingly challenging to sustain for the vastly underfunded public universities (Burtscheidt, 2010).

The typical public universities in Germany encountered a demand-response imbalance (Clark, 1998). With the limited resources, outstanding research, and high standards in teaching became challenging to realize and created the seeds for the emergence of a new institutional logic of managed education. The hallmarks of managed education are threefold (Münch, 2011). First, based on a market ideology, the education system has been reformed in the name of competition, excellence, and efficiency. Universities have been given greater degrees of autonomy, and the emerging discourse presents the university as a service enterprise embedded in competitive educational markets. The result of this competition for excellence, especially in research, is a stratification of elite and nonelite or central and peripheral educational institutions that differ in both their scale and reputation (Münch, 2007). While the education systems in the UK and the US have always been highly stratified, this development is relatively new for the German educational field, which traditionally rather equalized than fostered differences (Münch, 2011). Second, the new market discourse is coupled with the rise of an audit society (Power, 1997), in which organizational life is subject to practices of quantification and evaluation. These practices for the assessment of research and teaching activities became institutionalized. Third, the rise of new public management (NPM) established a new remote-controlled approach for managing educational institutions whose funding becomes depending on how the university "is assessed on the basis of its effectiveness and efficiency in achieving political purposes" (Olsen, 2007). Managed education has strong implications for the role of

the state, which plays an active role in orchestrating competition between educational institutions in the name of academic excellence and efficiency (Münch, 2007, 2011).

These trends are manifested in the new institutional logic of the educational field, which is sometimes referred to as the commercialization of higher education (Bok, 2003), academic capitalism (Slaughter & Leslie, 1997; Slaughter & Rhoades, 2004), or the triple helix that interlinks higher education, the state, and the market (Etzkowski, Webster, & Healey, 1998). Managed education unfolds strong isomorphic pressures, which forces universities to comply with these shared rules and norms of the higher education field (DiMaggio & Powell, 1983a; Meyer & Rowan, 1977). Instead of being passive adopters or victims of this new educational regime, scholars have suggested an entrepreneurial response as represented by Clark's (1998) Entrepreneurial University or, more recently, by Wissema's (2009) Third Generation University. The entrepreneurial response frames the university as an opportunity-seeking and exploiting institution (Shane & Venkataraman, 2000).

The existing literature on the German higher education system shows at least two main deficits. First, while dealing with a number of detailed developments on the macro-level such as the emergence of New Public Management (Lange, 2008; Lanzendorf & Pasternack, 2009; Löffler, 2003; Meier, 2009; Meier & Schimank, 2009; Nickel, 2007; Schmoch & Schubert, 2010), the new Excellence Initiatives by the federal government (Bloch, Keller, Lottmann, & Würmann, 2008; Hartmann, 2006; Kehm & Pasternack, 2008; Münch, 2006; Münch, 2007), or the impact of Bologna reforms on German universities (Hanft & Müskens, 2005; Nickel, 2007), very little research exists that synthesizes these existing findings into a broader, longitudinal analysis of the institutional changes that have unfolded during the postwar period. We argue that understanding these changes in institutional logics, actors, and governance is crucial for explaining the nature of the unique setting of the German higher education system, which created a path-dependency with distinctive institutional pressures. Second, on the micro-level, managed education is associated with the rise of the entrepreneurial university. In the context of the German higher education system, the entrepreneurial university concept has been mainly subject to critical analysis (Münch, 2011; Weingart, 2010). However, very little empirical research has been conducted on the specific institutional conditions, change processes, and practices of entrepreneurial universities in the German context (for the Technical University of Munich see Berger, 2008). Especially the question of how a more traditional public university is turned into an entrepreneurial one has not yet been investigated empircially.

The purpose of this research and our contribution is to better understand the societal and managerial issues associated with the transition and change on the macro-level from an era of professional dominance to managed education and on the micro-level from the Humboldtian towards the entrepreneurial university.

The paper is built as follows: first, we outline our theoretical orientation based on organizational institutionalism. The framework structures our analysis according to institutional logics, institutional actors, and governance systems. In the next section, we analyze and identify three eras of institutional change in the German higher education system; we refer to the era of professional dominance, federal involvement and Democratization, and more recently, managed education. In the third section, we illustrate a unique case of one of the most radical transformations of a university in the German postwar period. The Leuphana University of Lüneburg transformed itself from a troubled, highly underfunded public university to a new educational institution that shows many features of an entrepreneurial university. We conclude the paper by summarizing our main findings and outlining directions for future research.

THEORETICAL ORIENTATION

Organizational Field of Higher Education: An Institutionalist Approach

Institutionalist approaches have increasingly been applied to analyze the educational field and have demonstrated their usefulness in understanding restructuring patterns reflecting diverse institutional pressures (Meyer & Rowan, 2006; Schwarz & Teichler, 2000). Since its foundations (DiMaggio & Powell, 1983a; Meyer & Rowan, 1977; Zucker, 1977), modern institutionalism has become a dominant approach to understanding organizations (Greenwood, Oliver, Sahlin, & Suddaby, 2008). A major theme in institutional theory is that their institutional environment influences organizations. Following DiMaggio and Powell (1991: 2), institutional theory is concerned with understanding "how social choices are shaped, mediated, and channeled by institutional arrangements". Institutionalists conceptualize the relevant social environment in which organizations compete, and the appropriateness of organizational actions is evaluated as *organizational fields* (e.g., DiMaggio & Powell, 1983a; Scott, 1991; Scott & Meyer, 1983). Fields represent a mid-level social sphere that connects concrete organizational action with broader normative and social structures.

In order to explain the institutional change from the era of professional dominance to managed education and the transition from the Humboldtian to an entrepreneurial university,

we build on earlier work by Scott et al. (2000) and adopt their framework to the organizational field of higher education. It is composed of three main components that are of particular importance for understanding institutional change: (1) institutional actors, (2) institutional logics, and (3) governance systems.

Institutional Logics

The behavior of institutional actors like universities or the state is shaped by an institutional logic. By this, we mean "the belief systems and associated practices that predominate in an organizational field" (Scott et al., 2000: 170). Institutional logics influence individual and organizational behavior by various mechanisms such as socialization and identity formation, social classification and categorization, or struggles for status and power (Thornton & Ocasio, 2008).

In the literature on professions, it has been widely suggested that more fundamental changes in institutional logics have taken place. A shift from the traditional professional values of a "social trustee" to more business-oriented, "commercial" values has been observed along with an organizational change in professional organizations to more "corporate" forms of governance (e.g., Cooper, Hinings, Greenwood, & Brown, 1996; Suddaby, Gendronb, & Lamc, 2009). A changing definition of professionalism accompanied this. Commercial professional values are based on the notion of expertise rather than public service (Brint, 1994a; Greenwood, 2007).

These changes in institutional logics are also reflected in the higher education field. Gumport (2000) argues that the idea of higher education as a social institution has gradually been replaced with the image of higher education as an industry. While the former logic sees the purpose of higher education in educating and socializing society and advancing knowledge through free inquiry, the latter logic perceives the education field from a market logic. Universities become opportunity-seeking service providers that compete for students, funding, top faculty, and legitimacy in contested markets, and students become consumers who seek for the best human capital investments (Münch, 2011). As Thornton and Ocasio (2008) stress, institutional logics can coexist and become either drivers of change or inertia.

Institutional Actors

Academic knowledge constitutes the central "issue" (Hoffman, 1999) of the higher education field. Its creation, dissemination, and application connect institutional actors like universities as producers of academic knowledge with the state as the main architect of the educational system, professional associations, publishing firms, funding agencies, private

corporations, and the public and outlines a collective enterprise around which they can coalesce. Together, they form a "recognized area of institutional life" in the sense of DiMaggio and Powell's (1983b: 148) field concept. Whether individual or collective, institutional actors are involved in the creation and reproduction of specific institutional logics structuring the interactions of an organizational field (Scott et al., 2000).

Governance Systems

The third components are governance systems that are concerned with the formal and informal relationships between the organization (e.g., the university) and its constituents (e.g., academic and non-academic staff, the state, students), as well as the relationships between these constituent groups (see Fiss, 2008). In particular, an institutionalist perspective of governance draws attention to "how coalitions of actors constitute 'moral orders' that determine the power structure of" an organization (Greenwood et al., 2008: 25). While many different governance models have been proposed (for an overview, see Harlacher & Reihlen, 2010), we build on the earlier work of Olsen (2007) that offers a helpful typology of different governance regimes in the university setting. In brief, they are described as follow:

The collegial model: Collegial governance is founded on the idea of professional autonomy and self-governance. Professional autonomy for research and teaching is protected by law and supported by proper funding from the state. Instead of being a servant of political agendas, this ensures that "scientific research is driven mainly by curiosity and the desire for peer recognition, and … is controlled by truth tests" (Bunge, 1998b: 253). On the other hand, self-governance is accomplished through elected leaders and a meritocratic culture that favors academic scholarship.

The democratic model: Democratic governance is based on principles of political equality, competition for leadership, and effective participation in the struggle over power (Bunge, 2008; Dahl, 1998). While in the collegial model, self-regulation is restricted to an elite group – academic scholars only –, the democratic model includes all other interest groups in the democratic process like students, research, and administrative staff. Power and interests are more dispersed in the democratic model as all groups are represented on governing boards and councils. Decision-making is a political bargaining process with shifting coalitions and alliances.

The state model: In the state model, universities are viewed as instruments that reflect the day's political agenda with educational objectives and policies of current political leaders. Research and education are contributions to national wealth creation and become instrumental for

achieving national political ends. Contrary to the democratic model, leaders are not elected but appointed by the state as servants of state interests, and their work is supported by a tighter system of authority, bureaucratic rules, and performance targets. Decision-making power is delegated to the university's executive board, and funding depends on achieving specific performance targets (Olsen, 2007).

The market model: The market governance differs profoundly from the previous types. Governance of this model is founded on the attempt to maximize the entrepreneurialism of universities and their professional staff by creating incentives to capture the benefits of market opportunities, whether in research, teaching or for the commercialization of academic knowledge. Viewing education and science from a market perspective shifts the attention to a governance model as a trading place, in which universities compete for students and funds and researchers produce commodities to be "sold" on scientific markets (Bunge, 1998a). The market model is reflected internally by replacing principles of professional autonomy and self-governance with managerial control and a more hierarchical decision-making style. The managerial structure should match the continuous need for change in the search for market opportunities.

In practice, these ideal types (Weber, 1922) are mixed into different hybrid governance forms. Especially in the German case, in which higher education is a major political task of the state, governance, whether following a collegial, democratic, or market regime, has always been influenced by a degree of state intervention to achieve political objectives.

INSTITUTIONAL CHANGE OF THE GERMAN HIGHER EDUCATION SYSTEM

Institutional theory helps to identify and distinguish different institutional eras. The idea of an era is that the composition of actors, their interaction, and governance system is given coherence and orientation by an underlying institutional logic, which allows the production and reproduction of stable patterns of actions over time. We distinguish three eras of higher education systems in postwar Germany: professional dominance (1945-68); federal involvement and democratization (1968-1998); managed education (from 1998). Indeed, universities have a far more ancient history in Germany and historically grown ideals may still rule nowadays to some extent. Nevertheless, in 1945 the governmental and higher education system reconstituted itself and therefore provides an adequate starting point for our analysis. For the three eras, we will describe the manifestations of the three elements actors, logics, and

governance systems and explain the institutional change from one era to another by identifying the main events or drivers of change.

The Era of Professional Dominance

"Zero hour"

The German constitution organized the German Republic as a federation, and competences of culture and education were transferred to the states. The victorious allies connected the emergence of the Nazi regime to the authoritative education system and wanted to allow a re-education based on freedom and democracy by means of a decentralized higher education system (Burtscheidt, 2010). In principle, the system of the Weimar Republic era preceding the Nazi regime was restored, where power is centralized in the hands of the professors (Oehler & Bradatsch, 1998).

The avoidance of centralization, politization, and bureaucratization of higher education was achieved at the price of missing the opportunity to coordinate institutions across states and "two decades of non-reform" (Robinsohn & Kuhlmann, 1967). A minimum coordination of educational policies was conducted voluntarily through the Conference of Education Ministers (Kultusministerkonferenz) founded in 1949.

Institutional Logic(s)

Following institutional theory, we argue that each era has a distinct logic that organizes the interaction of institutional actors. The institutional logic of professional dominance is based on two general but important ideas associated with the concept of professionalism (Freidson, 1970, 2001). It is based on the belief that scientific work is so specialized that it is inaccessible to those lacking the required training and experience. In addition, it is built upon the belief that this work involves fresh judgment and discretion that cannot be standardized, rationalized, or commodified. Scientific expertise depends on a stock of academic knowledge, which accomplishes two basic functions (Abbott, 1988). First, the academic stock of knowledge is subject to a considerable amount of research activities. It was Wilhelm von Humboldt's basic idea "to appoint the best intellects available and to give them the freedom to carry on their research wherever it leads" (Scott, 2006 op. cit. Fallon, 1980:19). The logic of professional dominance is modeled around the Humboldtian principles of (a) the unity of research and teaching and (b) academic freedom involving *Lernfreiheit* (freedom to learn) and *Lehrfreiheit* (freedom to teach) (Scott, 2006). Finally, academic knowledge is a source of legitimacy of the scientist's claim of having esoteric knowledge (Veblen, 1918) that goes beyond the ordinary

and is, in a fundamental sense, the basis of scientific authority. In the service of free inquiry and scholarly based education, scientists should be autonomous; they should have full control over their work, and scientific ethics claims to be independent of any particular interest groups such as the state, private enterprises, or the general public (Freidson, 2001). As a consequence, the primary logic associated with professional dominance, corresponding to Brint's (1994b) idea of the professionals as "social trustees", is the quality of research and teaching as determined exclusively by scholarly rules and norms.

Important Institutional Actors

Universities were organized according to the Ordinaria system. Each full professor enjoyed great academic freedom and autonomy. He was in charge of a specific knowledge field, directed an "institute", and was supported by a number of academic and non-academic staff. Furthermore, the institute was directly funded by the ministry (Scott, 2006).

State ministries of education were the primary source of funding for science. Scientific associations were determining scholarly standards and norms in various research fields; journals and books have been the dominant outlets of scholarly work disseminated by academic publishers who perceived their work less as a business but rather as a profession (Thornton & Ocasio, 1999).

In order to coordinate higher education several actors emerged. Already in 1949 the Rectors' Conference (Westdeutsche Rektorenkonferenz) as a voluntary association of the universities was founded (Teichler & Bode, 1990). On the governmental level, in 1955 the Nuclear Ministry was founded and in 1962 transformed into the Science Ministry (since 1994 Ministry of Science and Education). In 1957 the Science Council (Wissenschaftsrat), with representatives from politics, science, and the public was founded as a regulative body in addition to the Conference of Education Ministers. The motive was to overcome decentralized planning failures and enable coordination between governmental bodies and the universities across different states (Burtscheidt, 2010; Scott, 2006; Teichler & Bode, 1990).

Governance System

Since 1945, academics demanded the highest possible independence in order to avoid political instrumentalization. The autonomy and freedom of science was codified in the new German constitution. Academics claimed a corporative autonomy through a legal form as a public body and financial independence by means of the senate drafting the budget (Haushaltsplan) as well as academic freedom in the sense of appointment power (Burtscheidt, 2010). To a great extent, the state embraced these demands and professors gained a degree of

power never reached before (Teichler & Bode, 1990). This was reflected in the governing structure, in which decision power was largely decentralized to the Ordinaria, who controlled their work through academic self-regulation following the collegial model. But the governance system remained a hybrid of autonomy and state control since higher education depended on public funding (Burtscheidt, 2010; Scott, 2006; Teichler & Bode, 1990).

Precursors of Change

In addition to the hybrid relationship between the state and the university, the contradiction of unbalanced power within the universities remained unsolved. By reconstituting the principle of the Ordinaria of the 19th century, the chance to restructure at the zero hour was missed (Burtscheidt, 2010). Therefore the emerging demands for the democratization of society in general and university structures in particular finally led to student revolts in the late 60s requesting equal access to higher education, the abolition of elites, and wide-ranging participation in academic matters (Teichler & Bode, 1990).

A second driver for change was the continuously increasing number of student enrollments due to economic prosperity. A growing middle class was sending students to universities and industry demanded highly skilled labor. Nevertheless, the rise of mass education was encountered with regional expansion and hiring in existing universities, but funding was not sufficient, leading to a decline in academic quality (Binswanger, 2010; Burtscheidt, 2010; Hödl & Zegelin, 1999; Münch, 2011; Teichler & Bode, 1990). It became more apparent that the existing logic of professional dominance with decentralization and academic self-organization could not deal with the increasing massification and serve the new demands for democratic reforms. A new institutional logic surfaced in which the federal government stepped in and took an active role as planner and regulator of the higher education at the cost of an emerging regime that coupled the university more tightly to the state's interests, initially worried by the victorious allies and academics. This increasing role of the state was coupled with wide-ranging reforms for the democratization of universities.

The Era of Federal Involvement and Democratization

Institutional Logics

In the precursors of change, we indicated two major forces of change, which correspond to two interacting logics characterizing the era of federal involvement and democratization.

The first underlying institutional logic of this era was marked by a massive expansion in higher education financed by the government, the equality and access to higher education

was stressed, and the state played an increased regulatory role (Teichler & Bode, 1990). This *logic of democratization* of higher education won over the incompatible logic of academic self-regulation and professorial collegiality, as non-professorial academic staff and students now took part in defining higher education quality.

The second logic is guided by making higher education for masses more effective by central coordination and planned development (Teichler & Bode, 1990) and can be labeled as the *institutional logic of central planning or bureaucratic control.* Professional self-regulation seemed to be incompatible with democracy as well as the massification and was therewith replaced by this new double-logic.

New Actors

The growing need in managing higher education of the masses in Germany was accompanied by a rapid proliferation of new federal and state agencies engaged in coordinating, planning, and controlling various aspects of the higher education system. As a consequence of mass education, financial problems of the states, and pressures of the 68 movement, the federal government gained influence on state legislation by establishing framework legislation power in higher education (Rahmengesetzgebungskompetenz) in 1969. Since then, coordination in higher education was anchored in the constitution, and the transfer of far-reaching responsibilities to the federal level was legalized. The peak of centralized federal involvement was reached with the Higher Education Framework Law (Hochschulrahmengesetz) from 1976. The idea was to homogenize the diversity in the German higher education system by regulating in detail the structure of university personnel and committees as well as academic domains (study programs, course contents, exams).

In addition, new agencies were created to deal with the rising number of students. For instance, already in the 1960s, the Rectors' Conference founded a central registrar (Zentrale Registrierstelle) for allocating study places to medical schools based on school leaving grades. In 1972 the registrar's successor agency (ZVS) was founded, which centrally distributed students mainly based on school, leaving grades to universities for several subject areas such as medicine, business administration, psychology, and law. With such a federal control agency, the supply of higher education programs was centrally coordinated with the demand of applicants. This marriage of federal control and mass education initiated the period of supply-oriented study programs (Müller-Böling, 2001).

Governance Structure

The governance system had an internal and an external dimension. Internally, democratization, as well as homogenization, was reflected by the following main structural changes (Teichler & Bode, 1990).

(a) The Ordinaria University was replaced by a new organizational type of the Committee or Group University (Gremien- oder Gruppenuniversität) (a judgment of the court in 1973 limited non-professorial voting power to the maximum of 49% (50%) in science (teaching)); (b) academic careers were shortened and autonomous research was facilitated for the academic staff that had not reached up to the professor rank; (c) duration of the rector was extended from 1-2 to 4-8 years; (d) without strengthening the position of the dean, some decision areas that addressed the interests of professors were transferred from the ministerial to the faculty level.

Besides the reorganization of the university's internal governance, the relationship to the state changed by more intensive financial and educational regulation and control. The reasoning behind this was to provide equal opportunities for university applicants and to cap costs. The newly created cost containment regimes of the early 1970s were supply-driven. This is well represented by the capacity regulation act (KapVO), which was a follow-up of a contract between the states and the federal government from 1972 (Seeliger, 2005). The idea of the capacity regulation regime was to balance conflicting interests between university applicants and the scarce availability of teaching capacity (Seeliger, 2005). As a consequence, the number of admissions into a study program under the capacity regulation regime was standardized based on the available teaching capacity. Universities were not allowed to set any admission restrictions or university-specific student selection criteria. Since they were required to exhaust their capacity, which "freezed" the number of incoming students, universities operated permanently at their limit and this weakened the position of state universities in an emerging higher education market with domestic private and foreign public and private competitors (Kluth, 2001). Furthermore, study programs/curricula (Müller-Böling, 2001), as well as budgeting, had been highly regulated and subject to a control philosophy (Nickel, Zdebel, & Westerheijden, 2009).

In this era, the state model of governance was strengthened by the state's new role and especially by the federal role in regulating and coordinating higher education. At the same time, the call for more democracy shifted internal university governance from a collegial to a democratic model.

Precursors of Change

In 1977 the state launched a policy of "Opening Universities" (Öffnung der Hochschulen) as a response to the predicted baby boomer generation. However, this policy aimed at ensuring equal chances for higher education without committing the financial resources needed for an expansion in educational infrastructure. As a result, universities had to overstretch their capacities, at least until the baby boomer generation would leave university (Teichler & Bode, 1990).

Furthermore, study duration in Germany was considered excessive, and graduates were perceived as too old compared to other EU countries. Probably unparalleled in any other country, an extension of regular study duration has tradition and has been regarded as academic freedom. In 1986, the average graduate was 28 years and studied more than seven years, while for most studies, the regular duration was four to five years, and dropout rates were about 15% (Teichler & Bode, 1990). Additionally, the average entry age rose considerably due to long schooling, military service, and increasing unemployment, which motivated graduates to accomplish an apprenticeship before enrolling in a university program (Teichler & Bode, 1990).

In this era, besides long duration of studies and massification, two dimensions of the problems became obvious: (a) the bureaucratic governance relation between state and university and (b) the "organized irresponsibility", as the rector of the Goethe University of Frankfurt once described the committee governance regime within universities (Herrmann & Steinberg, 2008). The often politicized internal governance accompanied with time and resource-consuming struggles in committees and the detailed regulation of academic and financial affairs by the state were accountable for the stagnation of universities being unable to improve the quality of research and teaching (Burtscheidt, 2010).

The first amendment of the Higher Education Framework Law in 1985 initiated the first reforms aiming at deregulation. Nevertheless, reforms in the 1980s remained precautious and far less drastically than in the decades before (Teichler & Bode, 1990).

In addition, initiatives were launched that concentrated on the improvement of research. Until the early 1980s, approximately only 20% of all research activities were directly funded by external sources such as governmental funding programs (Förderprogramme) and funding agencies. Universities were demanded to compete for external funding for their research activities and engage in entrepreneurial activities to improve quality, efficiency, and social and economic relevance of research (Teichler & Bode, 1990).

In 1983 the Federal Ministry of Education and Science labeled the emerging changes in higher education with the slogan "Differentiation and Competition". In the following years, an increasing consensus was formed that the competitiveness of educational institutions would be assessed based on rankings, reputation, and performance indicators of universities and their faculties (Teichler & Bode, 1990).

In the mid of the 1990s, an OECD-Study brought to light the deficits of the German higher education system, and the pressure for change rose. The OECD-Agenda was regarded as a primary driver for the new definition of the role of universities as promoters of innovations and economic growth; accordingly, universities were elevated to entrepreneurial actors in the worldwide competition for innovation (Münch, 2011).

These emerging trends made the contradictions of the era of federal involvement and democratization more obvious. Universities that were considered as the central actors in the global competition for innovation had very little strategic choices to improve their own competitiveness. Attracting highly talented students was confined by the state-controlled supply plans, making it difficult to develop a differentiated and attractive educational profile (for an overview of the discussion at the ending era of federal involvement, see Meyer & Müller-Böling, 1996). The situation was similar for attracting qualified academics contributing to a specific research and teaching profile; universities lacked the required financial autonomy to pay competitive and flexible salaries for highly skilled professors. In summary, demanding competition and differentiation as new policy measures of the higher education field was incompatible with the centralized state control model of the era of federal involvement and democratization. Expected benefits of competition can only be harvested if universities are given greater autonomy in matters of resource allocation, student selection, hiring policies, educational program development, and strategic positioning.

The Era of Managed Education

The Global Context of Managed Education

Globalization, shifting demographics, the changes in the production regime towards knowledge-intensive work, growing competition from the private higher education sector, and ongoing fiscal constraints have been drivers for the worldwide institutional change of higher education (Høstaker & Vabø, 2005; Sporn, 2001; Subotzky, 1999). Since Europe intends to become the "most competitive and dynamic knowledge-based economy" (European_Council, 2000), Germany's higher education system is considered to become more effective in producing

useful knowledge and skilled labor to support the necessary innovations on the level of the firm, region, and country (Warning, 2007). Additionally, more effective and efficient utilization of resources was requested to cut costs in higher education to meet fiscal constraints (Kluth, 2001). What we recognize is an emerging worldwide structure of higher education, which unfolds isomorphic forces. As an effect, academics, universities, and even countries are becoming more alike in the way they encourage, incentivize, and manage higher education.

The main properties of that global structure are, at the same time, the infusers of a different logic for managing education: (a) global competition in science follows increasingly an economic rationale, in which countries, universities, and researchers compete on a global education market for reputation and market share. Germany as a late-mover in this competitive game attempts to gain stronger visibility by scoring higher in global benchmarks and moving up in global rankings; (b) the Anglo-American model serves as an intellectual source for a market model of higher education by the German government and educational experts and derives its legitimacy from the successful positions of Anglo-American universities in global rankings, despite the articulated critique of how these rankings are constructed (Münch, 2011). In search for a more competitive educational regime, the market model unfolds strong legitimacy for the restructuring of higher education;

Institutional Logics

With the new initiatives from federal and state agencies as well as the emerging global competition in higher education showed that institutional actors "not only do things differently, but also increasingly do different things" (Scott et al., 2000: 349). With the rise of managed education emerged a new interpretive scheme based on three main pillars. First, the centralized planning approach to higher education invented in the 1970s was gradually replaced by a *market logic*. This move required new policy measures such as increasingly deregulating higher education, especially granting universities greater autonomy in selecting their own students, hiring their academic staff, and allocating their own financial resources for the development of a strategic profile in competitive educational markets. The role of students also changed gradually from socialized and cultivated learners to sovereign consumers in search for a human investment (Gumport, 2000; Ritzer, 2004). As Gumport (2000: 79) points out: "The conceptual shift elevates consumer interests as paramount considerations in the restructuring of academic programs and the reengineering of academic services."

The application of the market logic to research was facilitated by the emergence of research productivity indicators such as the social sciences citation index and various research

rankings (Adler & Harzing, 2009; Frey & Osterloh, 2010; Münch, 2007) that gradually formed the belief among academic bureaucrats and some educational experts that research output can be measured and reasonably quantified. This created the impression that even non-experts can access the quality and productivity of research by simply counting the number of publications weighted, for instance, by the quality of the journal. The market logic turns the highly uncertain venture of research into a commodity. As Bunge (1998b: 253) writes: from a market perspective, "scientists produce commodities namely problems, concepts, hypotheses, data, and methods - that can be imputed shadow prices; that they trade these commodities among themselves; that they sell them to universities, business firms, or governments; that every scientist attempts to maximize his utilities by producing the largest possible quantity of papers …; that scientific creativity is market-driven …".

Second, new *auditing practices* (Moldaschl, 2005; Power, 1997) became a prerequisite and a reinforcing mechanism of the new competitive regime of managed education. In order to organize higher education as a competition within quasi-markets (Bartlett & Le Grand, 1993; Binswanger, 2010), audits and evaluations serve as a substitute for purchase decisions in private goods markets (Meier & Schimank, 2009). Audits and evaluations, whether teaching or research, establish feedback mechanisms that aim to raise quality while creating "... a measure of uniformity and homogeneity" Larson (1977: 40). As Power (1997: 14) argues, with the rise of the audit society, auditing becomes a ritualized practice of verification whose technical efficacy is less clear than its role in the creation of organizational legitimacy.

Third, the market model is combined with a *managerialist ideology* based on the belief that the external university relation to the state can best be managed by a New Public Management (NPM) approach. NPM was developed in the 1980s and became the dominant managerial model for public organizations (Gruening, 2001; Lane, 2000). The German version of NPM was formalized as a New Control Model (Neues Steuerungsmodell) from the newly founded institution of Municipal Association for Administration Management (KGSt, 2012). A guiding idea of NPM is that decentralized decisions with organizational and financial freedom result in more effective outcomes and more efficient use of scarce resources than the former centralized planning approach of public administrations (Ziegele, 2002). Instead of regulating processes as the main property of the era of federal involvement, NPM defines educational policy missions and derives specific objectives for research and teaching that are further broken down to individual universities, faculties, and departments. The state's financial support then depends largely on the attainment of negotiated objectives (Nickel, 2007).

The internal dimension of the managerialist ideology is reflected in new roles and practices of academic managers. Principles of academic autonomy and self-governance have been perceived as less effective for adapting the academic enterprise to changing market needs (Wissema, 2009). Like in many other professions, more corporate models based on managerial authority and corporate control have gained interest and have been legitimized as superior for the enterprising university (Clark, 1998). The hallmarks of this new institutional logic are well summarized by Osterloh and Frey (2010: 3): "'More market' and 'strong leadership'".

New Actors

The emergence of new actors or the transformation of existing ones follows the logic of centrally orchestrated competition and an audit explosion.

(1) For all participating European countries, the Confederation of EU Rectors' Conferences became influential after the Bologna Declaration in 2000. This new actor initiated restructuring processes for the development of higher education (Hanft & Müskens, 2005; Nickel, 2007). The general idea of the "action program" of the Confederation of EU Rectors' Conferences can be headlined with convergence, competition and international competitiveness, higher quality, and efficiency (CEURC, 2000). The restructuring of higher education aims to "enhance the employability and mobility of citizens" and "to compete more resolutely than in the past for students, influence, prestige, and money in the worldwide competition of universities."(CEURC, 2000)

The main instruments of convergence are (a) a common framework of comparable degrees, (b) the distinction into undergraduate and postgraduate level, (c) the ECTS credit point system, (d) a European co-operation in quality assurance, and (e) free mobility for students, teachers, researchers, and administrative staff. For Germany, the main innovations lie in new study program structures, new degrees, introductions of evaluations of teaching and research, as well as accreditation of study programs, which was before an administrative act of the state ministries of science and culture.

(2) In 1994, the Center for University Development (Centrum für Hochschulentwicklung CHE) was founded with a yearly budget of 3 Mill. Euro, funded half by the Bertelsmann Foundation (private) and half by Foundation for the German Rector's Conference (Stiftung zur Förderung der Hochschulrektorenkonferenz). The CHE was designed as a partner for ministries and higher education institutions to support restructuring projects and to offer training programs. The CHE is free from directives of its funding organizations, publishes continuously studies, and since 1999 developed a national university ranking.

(3) Publications, associations, and conferences throughout all eras have been the institutions of communication, exchange, and networking for academics. In the past eras, communication and quality control of publications were more or less decentralized in the hands of academics. The emergence of central organizations characterizes managed education as intermediaries between state and academics governing science by allocating resources and reputation and controlling research agendas (Whitley, Gläser, & Engwall, 2010). The most important authorities are the citation indices such as the Social Sciences Citation Index, the hegemony of American high-impact journals, and rankings such as the Shanghai-Ranking (Münch, 2011). This narrowing of publication preferences results in a devaluation of monographs, book chapters, research reports, policy recommendations, etc. Consequently, academics increasingly focus on the publication type of the journal article and hunt for placements in high-impact journals, sometimes at the cost of originality due to the limits of the peer review process (Münch, 2011).

(4) Since the ministries no longer approve study programs, a new type of actor appeared in the German educational field: national and international accreditation agencies. These new actors became essential players in the quality control of the university's teaching programs and may improve quality assurance and reduce the inefficiency of "traditional" state bureaucracy (Schwarz & Westerheijden, 2004); however, the auditing practices of accreditation agencies may involve new problems such as a new bureaucratization of universities and an increasing standardization and homogenization of teaching programs as well as ignorance of non-measurable quality properties (Münch, 2011). With the establishment of the European Consortium for Accreditation (ECA) in order to mutually recognize accreditation decisions, governmental bureaucratization seems to be reintroduced on a higher level.

(5) The logic of managed education demands a division of labor like teaching, research, and academic management, resulting in new groups or actors. In Germany, this trend becomes visible, even though Germany is still lagging in hiring professional full-time presidents or deans (Kirchgessner, 2011), and some academics are critical about the division of teaching and research (Meier & Schimank, 2009).

Governance system

The changes in institutional logics were accompanied by a move from the state to the market model of governance. The new system of governance is reflected in: (1) an internal reorganization of the university and (2) new external relationships to the state and other actors in the field such as intermediaries.

(1) The internal governance system of universities changed by strengthening the rights of academic managers while reducing participation rights of academic and non-academic members. The withdrawal of democratic rules was manifested in the following structures:

(a) *Emergence of University Councils (board of trustees):* Behind the diversity of state laws of higher education, three commonalities can be identified: (i) the council is an additional managing body to the traditional organs of rectorate and senate; in most states, the majority of its members or all of the trustees are to be non-university members, which should make university leadership more sensitive and responsive to broader societal requests; (ii) inspired from NPM, councils are taking over supervision and control functions, which have previously been performed by state bureaucrats; (iii) university managers should be more professionalized and take the managerial practices from the corporate world as an important reference point (Burtscheidt, 2010; Kluth, 2001; Meyer-Guckel, Winde, & Ziegele, 2010).

(b) *Shifting power structure: From a rectoral to a presidential constitution*: The introduction of councils goes hand in hand – at least ideally – with a strengthening of the executive committee and a weakening of the senate by reducing its competencies in academic matters (Kluth, 2001; Meyer-Guckel et al., 2010).

(c) *Shifting incentives:* In the past eras, professors could negotiate initial endowments, and resources have been fixed for the time of their appointment (Burtscheidt, 2010). In managed education, academics increasingly are paid for their performance in research, teaching, and other university relevant domains measured by such indicators as the acquisition of external funding, number and quality of journal publications, as well as specific objectives that bring academics in line with the university's strategy (Osterloh & Frey, 2008).

(d) *Mergers of higher education institutions for cost efficiency and strategic profile development*: Whereas mergers in higher education have been widespread in the US, GB, Australia, and the Netherlands since the 1970s (Goedegebuure, 1992; Harman & Harman, 2003; Harman & Meek, 1988; Skodvin, 1999), in Germany mergers are a relatively new phenomenon. Motives for these mergers are profile development, quality improvement, raising visibility, economies of scale, and synergy effects to improve the position in competitive education markets (Battke & Cremer-Renz, 2006; Pruisken, 2012; Weber, 2009). Empirically, the majority of the few mergers in Germany (Battke & Cremer-Renz, 2006; Klockner & Rieck, 2010; Pruisken, 2012; Zechlin, 2003) still reflect state-decreed cost reduction policies (Pruisken, 2012).

(2) The reforms of external governance were designed to encourage competition among universities and enhanced at least an increasing degree of autonomy.

(a) *Ambivalent autonomy*: The 4th amendment of the HRG of 1998 was an important legal step to enhance universities' overall requested autonomy by deregulating the internal and external organization, the administration, and the budgeting process. Following NPM, input control was replaced by output control, i.e. funding was now related to outputs via goal attainments, controlling, reporting, and auditing systems based on performance indicators (Nickel, 2007). However, the extent of using performance indicators and goal attainments varies by states (Leszczensky, Orr, Schwarzenberger, & Weitz, 2004). Cameralism in the era of managed education was disappearing and replaced by global budgets, where the state only provides few aggregated titles (in the extreme case two titles: investments and current expenditures). In practice, universities' degree of financial autonomy varies by state law, and in most cases, a "minimal cameralism" remains (Ziegele, 2002). Since then, universities have gained a new degree of autonomy over their resources, especially financial resources, and they can allocate inputs themselves in order to accomplish specific outputs. These changes increased universities' independence, which is the necessary condition for creating profiles and striving for excellence. However, in practice, it did not stop the states from cutting university funding (Behrens, Leszczensky, Mück, & Schwarzenberger, 2006).

(b) *Substitution of basic funding through competitive funding programs*. Funding agencies like transnational organizations such as the World Bank or the European Union, national research foundations such as the Deutsche Forschungsgemeinschaft (DFG), Volkswagenstiftung, and programs offered by federal, state, and local government agencies are important actors in shaping research. In Germany, the percentage of so-called third-party funds of total funding increases continuously (DESTATIS, 2009). Funding agencies develop research programs ranging from the future of production (BMBF[1]) to Joint Ventures for Caucasian railways (EU). More recently, the most prominent of these competitive funding programs is the federal Excellence Initiative. Typically, these programs initiate interaction within the scientific community and even facilitate inter-disciplinary discourse depending on the program. The institutional function of these programs is at least twofold. First, they offer specific research services for the beneficiaries. Second, programs trigger innovations in the scientific system. Studies on innovation problems of research groups show that research teams tend to stabilize the status quo and, therefore, demonstrate conservative behavior patterns (Krohn & Küppers,

[1] BMBF : Bundesministerium für Bildung und Forschung (German federal ministry of education and research).

1989). Krohn and Küppers (1989: 89) argue that this situation leads to an interesting paradox. In those areas where science can be practiced autonomously, we can recognize a tendency of research groups to do the same thing over and over again; while in areas where they have to attract external funding, substantial higher innovating activities can be recognized. In this respect, funding agencies perform an important cognitive function for the scientific community. These programs are perspectival constructions of future knowledge. However, competitive funding is also subject to criticism, for it confines knowledge creation, especially in times when basic funding for independent research of professors is reduced, leads to a stratification of universities (Münch, 2009), and creates inefficient resource allocation because of declining economies of scale (Binswanger, 2010; Münch, 2011).

THE ENTREPRENEURIAL UNIVERSITY AS A STRATEGIC RESPONSE TO MANAGED EDUCATION

The Institutional Context in Lower Saxony Demanding Organizational Change

In chapter three, we explained the general institutional environment of managed education, which demands strategic responses of universities. Before illustrating an entrepreneurial response with the case of Leuphana University of Lüneburg (Leuphana), in this section, we want to describe the specific context that enabled the transformation of Leuphana.

The institutional setting is vital to understand the strategic response of Leuphana. This setting can be systematized in six related components: (a) the research assessment exercise of the Scientific Commission of Lower Saxony (WKN); (b) the cost-cutting program of Lower Saxony; (c) the Higher Education Law of Lower Saxony (NHG) affecting all institutions in the state; (d) the regulation of foundations of public trust within the NHG – the legal form given to Leuphana; (e) the Merger Law (FusionG) designed to conduct a merger of two institutions into the Leuphana University of Lüneburg; and (f) goal attainments as the concrete new instrument of higher education governance.

(a) The Scientific Commission of Lower Saxony (WKN) is a unique institutional actor in federal Germany founded in 1997 with the purpose to consult the government and higher education institutions concerning science and research policies (WKN 2007). In 2001 the WKN conducted the first research assessment exercise to evaluate faculties across Lower Saxony with a less favorable result for the former University of Lüneburg (UL). A new beginning was

recommended by building a more distinguishable competence profile (WKN, 2001, 2011). With that judgment, UL was made sensitive to necessary strategic activities and restructuring.

(b) In 2003, the MWK announced structural funding cuts (40 Mill. for 2004) to confront public debts labeled as "Higher Education Optimization Concept" affecting all higher education institutions in Lower Saxony (Behrens et al., 2006). For the most, the budgets were cut considerably and had to be met with individual dismissals. The Technical College Buxtehude, for instance, had to be privatized in order to avert closure. In 2004 the Ministry of Science and Culture developed a model for the merger of the UL and the University of Applied Science of Northeast Lower Saxony (UNLS). The critical conditions or main drivers for the decision to merge were clearly public budget and debt problems. Additionally, the Bologna European treaty on higher education can be seen as an enhancing or proceeding condition (Stratmann, 2006). Bundling competencies in order to create a research profile played a minor role besides the dominant and precise target to reduce costs (Pruisken, 2012).

(c) In the sense of enhancing managed education through strengthening autonomy and responsibility, the Educational Law of Lower Saxony can be counted as one of the most progressive laws in Germany. Lower Saxony was a pioneer in introducing a maximum degree of financial autonomy according to budgetary, legal frameworks (Haushaltsrecht) for three universities in 1995 and 2001 for all institutions (Behrens et al., 2006). Goal attainments and financial incentives as part of the budgeting process have been conducted since 2004 (Behrens et al., 2006). Since its introduction, composition and task definitions of university councils in the state have also been more progressive than the university councils regulated by the federal university laws (Landeshochschulgesetze): (Meyer-Guckel et al., 2010).

(d) Furthermore, the NHG provides more autonomy through a framework to take the legal form of a foundation of public trust (NHG §55-63) in order to support the competitiveness on international education markets (Oppermann, 2002). Foundation universities are legal personalities instead of being part of the state's administration, as had been the case previously (Behrens et al., 2006). Lower Saxony was the pioneer in actively applying the transformation from public bodies (Körperschaften) into foundations (5 universities transformed since 2003, (for an overview of Germany see Hener, Kaudelka, & Kirst, 2008). Up to date, only a few states do not provide this legal form (Lanzendorf & Pasternack, 2009), and besides Lower Saxony, only a handful of transformations have been conducted so far (Goethe-FF, Viadrina) (Hener et al., 2008). The foundation model for higher education follows the dominant forms for private foundations only to some extent, as funding is still guaranteed by the state

(Zuwendungsstiftung) but based on goal attainments with the ministry and performance measurement (Stratmann, 2006).

With the form of a foundation, the scope of action is enlarged by the right to appoint professors autonomously, create positions, allocate, and capitalize resources. In the Lower Saxonian model, the senate is no longer involved in operative and financial decisions; its role largely changed from a decision to an advisory body. Following the idea of NPM, decisions and accountability are unified in the university's executive committee (Stratmann, 2006).

(e) Besides the NHG and the foundation-option, the power of the executive committee of Leuphana was strengthened through the merger law (FusionG) especially drafted at the time in order to enhance the effectiveness of the merger and to create a capacity of action for the new institution facilitating restructuring and change (Bonin, 2005). Furthermore, the merger law aimed at a stronger symbiosis of teaching and research and at developing an advanced knowledge-transfer structure that would contribute to regional economic development.

(f) Additionally, structural changes have been initiated by the so-called "contract of the future" (Zukunftsvertrag) between the ministry of science and culture and the universities in 2006. This contract was renewed in 2010 with the main features: profile and network building, active third-party funding, performance-based funding, improvements in teaching, and cost-efficiency. Universities are committed to developing indicator systems to assess their performance and use indicators for internal control. Likewise, the ministry together with the different institutions, elaborated guidelines in 2001, which serve as the basis for specific goal attainments (Fedrowitz, Krasny, & Ziegele, 1999; Michaelis, 2002).

The latest goal attainments in Lower Saxony were made in 2010, valid for two years, based on the results from 2007. Among the more than 40 goals, the most important ones are (a) profile building in research (e.g., increasing of fundraising by 25% each year; increasing the number of international publications); (b) improvement of teaching (e.g., more masters students from external universities, more PhD-student enrollments, more courses taught in English); (c) networking (e.g., joint doctoral study programs); (d) facilitating academic careers (e.g., more doctoral theses, more academic grants), and opening for new target groups (increase of vocational training).

As a response, the controlling department at Leuphana developed as many indicators as necessary to measure the degree of the attainment of every goal. In this context, many of the entrepreneurial activities of Leuphana can be seen as a strategic response to the changes in its institutional environment.

Strategic Response in Institutional Environments and the Emergence of the Entrepreneurial University

Organizations react to institutional pressures by adopting different strategic responses (Oliver, 1991) to these institutional changes depending on the extent to which the institutional environment influences its specific organizational attributes and resources (Scott, Ofori-Dankwa, & Justis, 2008). While we recognize different responses to managed education by German universities, the most wide-ranging response is the emergence of a new archetype – the entrepreneurial university, which adopts innovative strategies and entrepreneurial approaches. We define entrepreneurship in the university context as the creation and exploitation of knowledge for research, teaching, and the commercialization of academic knowledge. Research on entrepreneurship has redirected its attention to the opportunity concept, describing entrepreneurship as opportunity-seeking and opportunity-exploiting behavior (Eckhardt & Shane, 2003; Hitt, Ireland, Sirmon, & Trahms, 2011; Shane & Eckardt, 2003; Shane & Venkataraman, 2000).

The entrepreneurial university was first introduced by Clark (1998) as a strategic response to emerging trends in higher education. Since then, several scholars such as Röpke (1998), Sporn (2001), Etzkowitz (2003), Kirby (2005), and Rothaermel et al. (2007) have extended some of the original ideas. The entrepreneurial university (Guerrero-Cano, Liñán, Toledano, & Urbano, 2009; Guerrero-Cano & Urbano, 2007; Guerrero-Cano & Urbano, 2010) strives for the "capitalization and commercialization of knowledge" (Etzkowitz, 2003; Slaughter & Leslie, 1997), the "contribution to local economic development" (Röpke, 1998); and the "development of an entrepreneurial culture", both within and around the university (Clark, 1998; Kirby, 2005). Entrepreneurial universities are opportunity-seeking and opportunity-exploiting regimes that respond strategically to challenges in their core domains of research, teaching, and commercialization of academic knowledge in order to fulfill their mission.

Higher education as a process transforms input resources such as academics, funds, and students into output resources based on teaching, research, and the commercialization of knowledge (Lindsay, 1982). The transformation process involves diverse attributes specific to each institution, which define the degree of accomplishment of the institutional mission. Previous research has provided a number of theoretical models based on specific criteria that define entrepreneurial attributes of higher education institutions (Clark, 1998; Guerrero-Cano & Urbano, 2010; Kirby, 2005; Rothaermel et al., 2007; Sporn, 2001; Wissema, 2009). Although difficult to define and quantify, the educational resources and institutional attributes can also be

qualitatively interpreted for illustrative purposes. We will use as a guideline some of the entrepreneurial attributes proposed by some of the previously mentioned theoretical models, which can likewise be illustrated in our example of Leuphana as an emerging entrepreneurial university. We consider this case a unique example of how a mid-sized university in the German state of Low Saxony was able to strategically reinvent itself as an entrepreneurial university in response to the institutional change within the German higher educational system.

THE CASE OF LEUPHANA UNIVERSITY OF LÜNEBURG

Strategic Reorientation

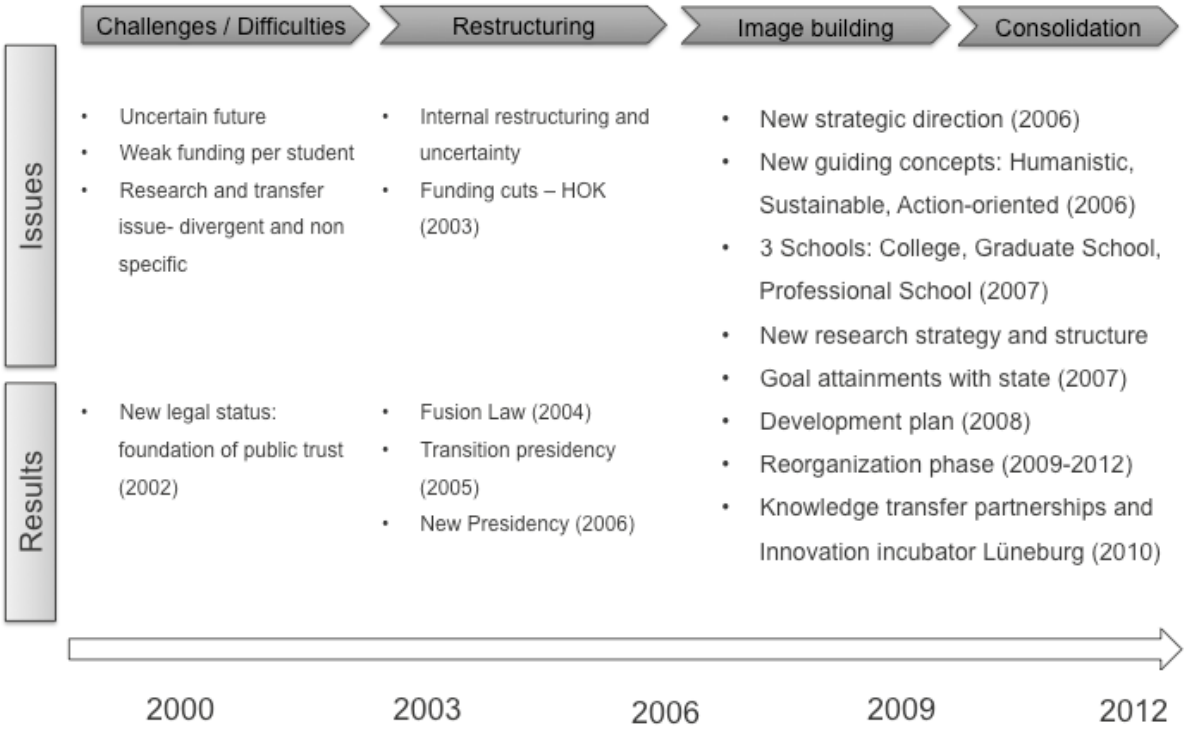
The Leuphana University of Lüneburg was formed in 2006 from the merger of the University of Applied Sciences of Northeast Lower Saxony and the University of Lüneburg. This new institution was to serve as a model university in the changing German higher education field. The innovative approach of the Leuphana concept constitutes an entrepreneurial institutional undertaking unique in Germany (Battke & Cremer-Renz, 2006). The process of merging and renewal of Leuphana was focused on creating a new type of German higher education organization. The emerging university was to build on the strengths of both predecessors, maintaining and developing an action-oriented teaching and research structure in close cooperation with industry and regional economic agents, playing in this way a more active role in the regional economy (Keller, 2008).

The merger of the University of Lüneburg and the University of Applied Sciences of Northeast Lower Saxony was triggered by changes in the institutional context. As explained earlier, these changes started in 1997 with the foundation of the states' Scientific Commission of Lower Saxony (WKN) and was followed by related components and subsequent events that preceded the union and restructuring of both universities. In 2005, the states' parliament approved the merger law (FusionG), which served as an instrument for the re-foundation of governance structures, granting more autonomy to the emerging institution and concentrating decision-making and managerial power in the new executive committee (Pruisken, 2012), consequently granting substantial freedom for building a distinctive educational profile (Bonin, 2005).

In January 2005, a temporary executive committee was established, officially merging the two universities. In May 2006, the governance bodies of the new institution were appointed. The new president Sascha Spoun was to lead the institutional reorganization and the strategic

management of the newly founded university. Under this new leadership, a strategic plan was developed to position Leuphana as a humanistic, sustainable, and action-oriented university (Keller, 2008) with the mission of teaching, research, and knowledge-transfer dedicated to contributing to lifelong learning for the greater benefit of society (Remdisch, 2009). Besides the states' top aim to promote more efficient use of its educational resources, Leuphana became a model for the Bologna treaty in Germany and to project the city of Lüneburg as a university town (Hoffmann, 2010).

A summary timeline of the main events leading to the merger, restructuring, and reorientation of Leuphana is shown below (Figure 1).



Source: Self-devised based on various documents 2001-2011.

Figure 1: Timeline of Events Leading to the Creation and Restructuring of Leuphana University Lüneburg 2000-2012

New Identity Creation: Leuphana Branding and Image Building

Even though there has been a proliferation of branding in higher education institutions around the world (Wæraas and Solbakk, 2008), this phenomenon is not yet common among German public universities with only a few exceptions, such as the TU München, Goethe University, and the Humboldt University (Keller, 2008). Hence, Leuphana is one of the few universities to make use of the branding concept in Germany.

The new "Leuphana identity" is value-based grounded on three main pillars that present the university as humanistic, sustainable, and action-oriented (Keller, 2008). The humanistic dimension evokes higher education as a fundamental role model that shapes and influences values, attitudes, and social skills. Sustainable denotes the universities' support for long-term societal development by promoting interdisciplinary and autonomous teaching, research, and knowledge transfer. A proactive or action-oriented university encourages responsibility and transmits achievement-oriented values, creative and reflexive abilities, in addition to a will to bring about constructive change in the public sphere(Müller-Rommel, 2010).

Moreover, the university searched for nationally and internationally renowned personalities that would help to create symbolic capital and could serve as image ambassadors by spreading the new brand identity along with different spheres, either on a single basis (i.e., a speech) or on a continuous engagement (i.e., through honorary professorships). Some examples among these "Leuphana ambassadors" are: former US president and Nobel peace prize winner Jimmy Carter; American architect Daniel Libeskind; and the philosopher Richard David Precht.

Reorganization of Academic Structures

The academic structures were organized based on student target groups, an innovative concept within the German higher educational field (Keller, 2008). The new organizational model subdivides the university into four transdisciplinary entities. Three "Schools" – College, Graduate, and Professional School – were created to fulfill distinct needs of differentiated academic target groups. The academic programs and activities of each school are differentiated and specific in accordance with the qualifications and age of the particular student group. The three schools are embedded within a research support structure called the "House of Research" (Forschungszentren), which was designed to coordinate and foster multidisciplinary and applied research activities. In 2010 an additional organizational entity, the Innovation Incubator

Lüneburg, was established to support further knowledge transfer and commercialization, entrepreneurial activities, and regional networks.

Inspired by the Anglo-Saxon model, the Leuphana college offers a unified first academic degree to Leuphana Bachelor undergraduates. Designed as an interdisciplinary study program, it aims is to foster personal development, applied knowledge, and social responsibility. The Leuphana Bachelor consists of three building blocks. Firstly, all students have to complete a joint-term called the "Leuphana Semester", in which students are enabled to engage in scholarly reflection, gain broad general knowledge, and become acquainted with methods and theories. Secondly, students choose one out of nine areas of specialization or "Majors" and combine them with one of 16 Minors (secondary field of study); allowing students to tailor their studies according to their personal goals, interests, and talents. Thirdly, an additional component called "Complementary Studies" develops personal and social skills, interdisciplinary problem-solving abilities, and discipline-specific praxis-oriented skills. The Leuphana Bachelor study model received nationwide attention and obtained the prestigious award "Bologna – Future of Teaching" from the Volkswagen Foundation and the Mercator Foundation.

In addition to the regular bachelor and graduate programs, the professional school centered on the motto of lifelong learning and applied professional education, focuses on knowledge transfer, and needs-oriented education for working professionals and teaching programs developed together with regional partners. The concept of knowledge transfer is at the core of the professional school, carried out by transfer centers and innovation assistance units (Remdisch, 2009). The educational programs consist of Masters, courses and seminars, customized continuing education programs for companies and organizations, as well as individual coaching. The Master's programs at the professional school have a unique system of dynamically combining social competence and field expertise. They constitute a notable example of educational innovation and institutional entrepreneurial initiative within the German higher education arena. They are application-oriented and designed as extra-occupational studies with a duration ranging from 3 to 5 semesters. The professional school currently runs a two-cluster portfolio of seven open Master's programs, plus an MBA program exclusive to young professionals at Otto Group. The programs offer a multi-perspective learning approach: changing learning environments, with academic professors and working professionals for teaching. Students also benefit from a dynamic learning environment, including case studies, blended learning, and individual coaching (Remdisch, 2009). The number of students at the professional school grew since 2008 by more than 40 % annually,

reaching more than 7 % of the total Leuphana students in 2011 in only four years of its existence and showing a clear focus of Leuphana in strengthening industry links and knowledge transfer.

The restructuring of the academic organization of the Leuphana seeks to facilitate innovation, entrepreneurial activities and applied interdisciplinary research together with regional industry.

Attracting External Funding

In order to increase and diversify the sources of third-party funding, a wide variety of potential partners were approached: Governmental agencies and state banks; Supranational entities such as the European Union; Larger private corporations; Small and Medium size regional companies; and NGO's and non-profit social organizations. Concrete research, academic and transfer projects were crafted to achieve mutual goals and satisfy the needs of both the partner and the university.

Among the concrete examples of new partnerships and projects that have already been established, we can mention an MBA in Strategic Management developed and conceived for young professionals of the Hamburg based OTTO Group; the graduate education program Audit Excellence in cooperation with the Big Four accounting firms, and a partnership with the Nord/LB bank.

One of the most recent successes in attracting external funding is the innovation incubator, developed by the university and the German Federal State of Lower Saxony. This is a project that is unique in Europe. Over six years, with an investment volume of around EUR 100m, it will jump-start regional economic development through innovative research cooperation, cutting-edge training, and development measures in College, Graduate School and Professional School as well as through infrastructure measures. A project-based meta-organization under the name of Innovation Incubator Lüneburg was established in 2010 (Müller-Rommel, 2010).

The general goals of the Innovation Incubator are the creation and strengthening of university-industry-government cooperation and links. Further stepping up applied research, development, and training in collaboration with regional small and middle-size enterprises. Moreover, it aims at promoting and supporting the creation of technology-oriented business and the development of industrial innovation.

Additionally, the Innovation Incubator has specific projects dedicated to regional networking with the aim to nurture the creation and expansion of knowledge-intensive jobs in

the region. These include business start-ups and counseling, e-learning, and social and creative-economy projects in close cooperation with regional partners from industry and governmental agencies. Moreover, a project format called "competence tandems" for network and knowledge transfer has been set up to increase regional research capacities. These tandems involve international academic researchers and science collaborators in specific interdisciplinary applied regional research projects.

The Innovation Incubator project will also invest in the infrastructure development of the Leuphana. Thanks to the funding of the European Union and the Federal and Region Government, the university will have by 2015 new facilities for integrated research. An environmentally friendly building will be constructed on campus, featuring an innovation and research center. The structure will also house the professional school and the innovation incubator. These long-term projects and investments should increase the attractiveness of the Leuphana and the region for highly qualified professionals and innovative entrepreneurs.

Since 2006 the university has managed to diversify and increase its funding base, augmenting the total financial resources by an increase of approximately 60 % and almost doubling the third-party funding ratio. Additionally, the innovation incubator project will represent a direct investment of more than 100 million euros over five years, which is likely to generate strong multiplier effects around the university, industry partners, and local economy.

Improving Conditions for Teaching and Research

The recruiting and human resources policies emphasize academic acknowledgment, teaching quality, industry links, and international recognition in the respected scientific community when recruiting and sourcing new professors and researchers. Likewise, professionals with industry experience and academic recognition were assigned for managerial positions and transfer projects. Various indicators signal an improvement in conditions for teaching and research due to these sourcing policies and other actions. For instance, the student – full professor ratio has been improved from 1 to 69 to 1 to 44. The research output of Leuphana increased since the restructuring in 2006. The impact of Leuphana researchers measured by the number of paper citations recorded in the web of science has increased six-fold, the external funding for research tripled, and the number of PhD students increased by 50% since 2006, indicating higher research efficiency and academic recognition.

Moreover, Leuphana's entrepreneurship profile has been publicly recognized. In a recent ranking of 63 German universities on entrepreneurship education and start-up counseling, Leuphana was ranked 4 (Schmude; Aevermann, & Heumann, 2011). Similarly, in

a survey of 395 German-speaking entrepreneurship researchers of the *Zeitschrift für KMU und Entrepreneurship,* Leuphana was ranked 5 (Papagiannidis et al., 2011).

The illustrative case of Leuphana explored the main events leading to the conception and restructuring of a different type of university. The case offers preliminary empirical insights: Our study shows two important forces accountable for Leuphana's transformation. First, the strategic response taken by Leuphana has to be understood and was facilitated by the changing institutional context of managed education in Germany and by the state of Lower Saxony. In addition, the unique history of the University of Lüneburg favored a more radical organizational change. Second, these institutional conditions offered the new executive committee greater freedom in repositioning and restructuring the Leuphana. This new scope of strategic actions was constructively used by creating unique entrepreneurial strategies for the field of teaching, research, and knowledge transfer. Moreover, contrary to the dominant concept of the entrepreneurial university, focusing mainly on the academic-industry link as the driving force for the organization's innovative activities, the Leuphana case shows that opportunity-seeking and exploiting also applies to the traditional domains of research and teaching. In fact, Leuphana gained its first attention through the innovative study model – the Leuphana Bachelor.

CONCLUSION

The key motivator behind writing this paper was the growing awareness that the higher education system in Germany and most other Western countries are undergoing a fundamental institutional change. This change is redefining the rules of the game of science and herewith the roles that universities and scholars, and the state play within this emerging institutional context of managed education. While managed education is a far more tangible reality in the Anglo-Saxon world, it also became the key reconfiguring force for the German system of higher education (Burtscheidt, 2010; Münch, 2007, 2011; Rhoades & Sporn, 2002). However, the German version of managed education is not simply a transfer of practices that have been implemented elsewhere, especially in the UK and the US, but turns out to be a locally adapted form creating substantial variations in actors and governance systems. Since all education systems have a history creating a path-dependency, our aim was not simply to reconstruct the current state of affairs of the German higher education system. Rather, we wanted to understand how the institutional changes unfolded over time and emerged into systems of beliefs, norms, and practices in the postwar period. As a result, we developed a typology of institutional eras composed of a unique interplay of logics, actors, and governance systems. The German system

of higher education, as we argue, departed in the postwar period from an era of professional dominance (1945-68), which was replaced by an era of federal involvement and democratization (1968-1998) until more recently, managerial and market orientation became guiding pillars for the new archetype of managed education (since 1998). With managed education, a new type of university emerged as a strategic response to the institutional pressures of the marketization of science. We described this emerging type as the entrepreneurial university and illustrated this with the case of the Leuphana University of Lüneburg.

Yet, this move to managed education is not only perceived as a progress. Its skeptics rather see the managerialist and market ideology behind managed education as a threat to the project of science (Münch, 2011; Slaughter & Leslie, 1997; Slaughter & Rhoades, 2004). While managerialism replaces professional self-regulation (Freidson, 2001) and may even foster professional disintegration (Broadbent, Dietrich, & Roberts, 1997), the market logic facilitates the commodification of science (Bunge, 1998a). Some of the dysfunctional effects of the marketization of science such as rising student consumerism (Gumport, 2000; Riesmann, 1998), intellectual prostitution (Frey, 2003), undermining scientific creativity (Heinze, Shapirab, Rogers, & Senkerd, 2009), a loss of intrinsic motivation (Binswanger, 2010; Osterloh & Frey, 2008), new bureaucratization under the guise of orchestrating competition (Binswanger, 2003, 2010; Münch, 2007), or tendencies of institutional decoupling of teaching and research (Meier & Schimank, 2009) are well documented.

Still, the critics partly overlook that the precursor of managed education – the era of federal involvement – already created the seeds for the decline of higher education in the Humboldtian sense. Mass-education in vastly underfunded universities combined with a centralized planning approach to higher education from the state and the managerial problems associated with the committee governance system of universities made it more challenging to commit the education system to high scholarly standards. Despite the drawbacks of managed education, as reported by its critics, universities have regained a degree of autonomy, which they lost during the era of federal involvement (Burtscheidt, 2010). However, returning to the hierarchical culture of the Ordinaria system, which was rightly attacked by the 68 movement, is antiquated and demonstrates no attractive and sustainable alternative.

As Olson (2007) points out, “institutional change is often seen as driven by perceived failure” (p. 52), which undermines the legitimacy of institutions and is followed by processes of de-institutionalization (Greenwood, Suddaby, & Hinings, 2002). While managed education replaced the era of federal involvement and democratization for good reasons because the

practices behind federal involvement were largely unsuccessful in meeting educational and scientific expectations, the emerging new practices improve science in some respect and carry the seeds of institutional conflicts. For example, the commodification of science undermines scientific creativity (Heinze et al., 2009), managerialism in academia conflicts with professional self-identity creating patterns of academic reactance to change (Schilling, Werr, Gand, & Sardas, 2011), and finally, the new academic incentive structure discourages transdisciplinary research and other forms of theory-praxis exchange (Münch, 2011). The more these conflicts and other emerging issues undermine the perceived effectiveness of science in the eye of powerful actors, the more the practices of managed education will encounter a legitimacy threat triggering again processes of de-institutionalization and change (Lawrence & Suddaby, 2006).

Future research should therefore investigate the nature and consequences of managed education in-depth. In order to do so we propose a multi-level analysis (Reihlen, Klaas-Wissing, & Ringberg, 2007; Reihlen & Werr, forthcoming). Such an analysis entails *first* the level of the higher education field involving actors, logics, and governing systems, as well as processes of change; *second*, the level of the university and, in our case especially the emerging archetype of the entrepreneurial university and its transformation processes; and *third* the level of the individual scholar socialized and embedded in this new institutional setting. The guiding research question is: How are marketization and managerialism affecting the reconfiguration of the higher education field, the strategic choices and structure, especially of universities, and the motivation and behavior of scholars? Shedding more light on these issues and developing sustainable policy measures are crucial for the future governing practices of science and consequently for its usefulness and relevance to society.

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ENTREPRENEURIAL UNIVERSITY ARCHETYPES: A META-SYNTHESIS OF CASE-STUDY LITERATURE

Abstract: Most research on entrepreneurial universities is case-study based. While this helps us understand specific characteristics of particular cases, integrative studies that build on cumulated knowledge have yet to be conducted. This study aims to synthesize existing research and to generate archetypes of entrepreneurial universities by conducting a qualitative meta-synthesis of the empirical literature. The underlying assumption of our research is that there is no single model or the best type of entrepreneurial university. Not-withstanding, we expect to see entrepreneurial universities converge into a few distinct archetypes that display similar organizational attributes. As primary data sources we used twenty-seven case studies on entrepreneurial universities, which we synthesized into four empirically grounded archetypes: the 'Research-preneurial' or research driven; 'Techni-preneurial' or industry driven; 'Inno-preneurial' or service innovation driven; and the 'Commerce-preneurial' or knowledge commercialization driven. This meta-synthesis provides a taxonomy of various structures, strategies, and resources that characterize entrepreneurial universities, serving as conceptual framework for a heterogeneous body of literature.

Keywords: Entrepreneurial University; Higher Education; Case Study Meta-Synthesis; Configuration Theory; Archetype Theory; Grounded Theory

INTRODUCTION

The medieval university looked backwards; it professed to be a storehouse of old knowledge. The modern university looks forward, and is a factory of new knowledge.
Thomas Huxley

Over the past two decades, universities have been facing a period of profound changes and unprecedented challenges. The rise of new public management (Greening, 2001) has disrupted the institutional setting of higher education (Teichler 1996; Neave 1995; Dill and Sporn 1995), increasing pressures to comply with new rules, requirements, and expectations from government and other stakeholders. The rise of managed education implies a more active role of government in monitoring and auditing educational organizations, while at the same time promoting autonomy and competition in the name of academic excellence and efficient exploitation of knowledge (Münch, 2011; Reihlen and Wenzlaff, 2014). While normative pressures drive universities towards structural homogeneity and facilitate isomorphic change (DiMaggio and Powell, 1983), at the same time, market deregulation and increased autonomy foster the emergence of distinctive structures. Hence, this paradoxical policed deregulation stimulates creative, strategic responses and novel organizational configurations, which have been described as the entrepreneurial university (Clark, 1998; Sporn, 2001; Kirby, 2006), third-generation university (Wissema, 2009) or the triple-helix model of university-industry relations (Etzkowitz, 2003; Etzkowitz and Ranga, 2010).

As universities struggle with the organizational challenges of creatively responding to a shifting institutional paradigm, it becomes essential to investigate first the emergent organizational structures of entrepreneurial universities, and second the strategic initiatives that facilitate the entrepreneurial transformation. Through the identification of relevant organizational characteristics in numerous case studies on entrepreneurial universities, we aim to generate a comprehensive taxonomy of the empirical literature and to identify distinctive emergent organizational archetypes.

On the basis of an inductive qualitative analysis of twenty-seven case studies, we develop a taxonomy of emergent university archetypes, which provides a more comprehensive understanding of recently evolving structures, processes and strategies in higher education institutions. Moreover, by describing aggregate generalizable patterns, this study should help to overcome some of the context-dependency and non-generalization issues associated with single-case studies. Additionally, archetypes could serve as conceptual tools for practitioners in designing, steering, and foreseeing organizational development in their organizations

The paper is structured as follows: first, we review the literature on the entrepreneurial university and define our understanding of its reach and scope. Subsequently, we present a short summary of configuration theory and the contribution of archetypes to understanding organizational structures and strategic change. Next, we explain our research's methodological approach and design, which will use techniques based on the grounded theory analysis (Glaser, 1992) to investigate qualitative data of twenty-seven entrepreneurial universities cases. Through this process we aim to inductively identify structural attributes and organizational processes, which we later analyze in order to identify emergent patterns in organizational configurations. Afterward, we look at the existing literature on entrepreneurial universities to help us enrich and contrast our results. Finally, we summarize our findings and propose some directions for further research.

THEORETICAL FRAMEWORK

Defining the entrepreneurial university

The field of entrepreneurship is characterized by a lack of agreement on precise definitions and key terms. Austrian economist Joseph Schumpeter (1936), in the early days of the academic discipline, emphasized its innovative nature, defining an entrepreneur as a person who carries out new combinations, causing discontinuity. This broad understanding was amongst the most widely accepted until the past few decades when increasing disagreement on the term and scope of the field has emerged. Our essential understanding of the term entrepreneurship is how opportunities are discovered, created, and exploited to bring news goods and services to the market (see Venkataraman, 1997). It thus often entails, but goes beyond a narrow understanding of entrepreneurship, which relates to creating new organizations or spinning them off from existing ones. In line with recent discussions in the entrepreneurship literature, we argue that entrepreneurship is opportunity-seeking and opportunity-exploiting behavior (Reihlen and Werr, 2012, forthcoming; Shane and Venkataraman, 2000) beyond means that are currently available and manifests itself not only in individuals, but also in organizations such as firms or governmental institutions (Bull and Willard, 1993). These chances to exploit future goods and services are not simply taken, but created through new organizational attributes and interaction within the micro-, meso- and macro-institutional levels (Venkataraman, 1997; Reihlen and Werr, 2012, forthcoming), thus resulting in many new organizational configurations that tend to converge into a few distinctive archetypes (Hinings and Greenwood, 1988).

The concept of entrepreneurial university in the academic literature tends to be diverse and ambiguous (Kirby et al., 2011). Significant differences in the meaning and scope of the term arise from the literature, depending on the context and specificity of the cases studied and the discourse of the researchers (Blenker et al, 2008). Moreover, since 1998 when Burton Clark introduced the term entrepreneurial university, several scholars (Röpke, 1998; Sporn, 2001; Etzkowitz, 2003; Kirby, 2005; Rothaermel et al., 2007) have used the term, while others have proposed alternative terminology such as third-generation university (Wissema, 2009). Clark's seminal work on entrepreneurial universities identifies five elements of entrepreneurial behavior in many detailed case studies that he conducted during the 1990s of various university transformations. This five-element approach has become the benchmark and point of reference in the entrepreneurial-university literature over the past two decades (Bratianu and Stanciu, 2010). The elements defined by Clark (1998) are: an 'expanded developmental periphery', which involves research transfer centers, joint ventures with industry, spin-offs, tailored educational and training programs for industry partners, etc.; a 'diversified funding base' by looking for alternative streams from local, regional and supranational public agencies, NGOs, revenues from student services, and alternative platforms such as e-learning, symposia and networking events; a 'strengthened steering core' with decision-making authority and autonomy, professional and accountable; a 'stimulated academic heartland' in which purposeful scholarly work is recognized, encouraged and innovative, collaborative research is pursued and remunerated according to its relevance; finally an 'integrated entrepreneurial culture' represented by a strong set of beliefs, principles and consistent practices, all of which 'ought not to be treated independently of structures and procedures through which they are expressed, thus an institutional perspective is required. The first four of the five elements are means by which transforming beliefs are made operative' (Clark, 1998: 7-8).

Various understandings on the boundaries of an entrepreneurial university and its relevant characteristics can be included in a wide-reaching definition, which would come closer to the original essence of the term entrepreneur to help us frame the structure for our study. An entrepreneurial university is one that responds strategically to field logic changes, by acquiring and employing resources in an innovative manner, underpinned by an integrated entrepreneurial culture that provides support structures in order to fulfill its strategic goals.

Clark's seminal study on entrepreneurial universities was aimed at identifying recurring elements among the cases he studied. In other words, his methodology intended to identify empirical regularities among the five organizations that he researched. Clark's approach makes sense when trying to identify and define novel phenomena through unprecedented empirical

research. As a result, he tends 'to homogenize what is, in reality, a pluralistic phenomenon' by discovering unifying themes, principles and thereby downplaying some of the multifaceted nature that entrepreneurial universities entail (Glynn, Barr and Dacin, 2000). In contrast to that approach, this study aims to look for empirical heterogeneity within Clark's homogeneous but general framework, on the premise that new market logics and deregulation favor organizational divergence in higher education and on the evidence from literature suggesting that different types of universities are all being described as entrepreneurial, even though there is significant variability among their organizational characteristics. In consequence, this study should generate, through the identification of archetypes, a more refined framework of specific organizational characteristics among various forms of entrepreneurial universities

Despite the heterogeneity regarding the term 'entrepreneurial university', we would like to derive two recognizable generalizations. First, universities in the Western world are increasingly experiencing profound transformations. These changes take different paths across organizations because each transformation is shaped by a unique institutional setting, which is one reason for the differing entrepreneurial-university models reflected in the literature. Second, the entrepreneurial characterization implies the framing of universities as an opportunity-seeking and exploiting institution (Shane and Venkataraman, 2000). However, existing literature tends to reduce that 'opportunity seeking and exploiting' behavior to the capitalization and commercialization of academic knowledge (Yusuf and Jain, 2008). While this is an important part of entrepreneurial behavior, it still overlooks the multidimensionality of the entrepreneurial phenomenon, which also relates to innovative approaches in the main academic areas of education and research. In addition to engaging in entrepreneurial activities per se, universities also need to embrace an entrepreneurial culture at all levels, from teaching and research to governance and management (Clark, 1998). Hence, the organization and its members also need to interact with the organizational field in an entrepreneurial manner (Röpke 1998). Accordingly, an entrepreneurial university would be an advocate of various support initiatives for entrepreneurship and an institution that develops and implements innovative strategies, including education and research (Salamzadeh et al. 2011).

The level to which the entrepreneurial culture is represented within the organization will depend on how actors in and around the university behave according to entrepreneurial values and beliefs (Greenwood and Hinings, 1993). In other words, organizational attributes represented by structures, resources and strategies will be determined at the most basic level by entrepreneurial socio-cultural attitudes of university stakeholders. Hence, we can understand archetypes as being underpinned by entrepreneurial values and beliefs, represented within each

organizational configuration through a set of attributes that denote the behavior of members in and around the university.

Archetypes as framework for analysis

This study draws on configuration and archetype theory in organizational studies as the theoretical framework in order to synthesize the diverse and complex structures of universities with the aim of finding discrete clusters of configurational schemes that serve as idealized types for comparability, design, and predictability (Greenwood and Hinings, 1993; Meyer et al, 1993; Miller, 1986, 1996; Miller and Mintzberg, 1983; Mintzberg, 1979; Weber, 1978; Harlacher and Reihlen, forthcoming).

According to Meyer et al. (1993) the term organizational configuration can be used to 'convey any multi-dimensional constellation of conceptually distinct characteristics that commonly occur together'. The study of configuration denotes the identification of certain key dimensions that together offer a representation of how organizations function. Numerous dimensions of analysis such as structures, strategies, and environments tend to cluster together to forms a representation of ideal types or gestalts within a defined organizational field (Greenwood and Hinings, 1993). Configurations may be derived conceptually or inductively from empirical data, and emerge from diverse forces that cause organizations to cluster together (Meyer et al., 1993). Some authors have suggested, based on population ecology theory of the firm (Hannan and Freeman, 1977), that selection drives organizations to converge into uniform clusters. Others such as DiMaggio and Powell (1983) as well as Hinings and Greenwood (1993) argue that powerful isomorphic pressures based on normative or coercive regulation or mimic behavior force the diffusion of a few common structures and strategies within a defined organizational field. Miller (1987) has explained how endogenous homeostatic forces drive organizations towards uniform configurations (Miller et al, 1984). Meyer (1982) describes how organizational ideologies and socio-cognitive processes undermine formal structures and shape consistent responses to external threats, which points to shared 'interpretative schemes' within organizations to support the emergence of a discrete set of recognizable structures and systems that tend to congregate among few 'archetypes' (Greenwood and Hinings, 1993).

Configurations result from interlinked relations among attributes across different dimensions such as structures, processes, resources and strategies. These configurations may be derived conceptually as typologies, or empirically as taxonomies (Miller et al., 1984). Configurations of single organizations tend to group within differentiated clusters whose boundaries represent 'ideal types' or organizational archetypes (Greenwood and Hinings,

1993). The archetype concept of Greenwood and Hinings (1993) expands on the configurational framework to extend it with a strong institutionalist perspective. They define archetypes as 'a set of structures and systems consistently reflective of a single underpinning interpretative scheme' (1993 p. 1057). This idea conveys the important role that values and beliefs play in determining how groups of organizations operate within an institutional arena.

We use configuration theory as a theoretical basis to review and synthesize several case studies using the grounded theory framework (Glaser and Strauss, 1967) and methodology (Strauss and Corbin, 1998) to identify different groups of entrepreneurial universities operating in distinct environments. Just as in other organizational fields, we might expect universities to converge into a few clearly differentiated configurations that display similar organizational attributes, which can be identified and described as ideal models or archetypes.

RESEARCH METHODOLOGY AND DESIGN

A growing body of literature on entrepreneurial universities has accumulated over the past decade, and case studies represent a vast amount of it. As in many fields of social sciences where aggregate, complex, and context-dependent phenomena are the object of analysis, case-study research in higher education stands out amongst the most commonly used research designs, especially in the areas of management and governance. However, since single-case studies are individual by nature, these suffer from issues of empirical generalizability and non-reliability (Newig and Fritsch, 2009). By combining a grounded-theory methodology (Greenwood and Hinings, 1993) for the analysis of a large number of cases, we hope to overcome some of the limitations of previous research by offering a synthesis of existing case-based research.

Grounded theory as methodological approach for meta-synthesis of case studies

Quantitative researchers have commonly used the term meta-analysis to synthesize and analyze large amounts of existing data accumulated from previous studies. Notwithstanding, in social sciences, numerous researchers have also used meta-analysis techniques to synthesize and analyze accumulated qualitative research (Yin and Heald, 1975; Mintzberg, Raisinghani and Theoret, 1976).

Based on grounded-theory methodology we seek to synthesize and find patterns in high-level constructs derived from our case studies. Grounded-theory methodology is a systematic approach to theory building through data-coding techniques and pattern recognition (Strauss

and Corbin, 1998). These emergent explanatory concepts and models are understood to explain the phenomenon under study and thus to be grounded in the data (Glaser, 1992). In this regard, variables and dimensions in this meta-synthesis will not be defined a priori but will emerge directly from the raw data as relevant attributes and relational patterns.

Even though grounded theory was not initially intended to conduct meta-synthesis of case studies, Glaser and Strauss (1967) in their seminal work wrote, 'When someone stands in the library stacks, he is, metaphorically, surrounded by voices begging to be heard. Every book, every magazine article, represents at least one person who is equivalent to the anthropologist's informant or the sociologist's interviewee' (p. 63), suggesting that drawing on published studies based on qualitative empirical data is in many respects similar to first-hand data collection because it allows richness and context. This qualitative meta-synthesis draws on grounded-theory methodology for research synthesis and meta-analysis.

Building on qualitative meta-analysis techniques and grounded theory, we follow a methodological approach that we have defined as a qualitative grounded meta-synthesis. This approach provides us with the means to synthesize and analyze rich qualitative data of case studies for the development of theory grounded in data. The procedures focus on identifying emergent concepts and abstract categories from separate studies, then on building categorical relationships in a cumulative manner in and across studies, and finally on grouping these similar categories while looking for relationships and patterns among them (Stall-Meadows and Hyle, 2010). Ultimately, the emergent constructs are compared and contrasted with existing theory about the related phenomena. These constructs would only hold for the specific studies that have been synthesized. However, since the number of cases taken into consideration has substantially increased, we can expect that the results can be empirically generalized to a greater extent than single-case studies (Hossler and Scalese-Love, 1989). Figures 1 and 2 provide us with a graphical overview of the iterative analytical process applied in the study and the methodological approach followed in order to derive the archetypes.

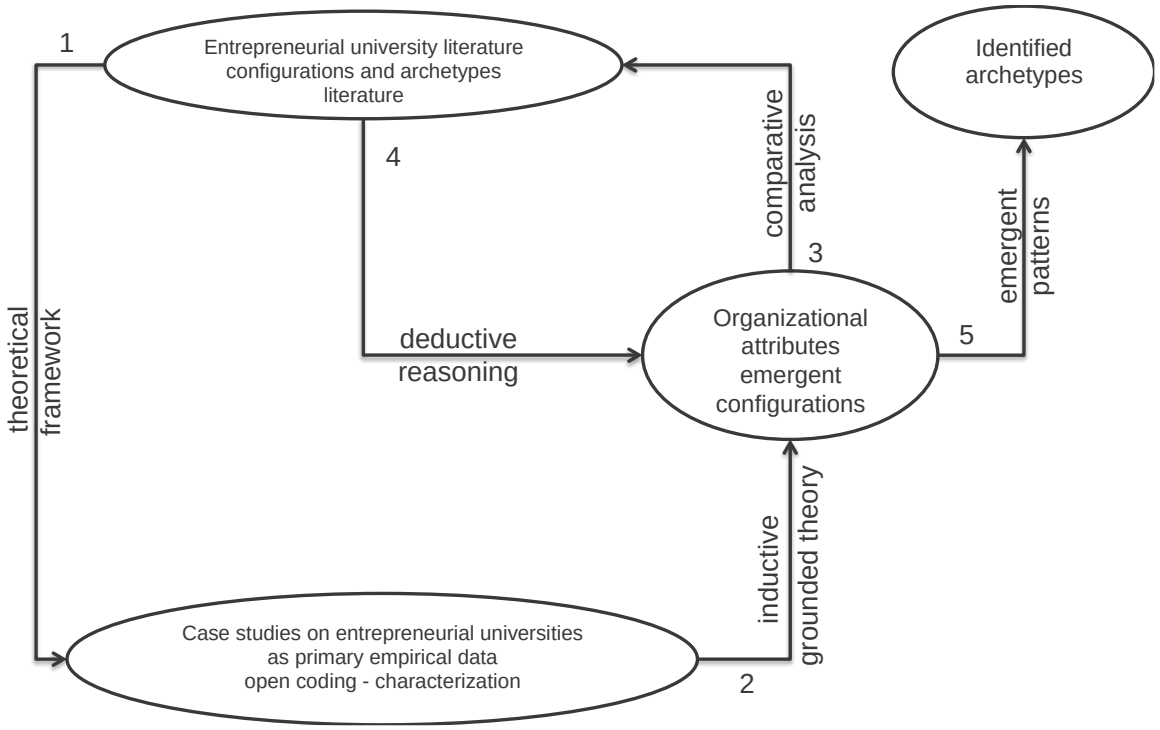

Figure 1: Analytical process for the identification of empirically grounded archetypes

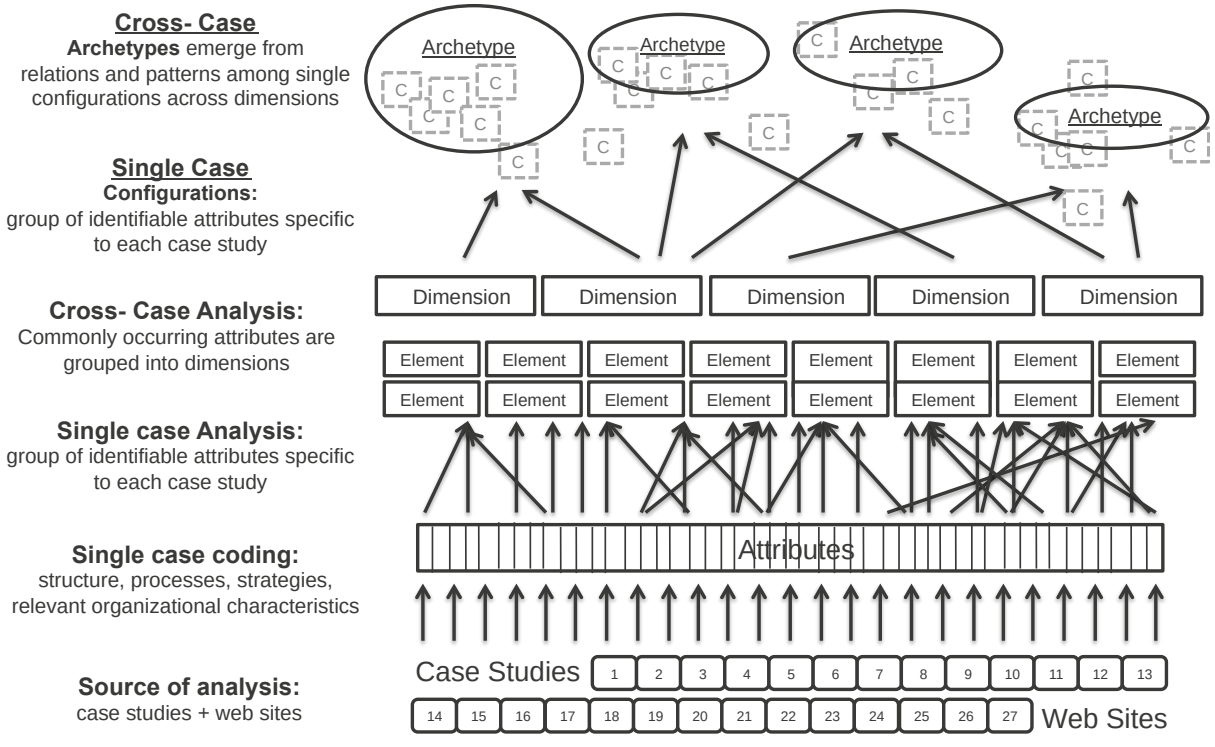

Figure 2: Meta-synthesis of case studies and the emergence of archetypes

Data collection

We have searched for relevant case studies of entrepreneurial universities published in refereed academic journals in the field of management, higher education, and public administration. Additionally, books and articles on entrepreneurial universities based on empirical data were also included for pre-selection, as well as academic papers presented at specialized entrepreneurship and higher-education conferences. We specified an inclusion criterion aiming at incorporating between 20 to 35 cases relevant for our study. The search was conducted using the most comprehensive databases and academic search engines available in the field, namely EBSCO Host, Web of Science, Google Scholar; we also consulted dedicated scholarly books covering the topic of university management and knowledge transfer, which contained descriptive case studies on entrepreneurial universities. We performed a simple Boolean search using the following pre-defined keywords 'entrepreneurship' and 'university'; and/or 'entrepreneurial university'; and/or 'knowledge transfer' and 'university'; and/or 'university governance' or 'university management', and/or 'triple-helix' and 'university'; and 'case study'.

In general terms, the main inclusion criterion was aimed at finding rich qualitative data in the form of peer-reviewed case studies on entrepreneurial universities. Regardless of the topics addressed and the scope of the cases, these studies needed to have defined the university depicted in the case as an 'entrepreneurial university', in accordance with Clark's (1998) parameters or any of the commonly used alternative terms, such as 'third-generation university', 'enterprise university', or 'triple-helix model'. Moreover, in order to enhance the reliability of our raw sources, selected cases had to contain enough qualitative and descriptive data concerning the organizational structures of the universities being studied (Yin and Heald, 1975). We selected twenty-seven case studies that fulfilled the inclusion criteria, containing at least five pages of qualitative data based on the theoretical framework and research methodology. In the appendix 1 we present the selected data sample, which includes cases from eighteen different countries in Europe, North and South America, Asia, Russia, and Australia, thus representing a global sample of entrepreneurial phenomena in universities, and portraying differences in environmental factors such as legal frameworks, culture, socio-economic factors, and contextual characteristics related to each country-specific higher education market.

Nonetheless, due to the meta-synthesis's cross-sectional nature, we have worked at a level of analysis that seeks to describe the attributes present at the meso-organizational level, hence coding and abstracting only organizational and environmental characteristics present cross-sectionally in the data sample. In line with the cross-sectional nature of this study, the

data set includes case studies of entrepreneurial universities ranging from 1998 to 2013. Moreover, as the case studies used for this analysis are primarily descriptive and represent an in-depth analysis of single organizational units usually through time and in relation to a specific context, the data set includes a broad historical range within the time dimension, but without being chronologically ordered or longitudinally compared at any point in time.

Data analysis

Open-coding and single-case analysis. The level of analysis is the case study itself, not its raw data. Case studies constitute our primary data source for the analysis (Noblit and Hare, 1988; Hoon, 2012), which in this case are analogous to the raw data or narrative account from an expert interview (Glasser and Strauss, 1967). Each case is assessed with the open-coding procedure, which is defined as the process of purposefully examining, comparing, abstracting, and categorizing data. Using qualitative analysis software, relevant information from the cases has been identified and coded. The process of ground-level concept identification is repeated for each individual case.

Cross-case analysis and axial coding. Once single case analysis and open coding had been performed, we proceeded to the cross-case analysis. According to Strauss and Corbin (1990 p.99) axial coding 'consists in linking subcategories to another category in a set of relationships denoting causal conditions, phenomenon, context, intervening conditions, action/interactional strategies and consequences'. We make use of causal network techniques (using the software ATLAS.ti ®) to display first and second-level concepts and their relations to higher-level dimensions. Analogous to the axial coding procedure, we looked for patterns in data by making connections among categories resulting in related groups or families. Then, similar concepts were grouped into abstract categories, broad enough to comprise all cases under synthesis. Subsequently, emergent patterns are conceptualized into formal statements describing the relations among categories.

Theory building and selective coding. We rely on our theoretical framework to selectively integrate related first-level concepts (variables) that form abstract categories (organizational attributes), which aggregate into distinctive dimensions (configurations). Stall-Meadows and Hyle (2010, p. 416) describe selective coding as the integration of concepts into theories. In this regard, we analyze and contrast emergent configurations with existing literature in order to describe and label archetypes. The result of this final process, which emerged from the open and axial coding, is a comprehensive conceptual representation of all cases being studied, grounded in the data.

FINDINGS

General elements of entrepreneurial universities

We have conducted this meta-synthesis in order to gain a more comprehensible understanding of the structures, processes, and strategies that shape distinct entrepreneurial universities. After a qualitative synthesis of 27 selected case studies, we were able to inductively derive and categorize common characteristics that shape the organizational configurations of the studied universities. These general characteristics found in the data sample, together with the elements and dimensions derived from all coded traits, provided the framework for analyzing and identifying entrepreneurial-university archetypes (see table 1). After open coding all qualitative data, we have identified numerous characteristics that represent all attributes arising from each particular case studied. Subsequently, coded attributes were arranged into separate elements that define entrepreneurial universities. The arrangement was made by inductively arranging families of coded data and by deductively categorizing codes, using previous reviews on entrepreneurial universities and its design parameters as analytical frameworks (e.g. Handscombe, 2003; Gibb and Hannon, 2006; Rothaermel et al., 2007; Yusof and Jain, 2008; Guerrero and Urbano, 2012; Gajon and Urbano). Moreover, the elements defining entrepreneurial universities were classified into aggregate dimensions according to the nature of the organization's resources, capability, and strategy. Furthermore, these dimensions were separated into internal and external factors based on a meso-organizational level and following the conceptual model for entrepreneurial universities proposed by Guerrero and Urbano (2012).

A foundation for identifying archetypes was the arrangement of 176 coded attributes inductively identified in the 27 cases. These organizational attributes were coded and classified, generating 32 general organizational elements grouped into five internal and two external dimensions. As represented in table 1, internal dimensions are: structure, financial resources, human resources, tangibles, and intangibles. External dimensions are: environmental and contingency. Moreover, table 1 serves as our analytical framework by providing a general overview of the organizational attributes, elements, and dimensions that underpin the four identified archetypes, each of which in turn represents a distinctive cluster of single configurations derived from the synthesized case studies.

Factors	Dimensions	Elements	Atributes	Codes
Internal Factors	Structural	Governance	Bureacratic / Hierarchycal	SGbh
			Collegial / Decentralised	SGcd
			Managerial / Corporate	SGmc
			Entrepreneurial / Flexible	SGef
		Organization	Faculties	SOf
			Departments	SOd
			Institutes	SOi
			Schools	SOs
			Research centres	SOrc
			Rigid / Traditional structures	SOts
			Flexible / Novel structures	SOns
		Size	Large	SSl
			Medium	SSm
			Small	SSs
		Legal Form	Public	Slpu
			Public-Private partnership	SLpp
			Foundation	SLf
			Private	SLpr
		Transfer Structures	Research centres	STrc
			Transfer / Patent offices	STtp
			Incubators	STi
			Science Parks	STsp
			Conference centres	STcc
			Spin-offs	Stso
	Human Resources	Faculty	Academic	HFa
			Scientific	HFs
			Industry links	Hfi
			Research / technical	HFr
			Entrepreneurial / Role models	Hfe
			Flagship academics / entrepreneurs	HFf
		Steering Core	Autonomous	HSau
			Partly autonomous	HSpa
		Decision Making	Centralised	HDc
			Decentralised	HDd
		Management	Professional	HMp
			Academic	Hma
		Leadership	Strong leader	HLsl
			Collective leadership	HLcl
			Low leadership	HLll
		Industry	High cooperation / dedicated personnel	Hlhc
			Low cooperation / little to none dedicated personnel	Hllc
		Students	Positive attitudes towards entrepreneurship	HSTp
			Neutral or negative attitudes towards entrepreneurship	HSTn
			Strong alumni network / Industry	HSTsa
			Entrepreneurship role models	HSTer
	Financial Resources	Historical	Well-financed	FHw
			Underfinanced	FHu
		Diversification	Diversified	FDd
			Undiversified	FDu
		Source	Public	FSpu
			Private	FSpr
			Mixed / Multilateral / NGO's	FSmm
			Research / Project based	FSrp
			Knowledge transfer / Lisencing / Patenting	FSlp
			Knowledge Commercialisation / Spin-offs	FSso
		Public Budget allocation	High	FPh
			Medium	FPm
			Low	FPl
	Tangibles	Infrastructure	Research centres	TIr
			Transfer offices	TIt
			Incubators	TIi
			Science Parks	TIs
			Conference centres	TIc
		Location	Urban	TLu
			High-Tech clusters	TLh
			Industrial	TLin
			Isolated	TLis
		Technology	Industrial based	TTh
			Knowledge based, new economy	TTk
		Facilities	Teaching oriented	TFto
			Research oriented	TFro
			Transfer oriented	TFtr
			Student friendly	TFsf
			Industry friendly	TFif
			Above average facilities	TFaa
			Average or bellow facilities	TFba

Factors	Dimensions	Elements	Atributes	Codes
Internal5 Factors	Intangibles	Strategic(foci	Academic(/(scientific(excellence	ISas
			Commercialisable(basic(research	IScb
			Applied(research(programmes	ISar
			High:tech(transfer	ISht
			Market:oriented(graduate(education(/(in(cooperation(with(regional(businesess	ISmo
			In:job(training(programmes(/(Industry(cooperations	ISij
			Post:graduate(education(/(praxis(and(entrepreneurialy(oriented	ISpg
			Knowledge(transfer(/(industry(cooperation	ISti
			New(economy(/(knowledge(transfer(through(commercialisation(of(professional(services(/(consultings(/(training(/(counseling	IScc
			Knowledge(commercialisation(/patenting(/(spin:offs	ISkc
			Incubation(/(High(tech(venturing(/(	ISiv
			Marketable(innovations(/(Spin:ins	ISmi
		Incentive(structures	Meritocratic	IIm
			Performance(Based	IIp
			Goal(based	IIg
			Research(aimed	IIr
		Rewards(systems(	Rewards(academic(entrepreneuralism	IRSa
			Rewards(knowledge(transfer(and(commersialization	IRSk
			Does(not(rewads(transfer(or(entrepreneuralism	IRSn
		Entrepreneurial(Initiatives	Support(meassures(for(Start:ups	IEss
			Entrepreneurship(education	IEee
			Spin:off(incentives	IEso
			Spin:in(service(commercialisation	IEsi
			Patent(commercialisation(offices	IEpc
			Entrepreneurial(courses(for(faculty(and(staff	IEef
			Tailored(graduate(trainingship(programmes	IEtg
			Start:up(funding	IEsu
			Lisencing(agreements	IEla
		Reputation	Elite	IRe
			Strong	IRs
			Increasing	IRi
			Weak	IRw
		Networks	Regional	INr
			Global	INg
			Academic	INa
			Industry	INi
			Capital(markets	INc
			Government(/(Lobbying	INl
External5 Factors	Enviromental	Historical(Conditions	Long(trajectory(/(Tradition	EHl
			Short(trajectory(/(New	EHs
			Experimental(/(Pilot(proyect	EHe
			Teaching(university	EHt
			Research(University	EHr
			Applied(Sciences	EHa
			Technology(oriented	EHto
		Higher(education(market(	Competitive	EEc
			Non(competitive	EEnc
			Global	EEg
			Regional	EEr
			Local	EEl
		Politics	Public(policies(favour(regulation(and(academic(orthodoxy	EPfr
			Public(policies(favour(entrepreneuralism(and(competition	EPfe
		Community	Favours(entrepreneruship	ECfe
			Indiferent(towards(entreprenurship	ECie
	Contingency	Regional(economic(base	Industrial	CRi
			Service	CRs
			High(tech	CRht
			New(economy	CRne
			Small(and(medium(business	CRsm
			Global(enterprises	CRge
			High:growth(dynamic	CRhg
			Low:growth(sluggish	CRlg
		Legal(Framework(/(Public(policies(	Strongly(regulated(field	CLs
			Moderately(regulated(field	CLm
			Deregulated(field	CLd

Table 1: Identified attributes and analytical framework for archetype synthesis

Entrepreneurial-university archetypes

In our study, we found four archetypes of entrepreneurial universities derived from an empirical sample of 27 case studies. This study does not suggest that all entrepreneurial universities are convergent towards the four archetypes; instead, these are idealized types from specific arrangement of organizational attributes that together represent clusters of single organizational configurations having common attributes (as represented in Figure 2). Nonetheless, we do suggest that entrepreneurial universities will tend to converge non-lineally in the long run towards these configurational clusters, contingent on their path-dependency and baggage of internal factors, economic environment, socio-cultural and political influences, as well as the vision, leadership, and commitment of the academic faculty, steering core and various stakeholders. As Bunge (1996) suggests, 'real types are "impure" - that is, mixtures of ideal types' (p. 66).

Subsequently, we describe various design elements and environmental factors present in the following entrepreneurial universities archetypes found in the study: 1) 'Research-preneurial' or research driven archetype; 2) 'Techni-preneurial' or industry driven archetype; 3) 'Inno-preneurial' or innovation driven archetype 4) 'Commerce-preneurial' or knowledge commercialization driven archetype. In table 2, we portray a comparison of the main elements present in each archetype. Altogether we have synthesized the general organizational attributes (in table 1), resulting in 22 relevant elements that are grouped into five distinguishable dimensions: structures, human resources, financial resources, strategies, and external (in table 2).

Dimensions	Elements	**Research-preneurial** research driven	**Techni-preneurial** industry driven	**Inno-preneurial** innovation driven	**Commerce-preneurial** Commerce driven
Structures	Organization	• Faculties and departments • Traditional structures	• Faculties and departments • Traditional structures • Professional schools	• Project driven • Ad hoc – novel structures	• Faculties, institutes, research centers
	Governance	• Collegial and participatory	• Bureaucratic and hierarchical	• Entrepreneurial / Flexible governance promotes autonomy	• Managerial / Corporate governance. Hierarchical but allows for flexibility
	Transfer Structures	• Science parks • Research centers in cooperation with industry and government	• Strong formal and informal industry cooperation links • Patent and TTOs • Incubators	• Cooperation networks. • Consultancy, training, and Start-up support centers • Innovation Incubators	• Techno-parks • High-tech R&D centers • For profit firms (spin-offs) • Technology incubators
	Infrastructure	• Dedicated science labs basic research centers • Above average facilities	• Applied research and development centers • Training facilities	• Service oriented transfer and training centers • Student centered facilities	• Techno-parks. Conference and network centers • Sector specialized world-class facilities
	Legal Form	In general all archetypes strive for a legal form which would grant them more autonomy and flexibility			
Human Resources	Academic Heartland	• Scientific and academic faculty with strong research background	• Practice oriented faculty with strong links with industry	• Strong formal and informal links to professional service and knowledge firms	• Academics and scientist with strong research and technical background
	Steering Core	• Academic and partly dedicated managers • Centralized • Institutional leadership	• Academic and partly dedicated managers • Centralized • Personal leadership	• Professional and dedicated management • Decentralized • Collective leadership	• Professional and dedicated management • Decentralized • Institutional leadership
	Networks	• Academic • Industry • Government • Supra-national	• Academic • Industry / SMEs • Regional and national	• Professionals service firms • Entrepreneurs / SMEs • Peripheral knowledge and service providers • Private professionals	• Global network links with influential academic, business, financial and political interest groups • Regional and global
	Alumni Networks	• Cooperation in research and development	• Strong involvement in training and teaching	• Strong cooperation in consultancy and services • Alumni role models	• Cooperation and direct stakes in firms / start-ups • Flagship business leaders
Financial Resources	Public Funds	• High	• Medium	• Low to medium	• High to medium
	Budget Allocation	• Project based applied research. Joint-ventures	• Project based knowledge transfer and training	• Knowledge transfer projects. Marketable IP • Spin-ins, joint-ventures	• High-tech research and development. Start-ups • Spin-offs. Investment funds
	Income stream Diversification	• Partly diversified • Dependent on major governmental grants	• Partly diversified • Important multilateral, and funding from industry	• Well diversified • Important third party, private income streams	• Well diversified • Own income and third party funding. Licensing

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Table 2: Comparative synthesis of entrepreneurial university archetypes

Dimensions	Elements	**Research-preneurial** research driven	**Techni-preneurial** industry driven	**Inno-preneurial** innovation driven	**Commerce-preneurial** Commerce driven
Strategies	Strategic Focus	• Academic excellence • Knowledge advancement • Differentiation through high standards / Elite	• Incremental research • Cooperation with industry • Regional support and economic development	• Service innovations • Innovative education • Customer orientation	• High-tech R&D and product development • Commercialization of academic knowledge • Self sustainability
	Mission	• Academic excellence • Basic and applied research	• Training and teaching • Cooperation and transfer • Incremental innovations	• Innovations • Intellectual property • Professional services	• Knowledge commercialization • Disruptive innovations • Marketable products and services
	Entrepreneurial Initiatives	• Basic and applied research initiatives in cooperation with industry and government	• Tailored educational and training programs in cooperation with industry • Entrepreneurship education, advise	• Consultancy services • Patenting, licensing, innovation transfer offices • Joint-ventures and incubators. New economy	• Business venturing, TTOs, Incubators, • Start-up funds, spin-offs
	Techno-orientation	• Basic and applied • Knowledge creation	• Incremental. Innovations • Applied technical expertise	• Service and knowledge intensive industries	• High-tech: mainly applied • Disruptive innovations
	Incentive structures	• Academic meritocracy • Research based cooperation with industry • Research grants attainment	• Technology transfer • Training and teaching • Cooperation with industry • Technical innovations	• Knowledge innovations • Customer satisfaction • Service offers	• Academic and technical meritocracy • Knowledge commercialization • Venture creation
	Image	• Long trajectory in research and teaching • Academic excellence • Tradition and reputation	• Important trajectory in applied-science and teaching • Strong reputation and networks with local industry	• New pilot project Evolution from technical to knowledge intensive • Forced reinvention • Erratic trajectory	• Innovative research university with strong cooperation with industry • Strong image, public relations and lobbying
External	Developmental periphery	• Industrial • Global enterprises • Research intensive industries (ex. life sciences)	• Strong industry base, technical, engineering • SME's, regional and some global players	• Knowledge intensive • Innovation clusters • Creative industry • New economy	• High-tech industries • Leading global firms in the field of expertise
	Higher Education Market	• Very competitive • National or global	• Not very competitive, regional niche • Regional and national in some cases dependent on field of expertise	• Competitive • Regional or national	• Very competitive • Global
	Socio-political attitudes	• Favor academic orthodoxy and formalities • University as knowledge originator and provider • Moderate involvement with university	• Favor practical knowledge • University as technical innovator supports industry • High involvement and cooperation with university	• Favor student consumerism • University as knowledge service provider for clients • Moderate involvement with university	• Favor competition and deregulation • University as for profit economic actor • High involvement and cooperation with university
	Public Policies	• Although country specific, in general public policies favor competition and deregulation in the higher education sector • Performance indicators and output measures aimed at assessing return on investment in higher education • Publicly funded knowledge transfer projects and programs supportive of entrepreneurial activities in higher education			

Table 2 cont.: Comparative synthesis of entrepreneurial university archetypes

A 'research-preneurial' archetype can be described as a research-driven university. Its main mission is the advancement of knowledge and academic excellence. It is structurally characterized by its collegial and participatory governance structures, supported by public policies and socio-cultural attitudes that favor knowledge, expertise, and academic meritocracy. It is traditionally structured into faculties and departments with dedicated knowledge-transfer structures. Among those, research centers and science parks in cooperation with public and for-profit organizations are an essential characteristic of this archetype. Most faculty members have a solid scientific and basic research background, emphasizing cooperative joint research projects, either with industry or government/research foundation funds. Financial resources are partly diversified, but most income streams flow from public and multilateral research funds; however, these are project-based and mainly with an applied perspective in cooperation with industry. Universities corresponding to this archetype possess dedicated hi-tech research facilities thanks to state funding and direct private investment from stakeholder firms. Strategic initiatives focus on achieving the highest academic and research standards and developing leading expertise in a specific field of research. Accordingly, incentive structures and rewards systems aim to foster elite recognition among peers of the scientific community. In this regard, incentive systems emphasize transferable scientific discoveries, which also serve practical purposes in addition to the advancement of knowledge. Thus, a strong emphasis is placed on developing and maintaining university-industry networks and lobbying for research funds for applied research projects. Path dependency plays an essential role in defining the archetype with which a specific university tends to comply. Consequently, research-preneurial archetypes are universities with a long tradition in research and teaching, and a strong reputation in academic and scientific excellence. These entrepreneurial universities usually benefit from public policies favoring scientific excellence and academic specialization as the basis for industrial and technological advances. Examples of this archetype are Stanford University, Technical University of Munich, University of California at Berkeley, and Universidad Católica of Chile, among the nine entrepreneurial universities comprising the research-driven entrepreneurial archetype cluster.

The 'techni-preneurial' archetype is steered by its technical expertise and a focus on applied sciences, seeking to serve and support surrounding industries through the transfer of specialized knowledge and technical training. This type of organization plays a vital role in developing and sustaining a robust and dynamic regional economy, for instance, by way of incremental innovations and through technical cooperation and training programs jointly developed with regional industry and public authorities. A traditional applied science university

has initiated its entrepreneurial path together with government support and strong cooperation between its academic staff and regional enterprises. This strong link between academic staff and industry partners is paramount to the techni-preneurial archetype as formal and informal networks with regional businesses form the essence of the entrepreneurial characteristics of this archetype. Flagship entrepreneurs and regional industry experts usually form part of the faculty. Partly autonomous and centralized management allows for a harmonic symbiosis between a traditionally collegial and a goal-based managerial administration. Funding is partly diversified, but still, most financial resources come from public sources. Nonetheless, consultancy services and tailor-made training programs become an essential income stream for this technically oriented entrepreneurial university. In this regard, technology transfer departments, entrepreneurship training facilities, as well as consulting offices, and multi-purpose rental facilities form part of the important entrepreneurial infrastructure of this organization. The strategic focus provides technical and academic support for regional industry, delivering market-oriented graduate education, and tailor-made technical training in cooperation with industry partners. Incentive structures reward applied scientific research and teaching along with on-the-job training programs and entrepreneurship education. This type of university has a strong regional reputation and support. A history as a university of applied sciences and a strong focus on technical need-based training are common defining elements of this entrepreneurial archetype. Also, a solid support from regional small and medium-size enterprises and strong staff and student involvement are environmental factors crucial for supporting entrepreneurial initiatives started from within the organization. A moderately regulated higher-education field, which promotes competition, entrepreneurialism, and cooperation with industry, is necessary for supporting the internal organizational structures of this type of university. Among the case studies, we can mention University of Joensuu, University of Waterloo, and Hamburg University of Technology, among the five entrepreneurial universities that form part of this industry-driven group.

An ‘inno-preneurial’ is a service-oriented university that pursues knowledge innovations and customer-oriented entrepreneurial endeavors. This type of university adapts to market characteristics and external surroundings through novel internal changes and structural flexibility. Thus, it portrays project-driven and ad-hoc structures as well as flexible and autonomous governance practices. Schools and interdisciplinary institutes foster service-driven innovations and knowledge transfer oriented toward problem-solving. We find various entrepreneurial structures such as incubators, intellectual property, and transfer offices.

Additionally, we can observe some novel service structures, for instance, consultancy departments and privately sponsored professional schools with tailor-made teaching and training programs. This type of university has strong formal and informal links with professional services and other knowledge-intensive firms, strengthening cooperation projects and widening opportunities for knowledge commercialization activities. Innovation, service, and problem-solving orientation are fostered through interdisciplinary research projects and well-nurtured cooperation networks with industry, local government, and communities. Professional management is autonomous and decision-making centralized. Financial resources are well diversified and income streams from private partners are important. The inno-preneurial archetype engages in knowledge-commercialization activities such as consultancy and business services, intellectual-property commercialization, and applied research projects carried out together with external cooperation partners. Thus, we can label this archetype as a service-oriented university, focusing on tailored teaching, training, and transfer activities.

Also, formal and informal services innovation and knowledge transfer are embedded in performance-based incentive structures. The innovation-driven archetype benefits from public-funding programs and private sponsorships to promote entrepreneurialism and knowledge-based regional development. The public policies and legal framework that influence this model tend to favor autonomy and active involvement of higher-education institutions in economic development and commercial activities. We notice that this type of university tends to be located in larger urban areas or knowledge-intensive clusters in which innovation, research transfer and consultancy services are more valued. Among the case studies analyzed, we found six converging within the inno-preneurial cluster, including Warwick University, Copenhagen Business School, and University of York.

The fourth archetype is the ‘Commerce-preneurial’, which is driven by entrepreneurialism focused on knowledge commercialization and sector-specific hi-tech research, seeking to capitalize on disruptive innovations and marketable products and services. Academic and scientific staff have strong links with, and cooperate with, industry in applied research projects and hi-tech start-up venturing. The institutions are characterized by novel and flexible but complex structures, such as faculties, departments, research, and transfer institutes, as well as business units, incubators, technology parks with cooperation partners, and spin-off businesses. The commerce-preneurial university also engages in start-up investment, intellectual-property capitalization, hi-tech capital venturing, and service enterprises, together with more knowledge-intensive professional services such as consultancy, mentoring, institutional advice, and project management. The steering core is professional, autonomous,

and empowered through managerial governance structures and strong leaders in key steering positions. This allows for a centralized performance-based organization with flexible and participatory strategic decision-making. Funding streams are well-diversified, relying less on direct government funding and more on market-oriented project funding from various private and public sources. This archetype engages in start-up incubation and funding, harvesting links and networks with corporate and venture capitalists, as well as seed-funders and entrepreneurs. Patenting, licensing, spin-offs, and joint ventures, along with property investment and venture funds, are among the various entrepreneurial and commercial activities in which this type of university engages. Primarily located in knowledge-intensive urban areas and technology clusters, the developmental periphery of the commerce-preneurial archetype is characterized by top-notch hi-tech research centers and information technology facilities, where the university engages in hi-tech basic and applied research, in cooperation with industry, government, and multilateral cooperation partners. Global cooperation networks with industry, public sector financial, and research communities are essential and thus well developed, supported and maintained by this type of university. The university engages actively in lobbying activities to ensure funds and policies that support its research, transfer and commercial agendas.

Also, important emphasis is laid on public relations and marketing, aiming at developing symbolic capital and a strong image. This entrepreneurial university is usually an evolution of traditional elite research universities with a long history of academic excellence and cooperation with industry in technological developments. It is located in regions where policies favor deregulation and competition in the university field and where community attitudes toward entrepreneurship are favorable. Moreover, global firms and hi-tech start-ups tend to be physically located in the surroundings, actively cooperate with the university, and benefit from its entrepreneurial endeavors. Among the cases analyzed in this meta-synthesis, seven were found to be within the knowledge-commercialization archetypical cluster; the list includes Twente University, Bandung University of Technology, and Waseda University in Japan.

In general terms, the meta-synthesis shows that the dominant legal framework and the regional industrial base exert an important influence on the archetype encountered. In addition, factors such as legal policies, socio-political attitudes and the competitiveness of the higher-education market influence the structures and strategies found in each individual case. Moreover, there seems to be an important relationship between the organizational heritage and the type of entrepreneurial university, suggesting a path dependency for the individual configurations, which are reflected in the archetypes. For instance, traditional research universities tend to display attributes pertaining to the cooperative research archetype. In

contrast, technical and applied-science universities tend to conform to the technical archetype. However, as clarified in the methodology section, it is essential to point out that this study did not consider the temporal dimension, focusing mainly on identifiable static characteristics. In this regard, further empirical research would contribute to determining how path dependency and contingency, and environmental factors underpin the set of internal attributes adopted by each entrepreneurial university.

DISCUSSION

Studies on the entrepreneurial university have become a lively research field, which predominantly pursues its investigations by using a qualitative case-based research strategy. Regrettably, the cumulative evidence from these cases on the nature and forms of the entrepreneurial university has not yet been systematically analyzed. This study therefore makes a dual contribution. First, we suggest a very different method that helps to generate cumulative evidence available from case study research. Our approach follows a recent call from Rauch et al. (2014) to use "a systematic synthesis of case studies to aggregate the findings of qualitative research". By analyzing patterns of organizational forms and practices from numerous case studies, our qualitative meta-synthesis facilitates the integration, clustering, and reflection of earlier case-based research into idealized types of entrepreneurial universities, here defined as archetypes, which allows for a detailed and generalizable classification from empirical cases in the field. Second, the results of our study contribute to a more comprehensive understanding of the nature of the entrepreneurial university. We identified four differentiated archetypes of entrepreneurial universities, naming them in accordance with their underlying strategic intent: 'research-preneurial' or research driven; 'techni-preneurial' or industry driven; 'inno-preneurial' or service-innovation driven; and 'commerce-preneurial' or knowledge-commercialization driven. In the following part of this discussion, we reflect on the research implications and limitations of our study.

From heterogeneity back to commonalities

In general terms, our meta-synthesis shows that some of the identified elements play a more preponderant role in driving the entrepreneurial transformation, even having the potential to influence its mission and strategic core. In this regard, internal actors such as managers and academics are crucial to the accomplishment of the entrepreneurial shift. Also, diversified funding is paramount because it contributes to the accomplishment of institutional autonomy

from the state and its politically influenced resource-allocation policies (Clark, 1998). Moreover, managerial and entrepreneurial governance structures are important enablers to support the entrepreneurial transformation. Interestingly, we did not find a dominant governance structure across archetypes supporting the entrepreneurial transformation. Rather, we found a broad range of different viable governance forms such as collegial, managerial as well as entrepreneurial governance (see Harlacher and Reihlen, forthcoming). Furthermore, performance-based incentive structures that reward entrepreneurial activities tend to encourage applied innovations and knowledge-commercialization activities (Debackere, and Veugelers, 2005). Additionally, a professional management with autonomous decision–making authority and leadership roles directs and sustains a focus on entrepreneurial activities as the strategic priority for the organization (Middlehurst, 2004). Likewise, organizational structures and tangible infrastructure such as business incubators and technology-transfer offices are strong support mechanisms in knowledge-commercialization activities, such as start-up formation, joint ventures, spin-offs and spin-ins (Link and Scott, 2005; D'Este and Patel, 2007). In addition, entrepreneurship training aimed at improving faculty and student skills helps to promote creative thinking and innovations (Kirby, 2004). Finally, location plays a preponderant role in defining entrepreneurial activities of universities, as distance to knowledge and industrial cluster influences the extent of cooperation with industry and the extent of engagement in entrepreneurial and commercialization activities (Siegel et al., 2003; Fini et al., 2011).

University entrepreneurialism and institutional complexity

Entrepreneurship is a social institution based on specific social values, norms, and a social order (Brandl and Bullinger, 2009; Jennings et al., 2013). Particularly, we see entrepreneurialism in higher education as a strategic choice to engage in innovative and entrepreneurial activities, in response to changing socio-cultural expectations about the role of modern universities in the broader economic context and society in general. This entrepreneurial drift in higher education is closely related with the rise of managed education, which based on a market ideology that fosters autonomy and competition, has led to policy changes and reform of higher education systems in most western countries (Reihlen and Wenzlaff, 2014). Our study suggests that the institutional shift towards academic entrepreneurialism does not, however, represent uncontested prescriptions for change and adaptation on the organizational level, as we recognize the emergence of more diverse organizational responses than traditionally assumed (e.g., Münch, 2011).

From an institutionalist perspective, the rise of different entrepreneurial forms and practices in higher education raises an interesting question. What institutional sources account for these variations in entrepreneurial forms and practices? In other words, universities under the regime of managed education do not follow universal field-level isomorphic pressures that result in very similar organizational adaptations, but rather display heterogeneous responses. One explanation why this may be the case is the institutional complexity hypothesis, which is enjoying increasing popularity among institutionalists. In this regard, Greenwood et al. (2011) explain that 'organizations face institutional complexity whenever they confront incompatible prescriptions from multiple institutional logics' (p. 318) such as the logics of science and of commerce. Our research provides further tentative support for this argument, and indeed extends it.

The results of this study suggest that under the regime of managed education, four different logics drive the nature of the entrepreneurial university – researching, industrialization, servitization and commercialization. We also showed how these logics have been translated and incorporated into different organizational features on the organizational and intraorganizational levels. Even so, future research into the entrepreneurial university should study the differences between these logics and how they are enacted, reproduced, or changed on the organizational and intraorganizational levels. As Greenwood et al. (2014) suggest, 'the central themes in institutional analysis – "institutional logics" – clearly point to the expectation that organizations will exhibit differences. From this perspective, the presumption should be of organizational difference, not similarity, and the guiding framework should be comparative analysis.' Following this plea will contribute to a deeper understanding of the institutional sources and underpinnings of different entrepreneurial forms and practices in higher education.

Limitations and suggestions for further studies

Among the limitations of our study, firstly we would like to discuss a potential for self-selection bias in our sample. A self-selection bias arises from the use of non-random samples to assess (Heckman, 1979; Shehata, 1991), in our case, the entrepreneurial behavior of universities. We included cases of universities that were self-identified by other scholars as entrepreneurial universities (see appendix 1). This can be considered as a limitation of our study because different researchers may have applied different criteria for what can be considered an entrepreneurial university, thereby generating inconsistent results. However, the findings of our study can also be interpreted from a different point of view. Social constructivism claims that all social facts are constructions of 'meaning communities' (see Bunge, 1996; Crotty, 2003).

Meaning is socially constructed in discourse. In this view, an entrepreneurial university is a phenomenon which is not objectively out there, but is constituted and reconstituted in discourse and thus becomes a social convention – a shared and negotiated understanding of what is meant by the idea of an entrepreneurial university. The four archetypes we found in our meta-synthesis of existing cases represent the different connotations and meanings that scholars associate with the concept of the entrepreneurial university. As such, our study represents different types of 'social constructions' of entrepreneurial universities.

Another limitation concerning the cross-sectional meta-study refers to the subjectivity of the case studies used as primary sources of data. Our data sample consists of qualitative studies with differing research objectives and foci of analysis. Likewise, the broad chronological range and various levels of analysis as well as potential interpretative biases of the studies' authors constitute potential pitfalls that call for further studies. Therefore, multilevel and longitudinal studies, which analyze changes in time among comparable units of studies, can further contribute to a broader understanding of how university structures evolve over time, in relation to changing environmental factors and expectations from various stakeholders.

Overall, research on entrepreneurial universities can clearly benefit from more comprehensive studies that go beyond methods commonly used in the field. As current research into academic entrepreneurialism and entrepreneurial universities further develops beyond single-case studies and historical analyses, we call for more complex studies in the area. Likewise, analysis and synthesis of the rich but dispersed case data would help build upon accumulated knowledge in the field, thus promoting a more systemic understanding of the elements, actors, process and environmental factors influencing emergent changes in the higher-education field across the globe. Also, longitudinal and cross-sectional studies would further contribute to our understanding of dynamics and contextual elements involved in the emergence of entrepreneurialism in higher education. Finally, interdisciplinary research efforts and multiple methodological approaches across various levels of analysis will further push academic knowledge in the field to go beyond understanding specific elements of individual and isolated cases of entrepreneurialism in universities, thereby helping to generate generalizable and applicable knowledge that would benefit not only scientific understanding, but also practitioners, policy makers, and stakeholders in the fields of knowledge commercialization, transfer, academic entrepreneurialism and higher education in general.

CONCLUSION

The underlying assumption of this research is that there is no single model or one best way to the entrepreneurial university. Instead, its environmental contingencies, path dependency, and unique structures, systems, and cultures affect the emerging type of entrepreneurial university. We argue that just like other groups of organizations in particular institutional fields, we might expect to see entrepreneurial universities converge into a few differentiated archetypes that display similar organizational attributes. We analyzed several empirical case studies, using grounded theory as our qualitative analytical approach, in order to identify and describe different archetypes of entrepreneurial universities, following configuration and archetype theory as our conceptual stance (Meyer et al., 1993; Miller, 1987a, 1996; Miller and Mintzberg, 1983; Mintzberg, 1979; Weber, 1978).

The identification of entrepreneurial-university archetypes contributes to a more comprehensible understanding of the elements, structures, and strategies that shape emergent higher-education institutions. By describing emerging patterns from a heterogeneous set of case studies, this research facilitates the arrangement of entrepreneurial universities into idealized clusters of homogeneous configurations. Hence, this qualitative meta-synthesis helps to overcome the context-dependency and non-generalization issues associated with single-case studies. Furthermore, archetypes can serve as conceptual tools for practitioners in designing, steering, and foreseeing organizational development in their organizations.

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APPENDIX

	Authors, Year	University Case Study	Country
1	Clark, 1998	Warwick University	England
2	Clark, 1998	University of Joensuu	Finnland
3	Clark, 1998	Twente University	Neatherlands
4	Clark, 1998	University of Strathclyde	Scotland
5	Clark, 1998	Chalmers University of Technology	Sweden
6	Kristensen, 1999	Copenhagen Business School	Denmark
7	Etzkowitz, 2003	Stanford University	USA
8	Bernasconi, 2005	Universidad Católica of Chile	Chile
9	Yokoyama, 2006	Waseda University	Japan
10	Martinelli, Meyer & von Tunzelmann, 2007	Sussex University	England
11	Guerrero & Urbano 2007	Autonomous University of Barcelona	Spain
12	Huggins, Jones & Upton, 2007	Cardiff University	Wales, UK
13	Azele, Meyer & van Pottelsberghe, 2008	Université Libre de Bruxelles	Belgium
14	Bramwell & Wolfe, 2008	University of Waterloo	Canada
15	Zhou, 2008	Northeastern University in Shenyang	China
16	Berger, 2008	Technical University Munich	Germany
17	Ma, 2008	University of California at Berkeley	USA
18	Crow, 2008	Arizona State University	USA
19	Wissema, 2009	University of Rousse	Bulgary
20	Wissema, 2009	Bandung University of Technology	Indonesia
21	Prausse, 2011	Wismar University	Germany
22	Dodgson & Staggs, 2012	Queensland University	Australia
23	Goddard, Robertson & Vallance, 2012	Newcastle University	England
24	Vorley & Nelles, 2012	Hamburg University of Technology	Germany
25	Avotins, 2012	Ventspils University College	Latvia
26	Uvarov & Perevodchikov, 2012	Tomsk State University	Russia
27	Minguillo & Thelwall 2013	University of York	England

Appendix 1: Selected case studies on entrepreneurial universities

"Be great in act, as you have been in thought."

– William Shakespeare