



From technological to social innovation: toward a mission-reorientation of entrepreneurial universities

Matthias Menter¹ 

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Abstract

Social innovation has increasingly become an issue of policy and particularly given the policy focus on societal grand challenges. As anchor institutions, the challenge for entrepreneurial universities is to effectively respond and contribute to both technological and social innovation through knowledge and technology transfer. The current conceptualization of entrepreneurial universities is predominately focused on technological innovation. This paper argues for a mission-reorientation of entrepreneurial universities that extends the current technological innovation based conceptualization to incorporate social innovation that effectively addresses environmental and societal challenges and responds to calls in the society for more sustainable and inclusive growth. While current business models that underpin entrepreneurial universities and underlying knowledge and technology transfer mechanisms mainly incentivize the commercialization and transfer of economic knowledge, an incorporating of social dimensions of innovation allows the conceptualization of a broader and more extensive role of entrepreneurial universities.

Keywords Entrepreneurial university · University mission · University business model · Social innovation · Technological innovation · Public sector entrepreneurship

JEL classification O30 · O35

1 Introduction

Economic growth has been one of the main goals of politics for the last decades. Especially in developed countries, technological innovation has thereby been perceived as a main driver of economic growth and hence has constituted a core policy target (e.g., Hasan & Tucci, 2010). Policy makers have tried to enhance innovation activities both in the private as well as in the public sector by implementing far-researching legislative changes, triggering

✉ Matthias Menter
matthias.menter@uni-jena.de

¹ Faculty of Economics and Business Administration, Friedrich Schiller University Jena, Carl-Zeiß-Straße 3, 07743 Jena, Germany

among others a paradigm shift in the higher education landscape (Cunningham et al., 2019, 2021). In the context of universities, policy fostered a shift of the role of universities from knowledge accumulators to central actors of technological innovation. This can be seen for example by the prominent Bayh-Dole Act of 1980 (see Leyden & Link, 2015), strengthening universities' so-called 'third mission', that is, the commercialization and transfer of economic knowledge, leading to the emergence of so-called 'entrepreneurial universities' (Etzkowitz, 2003; Guerrero & Urbano, 2012).

This growth paradigm "was convenient for the mid-twentieth century 'empty' world with abundant ecological resources" (Schmelzer, 2015: 270). However, in the present time, policy makers are increasingly concerned about the growing inequality between but especially within countries, environmental and societal challenges reflecting the so-called grand challenges that "are pressing social and environmental issues that transcend national borders and have potential or actual negative effects on large numbers of people, communities, and the planet as a whole" (Wettstein et al., 2019: 54). Striving for a balance between economic and ecological systems, multiple concepts such as 'circular economy', 'degrowth', 'post-growth', 'green growth', and 'doughnut economics' have been discussed (Belmonte-Ureña et al., 2021; Raworth, 2017). In this light, questions such as what should be understood as progress, and who benefits and who bears the costs, are moving into focus. Therefore, the call for more inclusive growth strategies, focusing not only on economic growth but on further dimensions, e.g., social, societal, and ecological aspects, has received increasing attention. Hence, a rethink of innovation policy and public sector entrepreneurship toward more inclusive policy strategies seems to be inevitable (Giuliani, 2018; Schot & Steinmueller, 2018).

In this context, particularly the concept of social innovation has attracted the interest of policy makers, aimed at accelerating (beneficial) social, societal, and ecological values. Social innovations thereby address changes in individual and collective behavior and cope with problems associated with social welfare distribution and imbalances in social structures, hence address core societal needs (Kuhlmann & Rip, 2018). Nicholls et al. (2015: 23) consequently subsume that social innovation "offers the potential to bring about substantive changes in the alignment of resources, policy and societal structures to address the major issues of modernity across many different countries".

As with technological innovation, universities contribute to social innovation and the associated social development and social change (Carl & Menter, 2021). Social contributions of universities might thereby stem from the university-community engagement including community-based research and community-service learning (Hall, 2009), the provision of knowledge and know-how (Benneworth & Cunha, 2015), the problematization of established practices, challenging prevailing social institutions and leading to a change in behavior and attitudes and the development of new norms (Neumeier, 2012), the promotion of community development and wider collaborative networks (Benneworth, 2013), and the collaborative sourcing and development of novel solutions to societal and environmental challenges (Arocena & Sutz, 2021). Against this background, there is a need to reconsider the third mission of universities. This paper calls for a mission-reorientation of entrepreneurial universities and conceptualizes the influence of universities' business models and their impact on social innovation, considering the underlying knowledge and technology transfer mechanisms. Given the changing needs of universities' stakeholders, universities need to modify their missions and underlying business models (Miller et al., 2014, 2021)

and shift or broaden the scope of the third mission from pure technological innovation to further, e.g. social, societal, and ecological dimensions. In this context, the question arises what approaches universities need to adopt for developing adequate business models to support the university mission shift and how knowledge and technology transfer processes need to be shaped and designed to enable the emergence and diffusion of social innovations.

Very little has been done on social innovation in general, since it is relatively new on the research agenda and, additionally, it is very challenging to measure social innovation empirically (Bund et al., 2015; Krlev et al., 2014). Existing approaches on social innovation are very heterogeneous, leading to a lack in cumulative or comparable insights (Rawhouser et al., 2019). Even a clear demarcation of social innovation is missing. While some authors describe social innovation as improved methods or opportunities for collaboration (e.g., Neumeier, 2012), others define it as innovations that are motivated by creating social value which is mostly done by organizations that aim to satisfy social needs (e.g., Mulgan et al., 2007). However, what almost all studies have in common is the rather comprehensive approach to cover all types of societal change, whether embodied in products, services, markets, or processes (Bund et al., 2015; Caulier-Grice et al., 2012; Moulart et al., 2005; Westley & Antadze, 2010).

Universities obviously can contribute to social innovation since they tackle numerous social dimensions through teaching, research, and transfer activities. Hence, they are providing a knowledge base and, consequently, increase the potential and opportunities for social innovation. This paper investigates how universities may contribute to social innovation and which changes are necessary to adopt a social innovation paradigm. The role that universities' business models play will be considered and corresponding approaches that universities use in developing new business models supporting the university mission change will be examined. Particular focus will thereby be put on underlying knowledge and technology transfer mechanisms, affecting the creation of social innovations.

The contribution of this paper is threefold. First, this paper extends the rather narrow focus of existing studies on the role of universities in fostering innovation and economic development (Audretsch et al., 2014; Bercovitz & Feldman, 2006; Cunningham et al., 2019). Whereas prior studies have mainly addressed issues related to technological innovation, this paper emphasizes the need for a mission-reorientation of entrepreneurial universities incorporating also the social dimension of innovation, thus extending the narrow focus on technological innovation. Second, the consideration of changing university business models and underlying knowledge and technology transfer mechanisms allows the conceptualization of a broader and more extensive role of entrepreneurial universities. On the one hand, adopting a social innovation paradigm allows entrepreneurial universities to more effectively respond to calls in the society, ultimately fostering sustainable economic growth and social welfare. On the other hand, this adoption requires changes in prevailing knowledge and technology transfer mechanisms and structures. Third, this paper conflates literature streams on entrepreneurial universities and social innovation, opening up multiple fruitful and promising avenues of future research. The developed conceptual framework helps to understand the various linkages between the university context, university strategy, university outputs, and social outcomes. Taking a social innovation perspective thereby enables transdisciplinary approaches, enriching and complementing the current scholarly debate on entrepreneurial universities.

The remainder of this paper is structured as follows. The next section describes the role and missions of entrepreneurial universities, considering the underlying university business models. Section 3 discusses the concept of social innovation as a complementary dimension to technological innovation. Section 4 examines the necessary reorientation of universities' third mission to adopt a social innovation paradigm. A final section concludes and outlines future avenues of research.

2 Entrepreneurial universities and university business models

Research on the topic of entrepreneurial universities has a rather long tradition, with first studies dating back to the late 1990s and early 2000s, highlighting the paradigm shift that occurred within universities, extending their missions beyond teaching and research toward the commercialization and transfer of newly generated economic knowledge (Clark, 1998; Etzkowitz & Leydesdorff, 2000; Laredo, 2007). Since then, scholars have focused on a broad range of themes, ranging from the adoption of an entrepreneurial paradigm (Etzkowitz et al., 2000) to an analysis of university missions, strategies, and underlying tensions (Philpott et al., 2011), university business models (Miller et al., 2021), technology transfer activities (Cunningham & O'Reilly, 2018), entrepreneurship education (Arranz et al., 2019), the changing roles and expectations of universities (Audretsch, 2014) and their impact on economic growth and social development (Klofsten et al., 2019). The unifying link of most of these studies is the strive for a better understanding of entrepreneurial universities' evolution over time and their impact on the economy and society. Studies thereby converge with the idea that entrepreneurial universities play a crucial role in knowledge-based economies by creating and disseminating knowledge and striving for its commercialization through distinct knowledge and technology transfer mechanisms, enabling and fostering innovation within and beyond their academic boundaries (Audretsch, 2014) and confirm their impact on economic growth (Guerrero et al., 2015).

Consequently, literature on entrepreneurial universities has to a large extent dealt with individuals, support mechanisms, processes and structures, the organizational architecture, organizational practices and culture, as well as the entrepreneurial context, facilitating and encouraging entrepreneurial endeavors within academic institutions, hence boosting the commercialization of research outcomes (Cunningham et al., 2022; Fitzgerald et al., 2021; Guerrero & Urbano, 2012; O'Shea et al., 2007; Siegel et al., 2003). Within this strand of literature, limited studies have focused on university business models, i.e. the underlying rationale how value within the university is created, delivered, and captured (Audretsch & Belitski, 2021; McAdam et al., 2021). Business models describe the logic of an organization and reflect an organization's realized strategy (Casadesus-Masanell & Ricart, 2010; Chesbrough & Rosenbloom, 2002; Zott et al., 2011). Hence, business models define allocations of resources and configurations of activities, thus outline the design or architecture of value creation, delivery, and capture mechanisms (Teece, 2010). Miller et al. (2014) examine the evolution of university business models over time and differentiate between the traditional university business model, the transitional university business models, and the evolving university business model.

The traditional university business model focused on the core missions of universities: teaching, research, and knowledge dissemination (Rasmussen et al., 2006). Although indus-

try was considered as a key stakeholder, the university-industry interaction was limited. Policy makers mainly considered universities as providers of skilled labor and creators of new knowledge. It was not until the 1990s that this image of universities slowly changed (Etzkowitz & Leydesdorff, 2000). Policy makers started to realize the great potential of universities and encouraged them to play a more active role in society. Leydesdorff and Etzkowitz (1996) conceptualized this shift in their triple helix model, describing the mutual interdependencies and relations between universities, industry, and government. Thus, the transitional university business model emerged. Over time, these described interactions were both intensified and professionalized, along with the definition of (formal) knowledge and technology transfer processes and the establishment of mediating institutions such as university technology transfer offices (Bradley et al., 2013; Debackere & Veugelers, 2005). In addition, universities fully adopted an entrepreneurial paradigm, thus changing their core value proposition; academics were now urged to commercialize their created knowledge through patenting or spin-off creation. Hence, the evolving university business model was ultimately implemented. The transition toward an entrepreneurial university is reflected and reinforced in a change of the university business model. Or in other words, the underlying vision and fundamental purpose of a university is defined by its university business model, guiding academics and the university community toward a certain direction. Currently, implemented university business models mainly encourage academics to engage in entrepreneurial activities, commercialize their research, and foster technological innovation, almost neglecting the social dimension of innovation.

To further analyze and understand the underlying knowledge and technology transfer processes and mechanisms in the context of university business models, a promising stream of literature has focused on university technology transfer business models, enabling universities to create and capture economic value from science. As different types of knowledge and technology transfer exist, a common differentiation is made between formal knowledge and technology transfer mechanisms (e.g., patenting, licensing, contract research) and informal knowledge and technology transfer mechanisms (e.g., academic/ industrial consulting, collaboration with industry personnel, joint publications with industry scientists), with different modes of interactions ultimately resulting in different outcomes (Bradley et al., 2013; Grimpe & Hussinger, 2013; Schaeffer et al., 2020). Considering these modes of collaboration, Baglieri et al. (2018) identify four types of technology transfer business models: (1) Mode 1 (catalyst) refers to universities putting particular emphasis on disruptive innovation, (2) Mode 2 (smart bazar) refers to universities disseminating science and engaging with society, (3) Mode 3 (traditional shop) refers to universities promoting patenting without any targeted stakeholder group, and (4) Mode 4 (orchestrator of local buzz) refers to universities acting entrepreneurially and encouraging the creation of academic spin-offs. University technology transfer business models may thus be considered as an activity system (McAdam et al., 2017), whereby university managers select certain design elements and themes that align with the overall university strategy. McAdam et al. (2021) thereby emphasize the value of portfolio business models, allowing for flexibility in addressing diverse stakeholder needs. It is yet important to note that current university business models have a predominant focus on economic considerations and technological innovations, almost neglecting the social dimension of innovation.

3 From technological to social innovation

Technological innovation is considered as a key engine for economic growth and prosperity (Hasan & Tucci, 2010). This perspective has served society well in past decades, however, has more recently been questioned due to the increasing awareness that not all members of the society participate equally from created wealth. For example, Howaldt et al. (2016: 26) argue that technological innovation “encounters limitations when it comes to resolving pressing social challenges”. Especially in the context of the grand challenges, i.e. major transnational societal problems that are affecting large numbers of people (Wettstein et al., 2019), policy makers have therefore tried to set up inclusive growth strategies that address not only economic but also social aspects to reduce societal inequalities (see George et al., 2012). As a result, social innovation has moved on the political agenda that is meant to overcome social market failures¹: “Social innovation is distinct from economic innovation because it is not about introducing new types of production or exploiting new markets in itself but is about satisfying new needs not provided for by the market (even if markets intervene later) or creating new, more satisfactory ways of insertion in terms of giving people a place and a role in production” (OECD, 2011).

Despite social innovation being a rapidly growing research field, it is a fuzzy concept characterized by conceptual ambiguity and a diversity of definitions (Van der Have & Rubalcaba, 2016). Scholars yet agree that the recognition of unmet social needs, followed by the creation of potential solutions to tackle these observed problems are the antecedents of social innovation (e.g., Mulgan et al., 2007; Dawson & Daniel, 2010). In this context, universities are perceived as central actors within the social innovation process as they create and provide (new) knowledge as well as bridge existing knowledge gaps (Benneworth & Cunha, 2015) and thus contribute to the development of social innovations. The role of universities in social innovation processes can thereby be described as knowledge creators and disseminators which is striking similar to their role in technological innovation processes (Bercovitz & Feldmann, 2006; Cunningham et al., 2018).

In general, universities’ engagement in social innovation reveals great potential, since they are “ideal partners to help break down or at least mitigate against multiple barriers to social innovation” (Anderson et al., 2018: 51). Possible contributions of universities to the social innovation process include increasing the institutional and political recognition, providing research activities for empirical evaluations of the effectiveness of social innovation and helping to examine determinants that can support, accelerate, or scale up social innovation. Further, universities can act as mentors, provide spaces for networking, and do lobbying (Anderson et al., 2018). The importance of knowledge in the social innovation process and thus the potentially influential role of universities is also highlighted by Benneworth and Cunha (2015) who argue that universities might affect social innovation processes through knowledge brokerage, material resources, and symbolic legitimacy. Further, Hardey (2020) finds that universities can act as supporters of social innovation for small firms within the respective region which highlights universities’ potential role as enablers in

¹ Social market failures relate to social needs that are not met by commercial market forces (see Austin et al., 2006). Whereas traditional profit-seeking entrepreneurs address commercial markets (among others through technological innovations), social entrepreneurs often address these unmet social needs (among others through social innovations). The same holds true for institutions with a core interest in economic returns (such as social entrepreneurial universities) that are driven and guided by their underlying (university) business models.

the social innovation process. Milley et al. (2020) argue on a similar basis as they examine the social innovation activities of 96 Canadian universities. Their findings reveal that every university is engaged in at least one social innovation project where the majority of these projects targets at promoting the collaboration of actors in- and outside the university. Moreover, most of the evaluated initiatives “are also engaged in training, mentoring, and capacity building activities” (Milley et al., 2020: 34).

There is strong evidence in the literature that universities can induce and support inclusive growth and social innovation in manifold ways (Bayuo et al., 2020). Thomas and Pugh (2020: 1639) thus criticize the narrow focus of the ‘entrepreneurial university’ being too incomplete and putting too much emphasis on technological innovation and instead call for an ‘engaged university’ that “credits equal importance to efforts towards social and economic innovation, entrepreneurship, and development”. Despite the need for social innovations to overcome existing environmental and societal challenges, multiple studies reveal that the potential of universities regarding social innovation is largely unexploited (e.g., Anderson et al., 2018; Benneworth & Cunha, 2015; Göransson, 2017).

4 Toward a mission-reorientation of entrepreneurial universities

For decades, university managers have highlighted the relevance of universities’ third mission and its relevance for the economy and society and promoted the commercialization of university knowledge through efficient knowledge and technology transfer processes. From a university manager’s perspective, it was about implementing an entrepreneurship agenda and orchestrating the various determinants that influence entrepreneurial outcomes – mainly technological innovation (Cunningham et al., 2022). However, the volatile environments universities are embedded in nowadays require a rethink of ingrained routines and pathways. Navarro and Gallardo (2003: 209) note that “changes in their environment and greater social demands are confronting universities with the need to implement a process of change”. Hence, entrepreneurial universities need to broaden their scope underlying the third mission and put their emphasis beyond technological innovation, yet also add the social dimension of innovation. Indeed, studies confirm universities’ impact on social change, creating wider public benefits (Carl & Menter, 2021; Klofsten et al., 2019).

Due to the urgent and serious environmental and societal challenges, entrepreneurial universities are under increasing pressure to adapt to changing stakeholder expectations, advocating a more active role for universities in addressing core societal needs (Bellandi et al., 2021). Consequently, there is a need for a mission-reorientation of entrepreneurial universities, enabling and supporting the university community to engage in social innovation and actively contribute to an increasing demand for addressing core societal needs. Benneworth and Cunha (2015: 520) argue that “universities’ greatest contribution to social innovation comes when their contributions to social innovation, and their relationships with social innovators, are closely aligned with wider strategic university interests”. Hence, not only university strategies but also the underlying university business models and knowledge and technology transfer mechanisms need to be changed and oriented toward social innovation. McKelvey and Zaring (2018) follow this line of argument and emphasize the various roles that universities can play in the co-delivery of social innovation.

Considering the predominant techno-economic rationale of universities, Cinar and Benneworth (2021) argue that institutional logics often serve as barriers to social innovation. These logics are strongly intertwined with the overarching university strategy and university business models as well as underlying knowledge and technology transfer mechanisms and relate to a university's value and belief system. Siegel et al. (2003) confirm that informational and cultural barriers as well as inadequate reward systems are among others the fundamental obstacles to third mission outcomes. University managers thus need to implement knowledge and technology transfer patterns that encourage community-based research and community-service learning, promote the development of communities, and foster the co-creation of social value, serving as a prerequisite for the institutionalization of social innovation. Hereby, especially informal knowledge and technology transfer channels seem to be suitable – extending the narrow focus on industry collaborations and considering the society as an additional key stakeholder in value co-creation processes².

The adoption of a social innovation paradigm should be considered as a significant extension of existing approaches and strategies within entrepreneurial universities. The creation of social value must thereby not be at the expense of economic value creation. Douglas and Prentice (2019) show that social entrepreneurship may contain both innovation and profit elements. Activities in the domain of social innovation thus might create both social and economic value (Wong et al., 2019). University managers consequently need to ensure that the creation of social value complements the creation of economic value. Arocena and Sutz (2021: 9) suggest that “a strong social commitment of universities can improve education, technically and ethically, as well as enrich research and build political support for it”. Hence, a mission-reorientation of entrepreneurial universities is associated with a reconsideration of universities' role in society and a reevaluation of universities' key stakeholders to ultimately become a socially accountable institution.

Figure 1 summarizes the various linkages between the university context, university strategy, university outputs, and social outcomes. The university context (e.g., institutional logics, university processes and structures, stakeholder expectations) decisively affect strategizing at universities. University business models that reflect a university's realized strategy are thereby influenced by underlying knowledge and technology transfer mechanisms. The university strategy thus shapes university outputs (technological innovation and social innovation), which are ultimately translated into societal outcomes (economic and social value). The created impact in turn influences the university strategy as well as the university context. Based on this conceptual framework, it becomes clear that tensions and trade-offs arise. University managers need to allocate scarce resources to satisfy potentially conflicting stakeholder expectations (e.g., economic vs. social value creation).

It is thus obvious that a mission-reorientation is beyond trivial. Entrepreneurial universities in their current form strive for publications and funding in order to satisfy their relevant stakeholders, acquire additional resources, and derive legitimacy, restricting their attention upon social innovation (Jongbloed et al., 2008). Due to the increasing focus on the commercialization of academic science, the competition within the higher education landscape has intensified, stimulating secrecy at the expense of cooperation (Hong & Walsh, 2009). This development yet impedes the creation of new collective social systems and associated

² Conceptual frameworks such as the quadruple helix (Carayannis & Campbell, 2009) and the quintuple helix (Carayannis et al., 2012) – extending the triple helix model developed by Leydesdorff and Etzkowitz (1996) – particularly emphasize the crucial role of the society to induce transformative structural change.

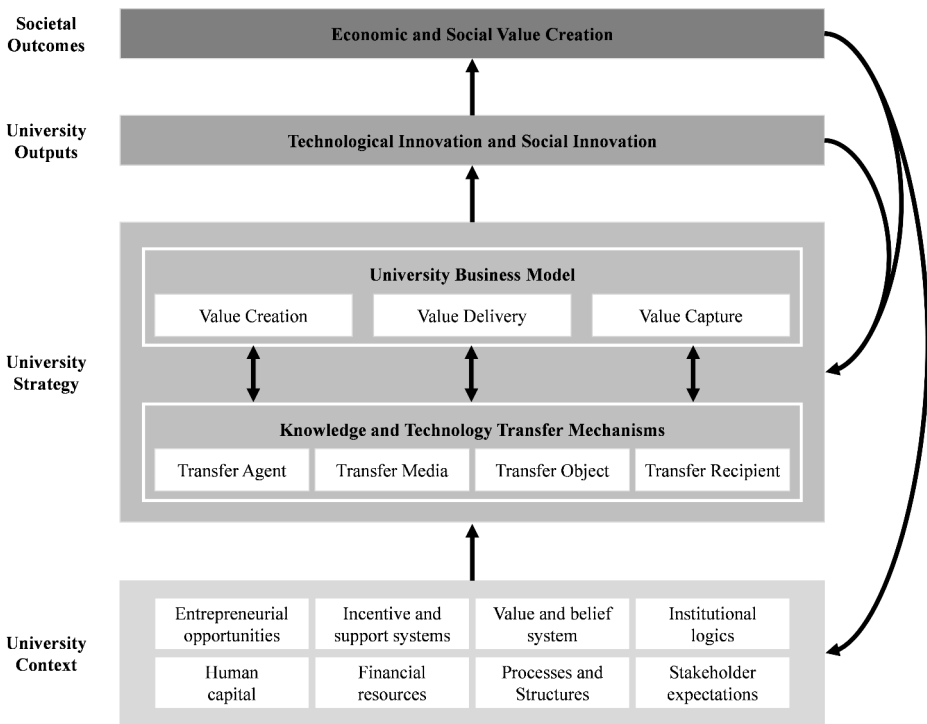


Fig. 1 Framework of a mission-reorientation of entrepreneurial universities

knowledge flows – a core prerequisite for co-creating social value. Furthermore, as the delivery of social innovation activities is so far not reflected in universities’ core missions, the incentives to promote social innovation within the university community are limited. Besides scientists’ role ambiguities provoked by the blurring boundaries between academia, industry, and society (Lam, 2010), internal capacity restrictions might significantly affect entrepreneurial behavior and social outcomes. Thus, an inclusion of the social dimension of innovation in the underlying strategies of universities and the reflection in universities’ business models and underlying knowledge and technology transfer mechanisms seems to be imperative, serving as a strong signal and providing legitimacy to efforts in the social domain of innovation.

University managers consequently need to allocate sufficient resources to social innovation activities, build and extend researcher’s capabilities, shape incentive and support systems, and enhance opportunities. As resources are always scarce, university managers further need to implement university business models that put economic and social value creation on the same level and encourage activities in both domains. Hence, the installment of appropriate mechanisms is crucial. Moreover, new approaches need to be adopted to measure and evaluate the success and impact of social innovation activities. The development of human capital also needs to be reconsidered, raising awareness for societal and environmental challenges. The inclusion of a social innovation paradigm is thus associated with significant structural changes at all levels of an entrepreneurial university.

5 Conclusion and future avenues of research

Universities have gone through several phases of transition, continuously adding additional expectations and duties and shifting university's primary focus beyond teaching and research. Especially in the context of the third university mission, due to the multifacetedness and complexity of entrepreneurial activities within entrepreneurial universities, tensions and hurdles arose, impeding the realization of entrepreneurial objectives (Philpott et al., 2011). Despite still prevailing challenges in the pursuit of economic value creation, this paper calls for a reorientation of the third mission of entrepreneurial universities, incorporating a social innovation paradigm. Social innovations create "capacities to respond to the grand challenges" (Benneworth & Cunha, 2015: 510), thus contribute to the formation of new social structures and systems. These social transitions are needed to combat social inequalities, favor inclusiveness, and boost social justice, thus address core societal needs.

Entrepreneurial universities therefore need to resolve existing path dependencies, implement new business models and underlying knowledge and technology transfer mechanisms, and reconsider their role in society, as an effective engagement of universities in the domain of social innovation requires a high degree of autonomy to build up collective social systems (Arocena & Sutz, 2021). In this regard, university leaders need to "internally define, visualize, and communicate the true meaning of an entrepreneurial university – that entrepreneurial is not merely the starting of new ventures but rather an attitude or behavior in the daily academic life for all members within the academic community" (Klofsten et al., 2019: 156). It is important to note that a focus on social innovation shall thereby not substitute but rather complement entrepreneurial universities' focus on technological innovation. Thus, incorporating the social dimension of innovation allows the conceptualization of a broader and more extensive role of entrepreneurial universities.

The inclusion of the social dimension of innovation into the third university missions opens up multiple fruitful avenues for future research (see Table 1). First, we need to broaden our understanding which changes to university business models and underlying knowledge and technology transfer mechanisms need to be taken to effectively integrate a social innovation paradigm. Considering the different types of university technology transfer business models identified by Baglieri et al. (2018), various adaptations seem feasible. Scholars should thus evaluate how changes to the business model affect the role of entrepreneurial universities and their interactions with relevant stakeholders, as the adoption of a social innovation paradigm will trigger the development of new forms of cooperation.

Second, necessary organizational changes within entrepreneurial universities need to be analyzed, enabling universities to fully incorporate the social dimension of innovation. Knowledge and technology transfer units such as technology transfer offices need to align their processes and mechanisms to reflect their extended mission and strive for both economic and social value. Hence, questions arise how such existing transfer units can best support the creation of social value or whether new transfer units need to be established.

Third, as business model changes affect the organization as a whole, future research should further consider the changing roles of academics and the university community and also take potential barriers associated with this mission reorientation into account. Extending the third university mission might put additional pressure on scientists and provoke role ambiguity and role conflict. Scholars should examine coping strategies of individual

Table 1 Future avenues of research

Themes	Research Questions
University business models	<ul style="list-style-type: none"> - To what extent do existing university business models consider the social dimension of innovation? - Which changes to university business models and underlying knowledge and technology transfer mechanisms need to be taken to effectively integrate a social innovation paradigm? - How can these changes to university business models and underlying knowledge and technology transfer mechanisms be effectively implemented? - How do these changes to university business models affect the role of entrepreneurial universities and their interactions with relevant stakeholders?
University processes and structures	<ul style="list-style-type: none"> - Which organizational changes within entrepreneurial universities' processes and structures need to be implemented, enabling universities to fully incorporate the social dimension of innovation? - How can existing knowledge and technology transfer units (e.g., technology transfer offices) align their processes and mechanisms to reflect their extended mission and strive for both economic and social value? - Which additional organizational units are necessary to fully adopt a social innovation paradigm within entrepreneurial universities? - How can incentive and support systems be adapted to stimulate (sustainable) economic growth and social welfare?
University community	<ul style="list-style-type: none"> - How do the roles of academics and the university community change in the course of a mission reorientation? - Which barriers and role conflicts arise in the course of a mission reorientation and how do these obstacles affect the adoption of a social innovation paradigm? - Which coping strategies are employed by individual researchers and how do they influence economic and social value creation? - How can support and incentive systems of entrepreneurial universities mitigate possible negative effects?
University stakeholder	<ul style="list-style-type: none"> - How can entrepreneurial universities best interact with different university stakeholder groups to co-create social value? - Which different modes of interactions are needed to address different university stakeholder groups? - How do knowledge and technology transfer processes need to be adapted in the context of different university stakeholder groups? - Which challenges arise in the context of the co-creation of social value for different university stakeholder groups?
University impact	<ul style="list-style-type: none"> - How can the performance and impact of entrepreneurial universities in the context of social value creation be measured and operationalized? - Which determinants on a micro, meso, and macro level (e.g., governance mechanisms, university culture, university competition, stakeholder expectations) affect social value creation? - Which knowledge and technology transfer mechanisms are best suited to drive social innovation outcomes? - How can policy makers strengthen and reinforce the impact of entrepreneurial universities in the context of social value creation?

researchers and how these are affected by support and incentive systems of entrepreneurial universities.

Fourth, future research should also consider the critical role of different university stakeholder groups. Given the multifacetedness of university stakeholder groups, different modes of interaction might be necessary to co-create social value. In this context, it is important to understand which knowledge and technology transfer processes need to be adapted to most effectively engage into social innovation activities. Moreover, an investigation of potential

challenges arising in the context of the co-creation of social value for different university stakeholder groups is needed.

Fifth, scholars should also reflect on social innovation outcomes and how the performance of entrepreneurial universities is affected by various determinants on a micro, meso, and macro level (e.g., governance mechanisms, university culture, university competition, stakeholder expectations). We require methods to operationalize social innovation in the university context to further develop this promising field of research and simultaneously ensure cumulateness. In this vein, especially an investigation of the effectiveness of different knowledge and technology transfer mechanisms and their impact on social innovation outcomes of universities is needed. These and further research directions should be examined by researchers from multiple disciplines. Especially transdisciplinary approaches will enrich and complement our understanding of entrepreneurial universities adopting a social innovation paradigm – a development that is important, necessary, and urgent.

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