

Universities and multi-stakeholder engagement for sustainable development: a research and technology perspective

Original

Universities and multi-stakeholder engagement for sustainable development: a research and technology perspective / Saluto, Paolo; Corazza, Laura. - In: IEEE TRANSACTIONS ON ENGINEERING MANAGEMENT. - ISSN 0018-9391. - STAMPA. - 68:4(2020), pp. 1-6. [10.1109/TEM.2020.3020736]

Availability:

This version is available at: 11583/2854345 since: 2020-12-01T15:34:01Z

Publisher:

IEEE

Published

DOI:10.1109/TEM.2020.3020736

Terms of use:

This article is made available under terms and conditions as specified in the corresponding bibliographic description in the repository

Publisher copyright

IEEE postprint/Author's Accepted Manuscript

©2020 IEEE. Personal use of this material is permitted. Permission from IEEE must be obtained for all other uses, in any current or future media, including reprinting/republishing this material for advertising or promotional purposes, creating new collecting works, for resale or lists, or reuse of any copyrighted component of this work in other works.

(Article begins on next page)

Universities and Multistakeholder Engagement for Sustainable Development: A Research and Technology Perspective

Laura Corazza  and Paolo Saluto

Abstract—If we have any hope of achieving sustainability, we, as researchers, need to develop a new perspective on universities and multistakeholder engagement. Stakeholder theory teaches us that engaging stakeholders in specific transactions and interactions can foster the sustainable development. But solving the grand challenge of sustainability requires more. Universities need to see themselves as part of a great network of stakeholders where interactions, knowledge, and data management go beyond the entrepreneurial university paradigm. Hence, in this article, we present Oztel's concept of a fourth-generation university as a launch-point for broadening the discourse on higher education's third mission. We establish a new stream of inquiry through four main propositions for research and technology management. Further, we call for interested scholars to pioneer this field with an inexhaustive list of potential avenues for future research. University managers, researchers, and policymakers should find great insights into the future evolution of sustainable development and its soon-to-be intrinsic place in the fabric of teaching, research, and society.

Index Terms—Knowledge transfer, multistakeholder networks, stakeholder engagement, stakeholder theory, sustainable development, universities.

I. INTRODUCTION

THE COVID-19 pandemic has demonstrated, once and for all, how the world is interconnected. The reality is that the world is a sum of different ecosystems where complex problems can affect everyone everywhere, and it is here, in the global flux, that we find the grand challenges humanity must solve [1]. Grand challenges and sustainable development are two mutually interlinked concepts because both are nexus-based problems. That is, more than one factor is responsible for trying to solve the problem, more than one solution needs to be implemented, and even if all the solutions are implemented, there may still be unforeseen negative implications [1], [2]. Today, the collective forces of communities, companies, NGOs and others have turned their attention wholesale to developing resilience [3]. As clarified by the United Nations, creating partnerships is pivotal to achieving all 17 of its sustainable development goals (SDGs).

Manuscript received June 22, 2020; revised August 15, 2020; accepted August 16, 2020. Review of this manuscript was arranged by Department Editor T. Daim. (Corresponding author: Laura Corazza.)

Laura Corazza is with the Università degli Studi di Torino, 10134 Torino, Italy (e-mail: laura.corazza@unito.it).

Paolo Saluto is with the DIGEP, Politecnico di Torino, 10129 Torino, Italy (e-mail: paolo.saluto@polito.it).

Digital Object Identifier 10.1109/TEM.2020.3020736

This has never been more evident than now [4]. Universities all over the world have been called to arms, with more emphasis on their social responsibility to “help science our way out” of this catastrophe. From medicine to epidemiology to economic theory, universities are being asked to find ways to ensure people survive both COVID-19 and the economic and social crisis to follow [5], [6].

According to Universities UK, from a financial, social, operational, and organizational point of view, COVID-19 will be one of the most impactful events universities have ever faced [7]. Researchers are now working to demonstrate how universities are overcoming disrupted classes, the dissolution of the university campus, and general strategies for coping with the pandemic [7]–[9]. Some of the most recent studies center on the prolonged uncertainty surrounding university operations and the impact disruption is having on local communities [10]. Anchor institutions, i.e., universities that root themselves in a territory, are deeply feeling the expectations society has of them during this time of crisis [11]–[13]. Living up to these expectations has involved providing services for the health of the nation, providing psychological services to citizens and medical staff, producing serological tests, repurposing medical students toward frontline healthcare, providing telehealth, creating joint partnerships with local companies to test and produce breathing pumps and masks, drafting public policies to temporarily reshape society exerting the role of civic leadership, and many others [9], [10], [14]–[16]. All these actions are examples of activities that go beyond teaching and researching; they fall into the realm of “public service” or the university’s “third mission” [17].

Despite the managerialism that has forced universities to account for tangible aspects of knowledge exchange [18]–[20], much of the intangible side of knowledge creation, such as social and relational capital, remains underexplored. Terms like entrepreneurial university [21], a university’s intellectual capital [22], and intangible knowledge transfer [23] have been coined to deal with the complexity of accounting for informal knowledge transfer and for the societal value created for the society. As a university can create value differently, more than one dimension of value should be considered [24]. Unfortunately, in the past, many management scholars have privileged economic worth over other forms of value [19]. Perhaps one of the few positives to come out of the COVID-19 emergency so far is that other dimensions of values are gaining priority. Daily concerns for public

university managers now include how to continue operating in different socio-economic contexts, figuring out what a recovery phase looks like, how to guarantee education for vulnerable students, and so on [11]. On one way, these societal issues are now been prioritized to safeguard future financial concerns, but it is also true that in time of prolonged uncertainty, COVID-19 or climate change, the resilience of a social system depends on the quality of its institutions [25].

Differences in management styles and strategies are also coming to the fore as universities that were once either physical and place-based are straining in the transition to virtual [13]. The creation of value of a university that was physical and place-based strongly depends onto the quality of the relations with its stakeholders. Only a few studies have considered how value is cocreated through the interactions between a university and its stakeholders, with or without economic intent [26], [27]. Projects of multistakeholder engagement for teaching, researching, or societal outreaches are happening in line with the end of the “ossification” of universities. The ivory tower is being dismantled, and universities are becoming more entrepreneurial. But calls for a more business-like mentality and also being balanced with calls for sustainability and value creation beyond the economic conditions. Moreover, sustainability studies are calling for scientists to consider the synergies between value creation and value destruction, and between a weak and strong orientation toward sustainable development [28], [29]. By consequence, more investigation is needed before we can fully explain how universities converse with their stakeholders, how universities can design strategies to encourage dialogues, and which technologies and techniques are used.

When it comes to the theoretical groundings of stakeholder management, existing studies usually focus on a few stakeholders at a time, such as students, projects partners, or local communities, without offering a cohesive and comprehensive approach to stakeholder relationships at the ecosystem level that considers intersections, conflicts, and salience of stakeholder needs [30]. Through all their missions, higher education institutions are significant contributors to one of the core elements of social capital theory—developing bridging and bonding relationships with multiple-stakeholders [31], [32]. This argument, which was first proffered by Patulny and Svendsen and Cots in 2007, is in line with recent advancements in stakeholder theory that reflect an ongoing shift toward a paradigm of relationships [33]. In a remarkable work, Leydesdorff defines stakeholder relationships and how much value they create as an n -tuple helix. However, Leydesdorff’s formula does not consider if the value created is sustainable for all stakeholders, nor what kind of value is created nor for whose benefit. Scant research has been undertaken in this regard since. Rather, researchers still recognize it as a future trend. In this article, we attempt to break first ground [34].

In this article, we extend the traditional perspective of value held by universities to include: social value for stakeholders; preservation of the environment through teaching, research, and sustainable operations; moral capital and good leadership, both stewarded and conveyed; cultural value created for people and communities; political value generated through engagement

with the region; and economic value generated with and for society. All these perspectives on value creation require public acceptance, collaboration, and cocreation with a wide range of stakeholders, which is compromised by our turbulent times.

In developing a new stream of inquiry into research and technology management involving many and vast stakeholder groups, the tenets of stakeholder theory are an obvious place to start. Therefore, to fulfill the proposed objective, we present an overview of the role of universities for sustainable development, where universities’ actions are aimed at creating and, most of the time, cocreating a sustainable growth with different stakeholders. Considering the peculiarities of universities and their territories, there is a profound need for translating and sharing evidence on how universities are managing their networks of stakeholder relations. More precisely, the managerial implications, the technological solutions, and the operational problems for university managers need to be explored.

II. UNIVERSITIES AND MULTISTAKEHOLDER ENGAGEMENT FOR SUSTAINABLE DEVELOPMENT: FRAMING THE RESEARCH LANDSCAPE

Most studies on universities and sustainable development focus on how universities are innovating their pedagogical techniques to align with issues of sustainability—for example, encouraging students to explore the UN SDGs, equipping them with leadership skills in sustainability, etc. [35]–[38]. Some of this research focuses on achieving sustainable development by creating scientific knowledge. Consequently, there is a stream of literature looking at how to break down the disciplinary silos in higher education so as to generate game-changing knowledge with multidisciplinary and transdisciplinary teams. In turn, some are exploring the organizational mechanisms needed to govern research funds, projects, and teams in these collaborative settings, as well as how to evaluate knowledge production across disciplines [39]–[42]. The “third mission” is another sphere of inquiry. Here, the third mission is viewed as a transversal process for transferring knowledge from teaching and research to the community through formal and informal flows of information. The studies most relevant to sustainability focus on the concept of entrepreneurial universities [43]–[47].

The common thread through all this research is the pivotal role of universities as engines of regional economic development. However, only a few provide an in-depth review of exactly what value is being created and for whom. According to Oztel [48], we need a new “exemplar” of a university—an institution he calls a “fourth-generation university.” Fourth-generation universities are defined as higher education institutes that join with core stakeholders to cocreate and promote sustainable growth for the socio-economic environments in which they operate. Going beyond education, research, and third-mission impacts, these universities negotiate, collaborate, and mutually cocreate value [49] to secure public value for a sustainable future. Considering the novelty of this idea, it might be premature to support it with gusto, but what is worthy of recognition is a multistakeholder view of the relationships between a region and the universities within them [50], [51].

A further critical reflection can be made. First, as anchored institutions, most have analyzed universities through the lens of economic value creation for their region—particularly using the number of research projects they undertake with local companies or how many international students they attract as measures of that value [52]–[54]. However, the sustainability impetus is broadening the spectrum of value creation, especially in relation to social and environmental sustainability initiatives [55]. Considering that sustainability science sees social, moral, environmental, cultural, political, and educational values as interlinked, further research is needed to understand whether these are notions of public value or public goods, or both [24], [56]–[58]. In the idea of the Humboldtian university, the concept of academic citizenship is defined as the creation of different forms of public value through community engagement, like in the case of citizens and interaction with multiple stakeholders, like start-ups, venture capitals, and large companies [59]. Further, all the different values are nested within the university missions, but individual stakeholders are highly likely to prioritize one or a few forms of value over the others. To date, few studies have been undertaken on how those working within universities interpret value, and how value is externally communicated to stakeholders. Therefore, further research is also needed into the value creation process of fourth-generation universities—for example, *which values are created and how values are nested*.

Second, adopting a holistic perspective of value creation means that stakeholder relationships should no longer be seen as transactions between parties to be counted. We are all familiar with credentials blurbs citing many industry partnerships and many government initiatives. This type of thinking must stop. In place, we need a relational perspective [60] that depicts universities as a large interconnected ecosystem, and not exclusively an entrepreneurial one [61]. For instance, within a region, a university can (and should) be part of the local health ecosystem, social services ecosystem, political and urban planning ecosystem, juridical ecosystem, etc. The relationships between and among universities and stakeholders can then form a network of networks that can be used strategically. These are concepts we already understand. However, we need a shift in thinking over their execution. For example, although we are, arguably, in the last years of dismantling the ivory tower [62], even today, universities are rightly accused of placing themselves at the center of a network or networks [33], [63]–[65]. Sometimes they are not the pivot, but universities do often connect different stakeholders, creating an ecosystem in the process. Yet, applying a stakeholder perspective means finding a university's rightful place. A second research proposition, therefore, is to understand *"who is a stakeholder?"* given these critical times.

Third, preliminary consideration should be given to the fact that universities do not have homogeneous governance and business models. At the same time, they are economically, socially, and environmentally embedded in their local territories, and this is deeply ingrained in each institution's culture, history, and canon. It is a key aspect of what distinguishes one university from another [66], [67]. Accordingly, the categories of stakeholders can vary because the functional features of each university are endemic to a place and community-based identity

[68]. Further, stakeholder engagement occurs on two levels: the individual and the institutional [69]. The individual level refers to the personal services performed by scholars, such as delivering a seminar on drug prevention. The institutional level refers to grander activities directly or indirectly managed by the university in respecting the social contract [70]. Further studies on who is in the network and who falls outside are extremely important nowadays because of the virtualization of universities imposed by the current crisis; networked individualism and networked institutionalism through real and virtual social networks is growing in importance [8]. Many aspects of both these levels of engagement need further exploration, e.g., the type of interactions; their nature, intensity, and frequency; the interdependencies between actors; the directionality of who needs the information, i.e., who is engaging who; and so on. All this requires interpreting and responding to the next question: *"How should universities interact with their stakeholders to achieve sustainable development?"*

Finally, the 17 UN SDGs and their 169 targets should be smoothly placed and interpreted within a university's public missions for public awareness [71]. This is rich and fertile ground for understanding which topics could be addressed through multistakeholder engagement because community-engaged services rely on activities that allow a member of the academic community to share his/her expertise and skills with others: to solve real-world problems for the betterment of his/her institution and the community at large [72].

In addition, multistakeholder engagement experiences can be analyzed using a discipline-specific framework, or a local, regional, national, or international context because, by changing the focus, we can identify more than one community [13]. Adopting the value creation perspective mentioned above, questions arise about *where* value is created, *how dialog and multiple dialogs support value creation*, and *which narratives are used*. As clarified by Kuntz, academic engagement in civil society has a strong political and leadership role and, consequently, there is the need to conduct research beyond managerialism and the performative if we are to create real impact [73]. Best practices, as well as constraints and barriers, can enrich the discussion on multistakeholder engagement. The challenges and risks of experimenting with and innovating for sustainability, given the specific characteristics of a university, need more in-depth discussion. For instance, *how should a university prioritize its stakeholder relationships to support the SDGs?* And if there is an intention to reward universities for their work toward the SDGs with public funds, *what forms should these rewards take?*

These propositions are not an exhaustive list of the work that needs to be done, but they are a start.

III. FUTURE RESEARCH

By definition, achieving the SDGs requires an interdisciplinary approach [74], [75]. However, it also requires rethinking the traditional dynamics of dialog between universities and their ecosystems. Moreover, the strategic drivers behind a more sustainable future mean most universities will need to reshape their relationships with stakeholders to embrace citizen science

[76]—a concept that is becoming known as “stakeholder science” [65], [77]. Further, viewing stakeholders from a network perspective should reveal underrepresented and marginalized voices as indirect links [41]. Work can then be done by all to build direct connections with these groups.

There is, therefore, an impellent need to establish methods, techniques, protocols, and new ways for universities and stakeholders to communicate both face-to-face and virtually.

Just some of the potential future avenues for research follow:

- 1) The dynamics between individual and institutional engagement for sustainable development.
- 2) Good institutional practices for forming collaborations and at the individual level.
- 3) Technical, operational, and digital approaches to engage and represent multistakeholder ecosystems, e.g., social network analysis, neural networks, etc.
- 4) Methods for cocreating informal partnerships and/or knowledge transfers to achieve long-term social and environmental goals.
- 5) Knowledge management in multistakeholder networks: bottom-up approaches, open data, constraints and obstacles such as interdisciplinary competition, hiding knowledge, fragmented knowledge over multiple power centers, etc.
- 6) Knowledge transfer for stakeholder and citizen science and its technological features and strategic implications.
- 7) Methodologies for providing student training in sustainable entrepreneurship and impacting their future careers as sustainability leaders.
- 8) The kind of values a fourth-generation university’s business strategy should foster.
- 9) Strategies to support the shift from entrepreneurial universities to sustainable entrepreneurial universities, and the links between the governance of a sustainable entrepreneurial university and the other dimensions of sustainability in universities, such as teaching, research, public engagement, and civic leadership.
- 10) Contradictions in sustainability research, such as nuclear power vs. hydrogen power and their resolution.
- 11) Weak and robust approaches to the sustainable management of universities; and
- 12) Old theories and new theories or paradigms to account for the sustainable multistakeholder management of a university—for example, New Public Management, fourth-generation universities, neoinstitutional theory, etc.

IV. CONCLUSION

A new perspective on research and technology management is not only relevant to academia, but will increasingly benefit decision-making processes as the future of sustainable development plays out. Thus, public administrators and politicians might consider establishing incentives and reward mechanisms based on a university’s performance in creating social and economic value. The dialogs and multidialogs within stakeholder networks where universities are one of the poles is territory that has not yet

been explored in-depth [78]. But data collection reflecting the phenomenon can be a starting point. Finally, there is a profound need for universities to share technological and operational best practices, and especially insights into the difficulties, constraints, and organizational procedures that must be overcome or put in place for these best practices to work in reality. This article was an explicit attempt to start exploring this new reality.

ACKNOWLEDGMENT

The authors would like to deeply acknowledge the Editor-in-Chief, Prof. T. Daim, for the opportunity to publish this article. They are grateful to Prof. M. Cisi, Prof. J. Dumay, Prof. S. Guelfi and Prof. M. Franca Norese for their support. They would also like to thank the anonymous reviewers for their suggestions and the time dedicated to reading this manuscript.

REFERENCES

- [1] W. V. Reid *et al.*, “Earth system science for global sustainability: Grand challenges,” *Science*, vol. 330, no. 6006, pp. 916–917, 2010.
- [2] C. Bai and J. Sarkis, “The water, energy, food, and sustainability nexus decision environment: A multistakeholder transdisciplinary approach,” *IEEE Trans. Eng. Manag.*, to be published, doi: [10.1109/TEM.2019.2946756](https://doi.org/10.1109/TEM.2019.2946756).
- [3] C. Folke, “Resilience: The emergence of a perspective for social-ecological systems analyses,” *Glob. Environ. Chang.*, vol. 16, no. 3, pp. 253–267, 2006.
- [4] United Nation Department of Economic and Social Affairs (UN-DESA). “The sustainable development goals report 2020,” ISBN: 978-92-1-101425-9, United Nations Publications.
- [5] D. P. Aldrich, “Ties that bond, ties that build: Social capital and governments in post disaster recovery,” *Stud. Emergent Order*, vol. 4, pp. 58–68, 2011.
- [6] J. Vale, R. Bertuzzi, and A. P. Monteiro, “Social responsibility reporting in higher education institutions: A systematic literature review,” in *Conceptual and Theoretical Approaches to Corporate Social Responsibility, Entrepreneurial Orientation, and Financial Performance*, IGI Global, 2020, pp. 76–96.
- [7] Universities UK. “Achieving stability in the higher education sector following COVID-19,” 2020.
- [8] R. Raaper and C. Brown, “The Covid-19 pandemic and the dissolution of the university campus: Implications for student support practice,” *J. Prof. Capacity. Community*, vol. Early Cite, pp. 1–7, 2020.
- [9] D. A. Ahlburg, “Covid-19 and UK Universities,” *Polit. Q.*, pp. 1–6, Jun. 2020.
- [10] M. S. Medina, R. B. Melchert, and C. D. Stowe, “The COVID-19 pandemic across the academy. Fulfilling the tripartite mission during a pandemic,” *Amer. J. Pharm. Educ.*, vol. 84, no. 6, pp. 683–687, 2020.
- [11] L. Ling, “Universities and research in times of crisis: the getting of wisdom,” *Qual. Res. J.*, pp. 1–11, 2020.
- [12] J. Smyth, “Critical social science as a research methodology in universities in times of crisis,” *Qual. Res. J.*, pp. 1–10, 2020.
- [13] R. T. Nørgård and S. S. E. Bengtsen, “Academic citizenship beyond the campus: A call for the peaceful university,” *High. Educ. Res. Dev.*, vol. 35, no. 1, pp. 4–16, Jan. 2016.
- [14] C. Regehr and V. Goel, “Managing COVID-19 in a large urban research-intensive university,” *J. Loss Trauma*, vol. 25, pp. 1–17, Jun. 2020.
- [15] A. A. Fernandez and G. P. Shaw, “Academic leadership in a time of crisis: the Coronavirus and COVID-19,” *J. Leadersh. Stud.*, vol. 14, no. 1, pp. 39–45, 2020.
- [16] E. F. de Moura Villela, S. L. M. de Oliveira, F. Toffoli, and R. B. Valdes, “Student engagement in a public health initiative in response to COVID-19,” *Med. Educ.*, vol. 54, no. 8, pp. 763–764, 2020.
- [17] L. Leydesdorff, “The triple helix, quadruple helix, . . . , and an n-tuple of helices: Explanatory models for analyzing the knowledge-based economy?” *J. Knowl. Econ.*, vol. 3, no. 1, pp. 25–35, 2012.
- [18] R. Deem, “Globalisation, new managerialism, academic capitalism and entrepreneurialism in universities: is the local dimension still important?” *Comput. Educ.*, vol. 37, no. 1, pp. 7–20, 2001.
- [19] L. D. Parker, “Contemporary University Strategising: The financial imperative,” *Financial Account. Manage.*, vol. 29, pp. 1–25, 2013.

- [20] L. D. Parker, "University corporatisation: Driving redefinition," *Crit. Perspect. Account.*, vol. 22, no. 4, pp. 434–450, 2011.
- [21] G. Elia, G. Secundo, and G. Passiante, "Pathways towards the entrepreneurial university for creating entrepreneurial engineers: An Italian case," *Int. J. Entrep. Innov. Manage.*, vol. 21, no. 1/2, 2017, Art. no. 27.
- [22] D. D. Berardino and C. Corsi, "A quality evaluation approach to disclosing third mission activities and intellectual capital in Italian universities," *J. Intellectual Capital*, vol. 19, no. 1, pp. 178–201, 2018.
- [23] G. Secundo, A. Margherita, G. Elia, and G. Passiante, "Intangible assets in higher education and research: Mission, performance or both?" *J. Intellectual Capital*, vol. 11, no. 2, pp. 140–157, 2010.
- [24] R. P. Winter and W. O. Donohue, "Academic identity tensions in the public university: Which values really matter?" *J. High. Educ. Policy Manage.*, vol. 34, no. 6, pp. 565–573, 2012.
- [25] J. M. Keenan, "COVID, resilience, and the built environment," *Environ. Syst. Decis.*, vol. 40, pp. 216–221, 2020.
- [26] C. Chapleo and C. Simms, "Stakeholder analysis in higher education: A case study of the University of Portsmouth," *Perspective*, vol. 14, no. 1, pp. 12–20, 2010.
- [27] M. McAdam, K. Miller, and R. McAdam, "Situating regional university incubation: a multi-level stakeholder perspective," *Technovation*, vol. 50, pp. 69–78, 2016.
- [28] M. M. Crow, "Organizing teaching and research to address the grand challenges of sustainable development," *Bioscience*, vol. 60, no. 7, pp. 488–489, Aug. 2010.
- [29] B. C. Crosby, P. 't Hart, and J. Torfing, "Public value creation through collaborative innovation," *Public Manage. Rev.*, vol. 19, no. 5, pp. 655–669, May 2017.
- [30] P. Myllykangas, J. Kujala, and H. Lehtimäki, "Analyzing the essence of stakeholder relationships: What do we need in addition to power, legitimacy, and urgency?" *J. Bus. Ethics*, vol. 96, no. S1, pp. 65–72, Jul. 2011.
- [31] R. V. Patulny and G. L. H. Svendsen, "Exploring the social capital grid: Bonding, bridging, qualitative, quantitative," *Int. J. Sociol. Soc. Policy*, vol. 27, pp. 32–51, 2007.
- [32] E. G. Cots, "Stakeholder social capital: a new approach to stakeholder theory," *Bus. Ethics A Eur. Rev.*, vol. 20, no. 4, pp. 328–341, Oct. 2011.
- [33] R. E. Freeman and R. Phillips, "Tensions in stakeholder theory," *Bus. Soc.*, vol. 59, no. 2, pp. 213–231, 2020.
- [34] J. M. Ahn, N. Roijakkers, R. Fini, and L. Mortara, "Leveraging open innovation to improve society: Past achievements and future trajectories," *R D Manage.*, vol. 49, no. 3, pp. 267–278, 2019.
- [35] M. von Hauff and T. Nguyen, "Universities as potential actors for sustainable development," *Sustainability*, vol. 6, no. 5, pp. 3043–3063, 2014.
- [36] D. Cottafava, M. G. Cavaglià, and L. Corazza, "Education of sustainable development goals through students' active engagement: A transformative learning experience," *Sustain. Account., Manage. Policy J.*, vol. 10, no. 3, pp. 521–544, Jan. 2019.
- [37] R. Lozano *et al.*, "A review of commitment and implementation of sustainable development in higher education: Results from a worldwide survey," *J. Clean. Prod.*, vol. 108, pp. 1–18, 2015.
- [38] P. Warwick, "An integrated leadership model for leading education for sustainability in higher education and the vital role of students as change agents," *Manage. Educ.*, vol. 30, no. 3, pp. 105–111, 2016.
- [39] T. Waas, A. Verbruggen, and T. Wright, "University research for sustainable development: Definition and characteristics explored," *J. Clean. Prod.*, vol. 18, no. 7, pp. 629–636, 2010.
- [40] A. Beringer and M. Adom̄bent, "Sustainable university research and development: Inspecting sustainability in higher education research," *Environ. Educ. Res.*, vol. 14, no. 6, pp. 607–623, Dec. 2008.
- [41] F. Findler, N. Schönherr, R. Lozano, D. Reider, and A. Martinuzzi, "The impacts of higher education institutions on sustainable development: A review and conceptualization," *Int. J. Sustain. High. Educ.*, vol. 20, no. 1, pp. 23–38, 2019.
- [42] J. Sarkis, T. De Bruijn, and Q. Zhu, "Guest editorial: Sustainability in engineering management—Setting the foundation for the path forward," *IEEE Trans. Eng. Manag.*, vol. 60, no. 2, pp. 301–314, May 2013.
- [43] J. A. Cunningham, M. Guerrero, and D. Urbano, "Entrepreneurial universities—overview, reflections, and future research agendas," in *The World Scientific Reference on Entrepreneurship*. vol. 1: Entrepreneurial Universities Technology and Knowledge Transfer, World Scientific, 2017, pp. 3–19.
- [44] M. Guerrero and D. Urbano, "The impact of Triple Helix agents on entrepreneurial innovations' performance: An inside look at enterprises located in an emerging economy," *Technol. Forecast. Soc. Change*, vol. 119, pp. 294–309, 2017.
- [45] R. Marozau, M. Guerrero, and D. Urbano, "Impacts of universities in different stages of economic development," *J. Knowl. Econ.*, pp. 1–21, 2016.
- [46] M. Guerrero, J. A. Cunningham, and D. Urbano, "Economic impact of entrepreneurial universities' activities: An exploratory study of the United Kingdom," *Res. Policy*, vol. 44, no. 3, pp. 748–764, 2015.
- [47] M. Abreu, P. Demirel, V. Grinevich, and M. Karataş-Özkan, "Entrepreneurial practices in research-intensive and teaching-led universities," *Small Bus. Econ.*, vol. 47, no. 3, pp. 695–717, 2016.
- [48] H. Oztel, "Fourth generation university: Co-creating a sustainable future," in *Quality Education. Encyclopedia of the UN Sustainable Development Goals*. W. Leal Filho, A. M. Azul, L. Brandli, P. G. Özyayar, and T. Wall, Eds. Cham, Switzerland: Springer, 2020, pp. 316–328.
- [49] R. Hambleton, "The new civic leadership: Place and the co-creation of public innovation," *Public Money Manage.*, vol. 39, no. 4, pp. 271–279, May 2019.
- [50] K. Miller, M. McAdam, and R. McAdam, "The changing university business model: A stakeholder perspective," *R&D Manage.*, vol. 44, no. 3, pp. 265–287, 2014.
- [51] M. Guerrero, D. Urbano, A. Fayolle, M. Klofsten, and S. Mian, "Entrepreneurial universities: Emerging models in the new social and economic landscape," *Small Bus. Econ.*, vol. 47, no. 3, pp. 551–563, 2016.
- [52] V. Peer and M. Penker, "Higher education institutions and regional development: A meta-analysis," *Int. Reg. Sci. Rev.*, vol. 39, no. 2, pp. 228–253, 2016.
- [53] S. Soliman, J. Anchor, and D. Taylor, "The international strategies of universities: Deliberate or emergent?" *Stud. High. Educ.*, vol. 44, no. 8, pp. 1413–1424, 2019.
- [54] N. Cantor and P. Englot, "Civic renewal of higher education through renewed commitment to the public good," in *Civic Engagement, Civil Development, and Higher Education*, J. N. Reich, Ed. Washington, DC, USA, 2014, pp. 1–11.
- [55] W. L. Filho *et al.*, "The role of higher education institutions in sustainability initiatives at the local level," *J. Clean. Prod.*, vol. 233, pp. 1004–1015, 2019.
- [56] B. Broucker, K. De Wit, and J. C. Verhoeven, "Higher education for public value: Taking the debate beyond New Public Management," *High. Educ. Res. Dev.*, vol. 37, no. 2, pp. 227–240, 2018.
- [57] K. Geuijen, M. Moore, A. Cederquist, R. Ronning, and M. Van Twist, "Creating public value in global wicked problems," *Public Manage. Rev.*, vol. 19, no. 5, pp. 621–639, 2017.
- [58] M. H. Moore, *Creating Public Value: Strategic Management in Government*. Cambridge, MA, USA: Harvard Univ. Press, 1995.
- [59] B. Macfarlane, "Defining and rewarding academic citizenship: The implications for university promotions policy," *J. High. Educ. Policy Manage.*, vol. 29, no. 3, pp. 261–273, 2007.
- [60] T. J. Rowley, "Moving beyond dyadic ties: A network theory of stakeholder influences," *Acad. Manage. Rev.*, vol. 22, no. 4, pp. 887–910, 1997.
- [61] M. Klofsten, A. Fayolle, M. Guerrero, S. Mian, D. Urbano, and M. Wright, "The entrepreneurial university as driver for economic growth and social change - Key strategic challenges," *Technol. Forecast. Soc. Change*, vol. 141, pp. 149–158, 2019.
- [62] H. Etzkowitz, A. Webster, C. Gebhardt, and B. R. C. Terra, "The future of the university and the university of the future: Evolution of ivory tower to entrepreneurial paradigm," *Res. Policy*, vol. 29, pp. 313–330, 2000.
- [63] T. J. Rowley, "The power of and in stakeholder networks," in *Stakeholder Management*. Bingley, U.K.: Emerald Publishing Limited, 2017.
- [64] J. Bryson, A. Sancino, J. Benington, and E. Sørensen, "Towards a multi-actor theory of public value co-creation," *Public Manage. Rev.*, vol. 19, no. 5, pp. 640–654, 2017.
- [65] D. Windsor, "The role of dynamics in stakeholder thinking," *J. Bus. Ethics*, vol. 96, no. S1, pp. 79–87, Jul. 2011.
- [66] P. Ingallina and D. Charles, *The Urban University and the Knowledge Economy: New Spaces of Interaction*. New York, NY, USA: Taylor & Francis, 2018.
- [67] E. G. Carayannis, E. Grigoroudis, D. Stamati, and T. Valvi, "Social business model innovation: A quadruple/quintuple helix-based social innovation ecosystem," *IEEE Trans. Eng. Manag.*, to be published, 2019, doi: 10.1109/TEM.2019.2914408.

- [68] V. Ratten, "Entrepreneurial universities: the role of communities, people and places," *J. Enterprising Commun. People Places Glob. Econ.*, vol. 11, no. 03, pp. 310–315, Jan. 2017.
- [69] M. Abreu and V. Grinevich, *Academic Interactions with Private, Public and Not-for-Profit Organisations: The Known Unknowns BT - Cooperation, Clusters, and Knowledge Transfer: Universities and Firms Towards Regional Competitiveness*. J. J. M. Ferreira, M. Raposo, R. Rutten, and A. Varga, Eds. Berlin, Germany: Springer, 2013, pp. 181–206.
- [70] T. Donaldson and L. E. Preston, "The stakeholder theory of the corporation: Concepts, evidence, and implications," *Acad. Manage. Rev.*, vol. 20, no. 1, pp. 65–91, 1995.
- [71] S. Moggi, "Social and environmental reports at universities: A Habermasian view on their evolution," *J. Accounting Forum.*, vol. 43, no. 3, pp. 283–326, 2019.
- [72] H. L. Pfeifer, "How to be a good academic citizen: The role and importance of service in academia," *J. Crim. Justice Educ.*, vol. 27, no. 2, pp. 238–254, 2016.
- [73] A. M. Kuntz, "Academic citizenship: The risks and responsibility of reframing faculty work," *J. College Character*, vol. 7, no. 5, pp. 1–9, 2006.
- [74] F. Annan-Diab and C. Molinari, "Interdisciplinarity: Practical approach to advancing education for sustainability and for the sustainable development goals," *Int. J. Manage. Educ.*, vol. 15, no. 2, pp. 73–83, 2017.
- [75] C. Kroll, A. Warchold, and P. Pradhan, "Sustainable development goals (SDGs): Are we successful in turning trade-offs into synergies?" *Palgrave Commun.*, vol. 5, no. 1, pp. 1–11, 2019.
- [76] S. Fritz *et al.*, "Citizen science and the United Nations sustainable development goals," *Nat. Sustain.*, vol. 2, no. 10, pp. 922–930, 2019.
- [77] J. Burger, *Introduction: Stakeholders and Scientists: Achieving Implementable Solutions to Energy and Environmental Issues*, J. Burger, Ed. New York, NY, USA: Springer, 2011, pp. 1–25.
- [78] J. Dillard, K. Yuthas, and L. Baudot, "Dialogic framing of accounting information systems in social and environmental accounting domains: Lessons from, and for, microfinance," *Int. J. Account. Inf. Syst.*, vol. 23, pp. 14–27, 2016.



Paolo Saluto received the Ph.D. degree in management, production and design from Politecnico di Torino, Turin, Italy, in 2017.

He is currently a Research Fellow with the Department of Management and Production Engineering, Politecnico di Torino. He is also the Operation Manager of a research center, the Osservatorio di Mercato IAM Italia of Politecnico di Torino for automotive spare parts, and the CEO and co-founder of Standard & Testing Spin Off, which is the arm of Politecnico di Torino that works to design business models for the automotive sector and certify them. His research has been published in the *International Journal of Business Administration* and *Measuring Business Excellence*. His current research interests include the link between economic value creation and business models for analyzing the sustainability of a business.



Laura Corazza received the Ph.D. degree in business and management from the University of Turin, Turin, Italy, in 2014.

She is currently a Research Fellow and a Lecturer with the Department of Management, University of Turin. She is also the Editor of the University of Turin's annual Sustainability Report. Her research has been published in books and peer-reviewed journals, including the *Sustainability Accounting Policy and Management Journal*, *Knowledge Management Research and Practice*, *Journal of Applied Accounting Research*, *Corporate Social Responsibility and Environmental Management*, *Journal of Business Ethics Education*, and *Information Resource Management Journal*. Her research interests include stakeholder engagement, sustainability accounting and accountability in private, public, and social enterprise organizations.