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ENHANCING TRIPLE HELIX MODEL THROUGH UNIVERSITY EDUCATIONAL OFFER

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Abstract

Objectives.

What configuration may the educational offer of university assume to enhance its role of innovation driver in favour of different actors and institutions in the current knowledge society? The aim of the study is to explore how the university can take on that entrepreneurial and engaged role that it is called to play within the regional knowledge ecosystem (Etkowitz et al., 2000), and to generate and transfer the knowledge infused into that system through innovative educational programs. In the study here presented, still at its preliminary stages, we outline the analytical framework and the methodological setting adopted to examine the development of a set of educational programs launched by the University of Modena and Reggio Emilia (Unimore), located in Emilia-Romagna (E-R) region in Italy. We adopted the theoretical lens of the Triple Helix Model to study how innovative educational programs may improve interactions and collaborative relationships with the local motorvehicle industry and local policy makers.

While, in the last century, universities evolved from the original role of conservator and reproducer of knowledge and became a producer of genuine knowledge (the first academic revolution), more recently they were also recognized and accepted in their new role of generator of knowledge-based enterprises, thus entering a phase known also as the second academic revolution (Etkowitz and Dzisah, 2008). This more complex role is played not only through the traditional missions of educating new generations and fostering cutting-edge scientific research, but also in weaving the ranks of collaboration within local and national industries and policy makers. This requires also that universities evolve in their organizational structures, integrate new institutional purposes, develop new collaboration skills, and ultimately take on new roles as innovation agency in the local context. "As knowledge becomes an increasingly important part of innovation, the university as a knowledge-producing and disseminating institution plays a larger role in industrial innovation" (Etkowitz et al., 2000, p.314), thus fully delineating what is universally known as the third mission of university.

This evolution of the university has been analyzed by the literature under different and only partially converging perspectives. For example, Perkmann et al (2013) defined academic engagement as the knowledge-related collaboration of academic researchers with non-academic organisations and the consequent transfer of knowledge from the university domain to the industrial one. While the academic engagement is embedded into a diversified set of collaboration forms with no equity investment involved, the academic entrepreneurship is centred on a technology transfer perspective based on the founding of new ventures, having the objective to exploit commercially the output of academic research (Shane, 2004). In both literature bodies, relatively little attention has been reserved to the role of educational offer in the intersection with non-academic organizations. Indeed, after the first and second revolution, universities are called to make a further step forward, by reaching a greater understanding of how teaching innovation may result as a driver of innovation in the revisited university – industry context. Similarly, advances in the theoretical understanding on how university can evolve in its entrepreneurial-like role of proactive innovation agency has failed to offer, since now, a convincing systematization of teaching activities as mechanisms to infuse new knowledge into a local innovation system.

To investigate how the reinvented educational offer may play a role in enhancing university's entrepreneurial new role, we adopted the Triple Helix Model (Etkowitz, 1993; Etkowitz and Leydesdorff, 1995). At the basis of the Triple Helix Model lies the concept of boundary spanning, according to which innovation activities are favoured when academia, industry and regional government are able to interact in a systematic way and when a weaker delimitation across the three institutional spheres occurs (Etkowitz and Leydesdorff, 2000). This permeability of domains would allow the development of ties and collaboration among the institutions. Only through a collaborative new configuration of these three actors – university, industry and government - innovation can spread effectively into the local regional

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system. Such inter-institutions collaboration allows each actor to exert an influence upon each other and to bring the creation of new networks and trilateral agreements, with the purpose of stimulating organizational creativity and regional cohesiveness, obtaining ultimately positive externalities on the whole society. According to the Triple Helix scholars, there are several ways in which this permeability of boundaries could be pursued – a permeability that is indispensable for university, industrial and governmental actors to come into contact and to instil innovation in the local regional system and society.

Within this model, a key role in making collaboration possible is played by those universities that show capabilities and strategic intention to assume a new entrepreneurial role. *Etzkowitz and colleagues clearly pose that “the entrepreneurial paradigm is by no means confined to newly invented technologies or research-intensive universities. It can be enacted at teaching as well as research universities through innovations in undergraduate education and continuing education” (Etzkowitz et al., 2000, p.314).* Innovation in teaching should be addressed to meet the evolving needs of the labour market for innovation, by using the collaborative approach at the intersections with industry and local government to obtain a constant fine-tuning with the sectorial patterns of change and the competencies required by the regional innovation system. Thus, through the implementation of new educational offer devoted to improving the interplay between university and industry, with the endorsement of local governmental institutions, students and interns may actively play an intermediary role in knowledge and technology transfer to local firms. “The assumption of an active role in economic development leaves existing academic missions in place, but it also encourages them to be carried out in new ways. In addition to translating research into economic development through various forms of technology transfer, the traditional teaching role is reinterpreted as the university assists the modernization of low- and mid-tech firms” (*Etzkowitz et al., 2000, p.314*). The innovative educational offer also lessens the separation of teaching, research and business activities within universities, allowing the incorporation of research and teaching missions with technology development and dissemination, under a pure entrepreneurial university paradigm.

Therefore, the Triple Helix perspective has contemplated and theoretically justified the role that teaching can play as driver of innovation. However, empirical works focusing on the relationship between Triple-Helix shaped collaborative approaches in innovating university education programmes in favour of the regional innovation system are still few. Furthermore, the educational first mission of university is then the vehicle through which the Triple Helix Model can be put in action and through which university may then account for a new interwoven configuration of institutional spheres within the regional innovation system. Despite that, no strong attention was addressed to investigate the effect that a strong reputation in teaching innovation can have on making the university a proactive and orchestrating actor in generating and supporting collaboration among institutions within a Triple Helix context, thus favouring the permeability of boundaries among the three institutional spheres. This work is an attempt to fulfil these two research gaps.

Methodology.

We adopt a qualitative approach, and a case study methodology (Yin, 2003; Eisenhardt, 1989) by focusing on the activities held by a medium-sized university, UNIMORE, within the local motorvehicle industry and the Emilia Romagna regional government. Specifically, we draw on a theory-driven approach in order to uncover emergent variables and relationship patterns. The empirical analysis is based on the historical reconstruction of the educational programs promoted by Unimore and it is specifically grounded on the study of two recent programs. Data are collected from multiple sources at the university, firm and government levels, through participant observation, documental analysis and field interviews. All documentary data and interviews are content-analyzed in order to extract relevant pieces of information. The corpus of the texts analyzed is composed of formal institutional agreements, minutes of meetings, data on teaching courses, doctoral, post-doc and researcher mobility, contract research, patents and academic spinoffs; archival data referred to regional innovation policies; newspapers reports, reports and other sources related to industrial cluster. Personal interviews involved six key informants, who directly participated to the decision-making process and to the set-up of the programs. The interview track aimed at grasping the evolution of the program, reconstructing how the collaboration among the three institutions started and then developed, identifying the expected objectives and illustrating the first partial results of the projects, in a longitudinal perspective. That would help in highlighting breadth of interactions among the three institutions, their roles and contributions to define and adjust the programs over time; detecting the past relationships between academics, industry and institutional partners; evidencing a pattern of interactions to be replicable. The authors coded the materials independently, and then data were compared and divergent items discussed till reaching a common interpretation.

The context of this study is the E-R motorvehicle industry, which stands at national and European level as a leading region for its manufacturing-based economic growth and its important brands known worldwide. The vast majority of manufacturing companies are concentrated on some well-structured clusters, mainly linked to mechanical engineering

and automotive, in particular sportscars, motorcycles, and agricultural machines, showing high innovation capabilities along with an attention and inclination towards R&D, testified by the number of work units (roughly 29.5 thousand) dedicated to research and development. Overall, the innovation model shows significant traits of distribution into the territory, facilitated by the geographical proximity of large enterprise (OEMs) with the actors of their supply chains. Not only big first-tier suppliers, but also smaller second- and third-tier suppliers contribute to innovation. Within this network of collaboration between small, medium and large companies devoted to innovation and sector specialization, it has developed the so-called Emilian Motorvehicle Valley, worldwide known as the regional cluster of automotive and sportscars. In such a context, the local university, Unimore, established and directly run the Automotive Academy Programme (AAP) and took a leading role in the formation of the Motorvehicle University Network of Emilia-Romagna (MUNER) program, which associates the four regional universities with the most important firms of the Emilian Motorvehicle Valley. Both the AAP and the MUNER programs are designed to be an innovation hub for the local motorvehicle industry for education of the future engineers, held with the endorsement of the local regional government.

Findings.

The analysis of the corpus of the texts under a longitudinal perspective allows to identify the seeds that lead Unimore to take an important role in conjoint the academic, industrial and governmental spheres. The very first steps were taken within the university itself, with the creation of organizational structures, from the creation of the faculty of engineering in the 90s, to the integration of the first experiences of learning-by-doing projects (e.g. Formula Students Projects introduced in 2003) along with tradition degree and master degree courses. In the 2000s, Unimore also starts a massive reorganization aimed at developing network laboratories, at the beginning limited to and created in the specific disciplinary area of engineering, subsequently enlarged following a multidisciplinary perspective. All these activities have been possible thanks to the support of the central offices of the university itself, as well as to local policies aimed at favoring the creation of technopoles and network laboratories, as well as the involvement and interest of the industrial part. By looking at this longitudinal analysis, it is then possible to trace back the internal transformation of the academic sphere, and how the traditional roles and functions within a medium-sized university have been reinterpreted, updated and expanded in light of new objectives (Etzkowitz et al., 2000). We found that, in the early phases, Unimore has principally exploited the initiatives and opportunities promoted at the local level by political institutions (e.g. the creation of a regional network of technopoles). Lately Unimore started to promote initiatives and programs that extended significantly the variety of knowledge transfer activities provided to motorvehicle industry, by identifying a possible confluence of interests and needs between external stakeholders and trying to develop activities aimed to intercept those needs (Etzkowitz et al., 2000). As university has enlarged its role in innovation, expanding its third mission, also education and research activities passed through a process of reformulation that led to an integration of all the three university missions in a more entrepreneurial-oriented new paradigm.

Based on the principle that education, research, and third mission are inherently connected, Unimore since 2017 has conceived two new programs, namely AAP and MUNER, as a collaborative platform with the aim to coordinate educational activities and to collaborate with the top automotive companies based in E-R region, with the support of the local regional government. Overall, both AAP and MUNER programs facilitate the introduction and diffusion of new technologies, skills and knowledge, by promoting an innovative and interdisciplinary approach in research and by introducing a new way of teaching and radically changing the training and education of future engineers.

The Automotive Academy program (AAP) started in 2017, as a strategic project by Unimore with the aim of enhancing its experience in the field of research at an international level, for the study and development of cutting-edge technologies in high-performance vehicles. However, AAP plays a great role also as a collector in the aggregation and consolidation of a public / private partnership, aimed at sharing objectives and methodologies that encourage direct application, improvement and use of teaching programs to contribute to the social and economic development of the community and territory. Indeed, one of the main objectives of AAP is to train engineers specialized in the design of high-performance and competition vehicles and motorcycles. The educational offers developed under AAP is studied on the basis of the needs of the local automotive sector. AAP therefore presents itself as a focal point in the mapping of the knowledge needs and skills of local firms. The interaction with the local innovative system, then, has been translated into a first realization of targeted courses. This line of action took the form of both the introduction of two specific undergraduate degree courses, which enriched Unimore's overall educational offer, and the creation of seminar and training activities for professionals of the automotive sector. Both actions allowed to infuse on the territory those skills that were required to feed the innovative and industrial system of the Motorvehicle Valley.

The MUNER program makes a step forward, since it specifically attempts to answer to the local growing training needs for highly qualified professionals to be introduced in the automotive industry. MUNER offers an innovative

educational offer, whose main objective is to align, within a Triple-Helix collaborative approach, the knowledge generated at the university level and the skills needed by the local firms to support their innovation strategies. MUNER is presented as “a campus as big as a region”, which has its root in a land of worldwide-known brands and cutting-edge technology, where the history of the two- and four-wheels vehicles was written. The local university cannot be blind to the worldwide importance of the local automotive district, and must assume a predominant role in supporting its competitiveness. The actions undertaken to develop high-level professional competencies in order to sustain the firms of the Motorvehicle Valley include the redesign of existent degree courses; the development of new academic programs; the strengthening of learning-by-doing approach through numerous laboratory activities and internships in local companies, the massive introduction of practical classes in the laboratories of University and private companies. Under the MUNER program, then, two new Master’s Degree Programmes were developed, in collaboration with the four regional universities (Unibo, Unife, Unimore, and Unipr) and ten innovative E-R-based motorvehicle manufacturers (Automobili Lamborghini, Dallara Automobili, Ducati, Ferrari, Haas F1 Team, HPE-Coxa, Magneti Marelli, Maserati, Pagani Automobili, and Toro Rosso), and with the support of the E-R Regional Government. Overall, the results of such a collaboration is the design of six curricula targeted to the automotive engineering careers of the future. The teaching methodology – with lessons taken by both university professors and industrial professionals, the structure of the courses – strongly based on laboratories activities and on a learning-by-doing approach, the frequency of moments spent within the partners automotive companies, and the presence of international students and teachers allow for a complete new configuration of the educational offer in engineering, that is designed to instill in the local Motorvehicle Valley the knowledge and skills that can make it competitive with respect to the great changes the whole automotive sector is facing worldwide.

The two programs introduced by UNIMORE are a concrete example of triple helix model applied to teaching innovation. Knowledge, skills and innovative attitude are no more transferred only through the traditional mobility patterns based on arm-length labor market mechanisms. These market mechanisms are complemented by mobility programs based on structured collaboration for joint education programs addressed to favour the innovative development of the motorvehicle industry. Through a program of internships, company visits, and joint research activity, students are educated to new methodological approaches, endowed with innovative skills to ‘read’ the technology trends, and trained to apply technology in the industry setting.

Indeed, in an evolutionary perspective, the collaborative creation of an educational offer allowed also for the strengthening of inter-institutional collaboration and of mutual support in enhancing innovation at the regional level. The collaborative work required to design and implement the AAP and the MUNER programs has created new complementarities between the three different institutional spheres, which inspired and are going to suggest new solutions for regional i

nnovation challenges. In particular, UNIMORE has succeeded in assuming a role in smoothing out differences among stakeholders and in making more permeable the boundaries with local companies and the regional policymakers.

Research limits.

As for any on-going research project at its early development, many steps further are needed in order to get more insights useful to cope with the research questions. Firstly, more documental data are needed in order to enrich the corpus of text, both from primary and secondary sources, and to clearly defined the emerging patterns of collaboration. Secondly, the monitoring of the results of the programs, in term of research projects conducted, number of graduates, and other outputs should be monitored in the medium and longer term to assure the sustainability and the replicability of the model. Thirdly, future research should investigate how the collaboration patterns and the partnerships are evolving and maintained by the time in a more empirically consistent way. Finally, results should be derived cautiously since case study assures only low generalizability.

Practical implications.

We believe that our findings can provide useful patterns of collaborative and inter-institutional framework that could inspire other universities to take on a prominent role in order to support innovation policies thanks to the creation of cross-organizational and cross-institutional educational programs (Etzkowitz et al., 2000). The cases here presented, even if with the caution that arises from the research limitations, could be taken as model to be replicated in other industry clusters, in Italy and abroad. Specifically, the case study, if further developed, would allow to detect the further steps necessary to the improvement of that permeability of boundaries that lies at the basis of the triple helix model.

Originality of the study.

The originality of the study resides in its contribution to delineate how a medium-sized Italian university has reinvented its educational offer to support an excellence of the local regional system to which it belongs, under the lens of the Triple Helix Model. The case study is in line with what suggested by some other works in the Triple Helix school, which offered virtuous examples of innovation in the educational programs, such as the study of Etzkowitz (2012), who traces the experiences of MIT and Boston, Stanford and Silicon Valley and that study of Etzkowitz and Dzisah (2008), who trace the evolution of the university system in developing countries. Specifically, our case study falls in a European context, and in particular in a national and local context with well-defined traits. Indeed, the peculiarities of the context influence the responses and the models of the institutional actors they adopt in realizing that permeability of borders and interwoven of spheres required by the Triple Helix Model. The originality of the case presented, also, lies in the focus on the educational offer and teaching activities as vectors of innovation within a Triple Helix model.

Key words: Triple Helix Model, Academic Entrepreneurship, Academic Engagement, Case Study,

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