



University of Naples “Federico II”



Digital Academies for Inclusive Learning

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This case study focuses on the digital academy programme of the University of Naples within the campus of San Giovanni. The analysis examines the successful collaboration between the University and several global high-tech players taking root within a fragile setting in Italy. The academy programme promotes digital innovation and leverages partnerships with both regional and international industries; hence, the programme has earned legitimacy and forged resilience in the current pandemic crisis and an otherwise challenging context. This case illustrates how university public engagement, which is a heavily contextual and non-linear process, can gain international traction and contribute to innovation and regional development. The analysis highlights the implications for (i) regional development and innovation policy, and (ii) the evaluation of public engagement or the so-called third mission of higher education institutions.

This case study unfolds along six sections. The first section presents the description of the programme and its growth over time. The second and third sections analyse the context and the challenges the programme has faced. The fourth section focuses on its innovativeness, and the fifth section presents the results thus far achieved. Finally, the sixth and seventh sections draw policy and evaluation implications, and a few concluding remarks.

1. Backward and forward linkages to build a digital learning environment

Since the year 2016, the University of Naples “Federico II” —in the modern campus of San Giovanni²— has developed a rich and diversified digital education programme. The Digital Academy for Inclusive Learning³ is a world-class digital skilling and up-skilling training centre for Industry 4.0. The programme has

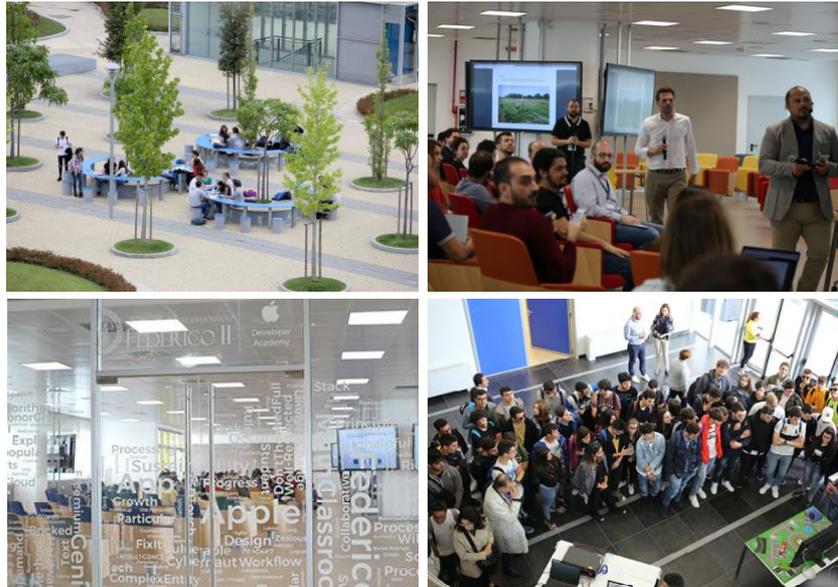
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² A description of the campus is available at this link in Italian: shorturl.at/imzA2

³ This programme is among the finalists for the Regiostars Award 2020 of the European Commission's Directorate General for Regional and Urban Policy that yearly identifies good and innovative practices in regional development, which could be attractive and inspiring to other regions and project managers; see <https://regiostarsawards.eu/>.

“Development is essentially the record of how one thing leads to another”

- Albert O. Hirschman



featured the collaboration of the University of Naples with such global tech companies as Apple, Cisco, and Deloitte — to name the most important. Since the first agreement with the Apple Developer Academy in 2016, the digital education programme of San Giovanni has given rise to seven innovation schools with international players, namely:

- the DIGITA Academy with Deloitte⁴
- the FS Mobility Academy with Italy’s Railway Holding Company
- the Cisco Networking Academy with Cisco
- the 5G Academy with Cap-Gemini⁵
- The Accenture Cyber HackAdemy⁶ and
- the Aerotech Academy with Leonardo, Italy’s most important Aerospace Group, plus other partnering projects are in the pipeline

⁴ The DIGITA Academy aims to offer young graduates the skills to bridge the gap between the demands of businesses and the ecosystem linked to the Digital Transformation. It is an initiative aimed at 50 digital disruptors that provides training of around 1,400 hours, of which: 850 are classroom-based on the issues of industrial engineering, IT engineering, sociology, economics, law, etc., and 550 hours of project work in the company.

⁵ In 2020, the 5G Academy, the first 5G academy in Italy, was born from a partnership between The University of Napoli Federico II through the Centre for Metrological and Advanced Technological Services, CESMA and Caggemini. Going beyond traditional research and advanced training, participants are meant to acquire basic consulting and digital skills, to contribute to the development of sector-specific business cases. The 5G Academy not only targets scientific-technological degrees, but also economics and humanities. In this first edition, a group composed of 50 per cent of graduates in STEM disciplines, 30 per cent in economic disciplines, and 20 per cent in sociological / legal / psychological disciplines, has been identified.

⁶ In 2020 the Accenture Cyber HackAdemy (<https://www.accenture.com/it-it/careers/cybersecurity-hackademy>) a training initiative in partnership between the University of Napoli Federico II and Accenture was founded. The main goal of the HackAdemy is to forge security experts in the context of the so-called Industry 4.0 ecosystem. The training path aims at designing and delivering advanced activities in the field of ICT security, with special reference to techniques and protocols for securing networks, cloud infrastructures, and IoT (Internet of Things) systems. Offensive Defense methodologies will also be part of the curriculum.

The academy training unfolds along a separate track from the regular university teaching courses. Yet, the engineering mainstream curriculums within the Polytechnic School of the University have provided — in Hirschman's words — the *backward linkages*⁷ to build a parallel pathway for digital education and knowledge exchanges with private partners. From the university core courses, the academy programme has drawn a pool of faculties, researchers, and university personnel able to work on innovative offerings. Although participants come increasingly from diverse backgrounds, regions, and countries, the University curriculums have been the reservoir, from which the academy programme has enrolled graduate and doctoral students that have eventually become trainees and instructors within the academies.

Since its inception, the programme has promoted several university-industry education and research consortia with local and international firms. Public-private partnerships have built the *forward linkages*⁸ the academy programme has leveraged to further grow and expand. While regional and international industrial partners have increasingly recruited academy-trainees, a growing number of high-tech and consulting firms — such as Accenture, Sita and TimWK, with its pole for 5G technologies — have relocated around the campus area to directly benefit from the ecosystem geared towards innovation. The campus currently hosts almost 30 applied research labs united within the Centre for Metrological and Advanced Technological Services (known with the Italian abbreviation of CESMA), several spinoffs, a start-up including Materias,⁹ and two certified incubators for enterprise creation (namely, Campania NewSteel, and TimWCap).¹⁰ The growing presence of global players has made the campus an international centre for digital transformation, contributing to revitalising the de-industrialised area of the Eastern part of Naples.

2. The regional strategic context

The location of the campus in the peripheral area of San Giovanni a Teduccio has preserved the heritage of manufacturing companies previously operating in this part of the city. This area was specialised in the tomato processing industry until the de-industrialisation of the early nineties of last century. Since then, the neighbourhood has been plagued by a culture of defeatism, organised crime, and a longstanding reality that many young adults from the region migrate abroad. Gradually, the presence of the campus has helped revive the fortunes of this area. A fast-track railway line better connects the University to the larger metropolitan area, and new commercial and hospitality services — i.e., stationery, restaurants, canteens, student housing, etc. — have grown in the neighbourhood. The park within the campus has become an open space for social gathering, symbolising the renaissance of the neighbourhood from the ashes of its lost industrial past.

Currently, the vast area surrounding the campus belongs to a *Special Economic Zone*,¹¹ created by the government to support regional SMEs and attract investments from abroad. In this context, the campus

⁷Hirschman A.O. (1986), *Linkages in Economic Development*, in *Rival Views of Market Society and other recent essays*, Viking, New York. According to the author, linkages are elements of processes that unfold through time and, like all historical processes, they are intrinsically uncertain and open to unexpected shifts and turns, and do not fit in any pre-ordained framework.

⁸Hirschman, cit.

⁹ For information, see <https://materias.it/en/>

¹⁰ For more information in Italian, see <https://www.campanianewsteel.it/> and <https://www.wcap.tim.it/it/hub/napoli>

¹¹ More information is available at this link: shorturl.at/cetvZ

plays a strategic role. The infrastructure investment, contributing to the urban regeneration of the neighbourhood, has involved two European Union (EU) regional policy cycles (i.e., 2007-2013, 2014-2020) and planned additional interventions are to be financed in the next programming phase. All European Regional Development Fund (ERDF) measures for the physical infrastructure will amount to a total of 200 million euros by the end of construction, which is expected to be completed by 2022. Currently, all teaching and research activities take place within seven building modules, which are fully operational to host research labs, teaching and training programmes, conference events, spin-offs, and business incubators.

Both through the academy learning approach and the internal labs located within the campus, the University of Naples has created several consortia, which are strategic for stimulating employment and growth. While the academies address the digital knowledge needs of manufacturing and services businesses transitioning to Industry 4.0, the University cooperates with aerospace, mechanics, and food processing industries of the region. Moving down the learning curve, university-industry collaborations can help SMEs acquire know-how that can be translated into better yields and lower costs in their production lines.¹²

3. Meeting the skills and institutional challenges

The academy programme has meant to address both the local and global job market needs. High-tech manufacturing and services create demand for workers with digital competencies who can function well on a team, solve problems, exercise leadership, and pay close attention to detail. And the programme aims to fill the regional digital skills gap, which has grown over time because of declining enrolment in higher education. The pandemic crisis has further increased the need for skilled workers and smart working. Yet, industries' workforce demand has been both growing and volatile, especially during the Covid-19 emergency. Companies recruit staff hurriedly to cope with surging demand while they retrench sharply in downturns.

The academy programme has coped with the tension that exists between the industry demand for more skilled workers and the degree to which the education and training pipeline can be adjusted, expanded, and reoriented to respond to such needs. The educational offerings are by nature long and difficult to modify as opposed to the wide and sudden variations the tech industry workforce is subject to. The mismatch between demand and supply has even worsened because of an inability to foresee future workforce needs with any degree of precision. Thus, the ability of the University of Naples to quickly introduce digital innovation training has been a key factor underlying the success of the academy programme. The remarkable speed with which university faculties were able to introduce an entirely new digital offering has been crucial in engaging global scale tech companies to invest in the San Giovanni ecosystem and relocate around the campus.

¹² See on this also Wessner, C.W., Howell, T.R. (2019) *Regional Renaissance How New York's Capital Region Became a Nanotechnology Powerhouse*, Springer. In the case study on the New York's Capital Region, the authors show how entrepreneurship, innovation, investment in education, research and political collaboration are critical to achieving regional success.

The financial sustainability of the programme and, above all, of the whole campus of San Giovanni is another key factor the University has leveraged through partnerships. The campus's annual budget has grown over time thanks to the cost-sharing agreements stipulated with industrial partners, clients, and stakeholders, adding further resources to the University endowments. All measurement and certification operations conducted within the internal labs of the campus are revenue-generating activities and allow academy trainees and other doctoral students to receive extra funds and research fellowships. Since 2016, through the European Social Fund (ESF), the Campania Region has supported the academy programme with a total of 1,750 scholarships in five years.¹³ While the Apple Developer Academy has financed 25 percent of its participants through attendance allowances, the DIGITA Academy has provided financial support for participants in the project work phase of their training thanks to more than 100 collaborations with local and international firms. All tailored initiatives, like the hackathons, the fairs, and the contests carried out during the year, are funded through sponsorships. These initiatives are designed as cost-sharing activities, and globally marketed.

4. The innovative pedagogy of the academy learning

The academy training focuses on the learner, who develops technical and soft skills, and self-empowerment by interacting with mentors, managers, and investors. The academy approach consists of a mix of theory and practice through seminars, hackathons, project works, and internships. The programme boasts a placement of over 95 percent among the 85 national and international partners that partake in the initiative. A yearly fair allows participants to present their portfolio to more than 100 companies, incubators, and investors, which organise job interviews during the event.

The academy learning style builds on the Challenge Based Learning (CBL) framework. This pedagogical approach requires participants to formulate ideas, ask questions, address challenges, gain subject area insights, develop skills, and share experiences with the outside world. For instance, with Cisco¹⁴ and Deloitte, the training has included project work and co-innovation initiatives to tap into the global partners' networks of platforms, start-ups, and local firms. The digital training blends technical knowledge (i.e., coding, computation, and prototyping), soft skills (i.e., critical thinking, design, and management), and heightened awareness of social responsibility.

Engage, Investigate, and Act are three interconnected phases driving participants to self-empower and learn by leveraging their own passions. Global-scale tech companies co-manage each phase of the training and provide real-world cases learners can draw on. Participants gain know-how through hands-on

¹³ Based on semi-structured interviews with the Assessor for Innovation of Campania Region.

¹⁴ The Cisco Digital Transformation Lab (DTLab) is an open lab facility established in 2018 by Cisco and University of Napoli Federico II in collaboration with Consorzio. Clara DTLab is part of the international network of co-innovation centers and the Cisco Academy. This is a place dedicated to developing co-innovation projects, taking advantage of open platforms and collaboration with startups, universities, and local companies. In 2019, a total number of 123 applications were received at the first stage, 24 from women and 99 from men. At the second stage of the selection, only 52 candidates showed up at the computer-based test, which was administered on November 8, 2019. At the end of the selection, 20 students were admitted to the Cisco DTLab Networking Bootcamp 2020, out of which only one was a woman. This information is based on semi-structured interviews conducted between April 2019 and March 2020 with faculties and instructors that belong to the campus of San Giovanni.

operational experience, close observation of actual results, and trial-and-error experimentation. Learners focus attention, maintain their commitment, and develop resilience while dealing with frustration, failure, performance anxiety, the motivation for action, and the assessment of risk in the business initiative.¹⁵ Besides mastering technical capacities, participants get involved in social impact initiatives both within the immediate neighbourhood and throughout the world with such projects as the Future Fair¹⁶ and The Pier.¹⁷ Participants contribute to developing IT solutions for promoting the social inclusion of minorities and disadvantaged groups. Building digital skills and organisational leadership and management abilities become, therefore, an essential work-life experience.

Unlike traditional teacher-student evaluation formats, peer assessment occurs both through in-person sessions and digital platforms. Participants perform their presentation before diverse audiences and are able to pitch their ideas to both visiting CEOs and classmates. Instructors never evaluate their students: learners are encouraged to self-evaluate reflecting upon their practice at the end of each challenge. This

¹⁵ In the 5G Academy, during the last phase of training, students divided into work teams to develop corporate projects on current hot topics, such as IoT, Digital Manufacturing, Cyber Security, Artificial Intelligence, and Cloud technologies, leveraging the key technologies of 5G. Trainees were accompanied by the technology partners involved, TIM and PTC, who supported the drafting of business cases and the development of specific technical skills. This information is based on semi-structured interviews conducted between April 2019 and March 2020 with faculties and instructors that belong to the campus of San Giovanni.

¹⁶ The Future Fair is an organised form of chaos where students meet the outside world for the first time and get job interviews. The fair lasts two days and along with it, an internal platform connects all students, who can present their portfolio to companies and brands. More than one hundred companies, coming from different sector clusters; several stakeholders, incubators, investors, public bodies equivalent, etc. participated in the Future Fair 2019 and had the chance to have the projects of iOS Developers. Most of the companies, about 70 per cent, expressed their interest in having job interviews during the event. We expected about 3.6 guests per company, on average about 54 per cent were returning companies from FF 2018 and 46 per cent new companies. About 70 per cent of the companies registered asked to perform job interviews. From the different 20 sector clusters present at the event, IT/ITC/Telco/APP economy made up about 50 per cent of the total. Consulting/HR/Head Hunter made up about 15 per cent and other was about 42 percent. The 2020 Future Fair online edition featured 378 participants (from 32 countries) who developed 40 apps already on the market plus another 100 in development. About one hundred companies participated in the fair, and one thousand job interviews were conducted business to business. This information is based on semi-structured interviews conducted between April 2019 and March 2020 with faculties and instructors that belong to the campus of San Giovanni.

¹⁷ The Academy developed the PIER project as a form of pre-incubation period to facilitate trainees to enter into the labour market and to support them while creating new digital products. During the second year of the Academy, the project of the PIER reached its maturity. Former participants joined the Academy programme once again to become freelancers and work on social entrepreneurship projects. The latter are spread throughout the world and are mainly concentrated in India, South Africa, Malawi, and Italy, within the city of Milan. In Milan, the PIER project with Niguarda Hospital with the Italian title of “Spazio Vita” monitors patients affected by Spina Bifida. There are also additional IT solutions to keep track of the progression/regression of degenerative pathologies regarding the upper limbs. In India, the State of Rajasthan in collaboration with Barefoot College Pier project is working with illiterate women to bring electricity back to their villages. The project succeeded in achieving its objectives with no textbooks and traditional learning, but through digital instruments that provide the knowledge to recreate the basics for analogical electronics. Recently in Malawi with Voluntary Service Overseas (VSO) more than 4000 digital tables were updated and managed with no requirement of internet connection. Since the region is not able to be reached by modern internet providers, the PIER developed a network system for tablets with a proper setup to be used in hometown schools. Finally, in South Africa with Ubuntu, another NGO is working with the PIER to provide children’s education in a community affected by HIV-AIDS. This information is based on semi-structured interviews conducted between April 2019 and March 2020 with faculties and instructors that belong to the campus of San Giovanni.

pedagogical approach is highly adaptive and evolves over time. When the Covid-19 pandemic hit the programme, the whole training process shifted to distance learning, and remote activities have maintained their interactive dynamics, continuously involving participants throughout the learning sessions.

5. Results: enrolment, employment, entrepreneurship, and social impact

Participant enrolment has increased over time, reaching more than 3,000 participants since 2016. Trainees have come from increasingly diverse backgrounds —not only from engineering and computer science but also architecture, design, medicine, economics, archaeology, and the humanities. In 2020, the Apple academy has represented 36 countries with an improved gender balance, shifting from 3 percent of women in 2016 to 27 percent in 2020. The age range of participants is between 18 and 57 years old. Most participants come from high school education (64 percent), 26 percent hold a Bachelor's degree, almost 10 percent a Master's degree, and only 0.29 percent a Ph.D. Their educational focus is mainly Software Coding, Business Development, Entrepreneurship (56 percent), and Design (15 percent). Half of the Apple Developer Academy trainees have never been in the labour market, while 68 percent have never developed an app before. In the Cisco and Digita Academies, trainees hold a university degree and have acquired some professional experience.

Yet, all participants in the different academy offerings find a job within the ever-expanding network of local, national, and international companies that gravitate around the San Giovanni campus. As previously anticipated, a significant impact of the training is the 95 per cent job placement each year. At the end of the year-long training, graduates receive multiple job offers from both ICT and traditional manufacturing businesses operating in the region and internationally. A third of participants start their own business or become freelancers. Many are involved in social entrepreneurship projects (i.e., in Milan, India, South Africa, and Malawi). Thanks to the incubator located on the campus, graduates are accompanied throughout the start-up process. They benefit from the broader ecosystem, which thrives within the campus.

Furthermore, the academy-style approach has leveraged the number of partnerships between the University and the private companies at the international and regional levels. This collaborative approach has proved to be scalable and customisable. The partnership with Apple pioneered the academy formula. With the other international players, the Academy training has grown and customised, multiplying the number of partnerships that the University has built up also throughout the region. As previously mentioned, the campus has attracted firms both within and around the area, enhancing the University's local engagement. Traditional and digital firms, such as Axa Matrix, and Innovation Hub by Intesa San Paolo Bank have relocated to Naples, providing opportunities for employment, applied research, and professional growth. Alongside all companies recently settled in San Giovanni, the programme has mobilised qualified personnel (around 2500) and local service providers.¹⁸

Finally, the academy programme has launched several collaborative initiatives with local schools to disseminate digital culture and promote social inclusion. Each year, boot camps and hackathons mobilise

¹⁸ This information is based on semi-structured interviews conducted between April 2019 and March 2020 with faculties and instructors that belong to the campus of San Giovanni.

an average of 500 youths per time from the region and abroad. For instance, the 2019 two-day hackathon for the innovation in public administration involved 14 challenges with a EUR 37,000 prize: 107 finalists were selected out of 320 participants, and 60 winners were awarded before the King of Spain and the Italian and Portuguese Presidents. In the Covid-19 emergency, the Cisco academy has provided the free distance learning platform Campania Smart School, used by all local schools with remote assistance. The PIER project for social impact has leveraged NGOs to benefit hospitals, poor women, and HIV patients in Italy, India, South Africa, and Malawi. Finally, an outreach campaign on social media disseminates the project globally (i.e., Digita's followers on twitter).¹⁹

6. Strengthening policies and metrics for innovation and engagement

The digital academies of the San Giovanni campus in Naples provide the ideal conditions for young talents to contribute to free innovation that is not exclusively meant for market-based applications. Free innovation stems from a reversed sequencing compared to what a company would develop when it launches a new product or restructures production according to Industry 4.0 standards. In the model of free innovation, developers create digital applications independently. Through replications and gradual improvements, developers share their ideas and artefacts on online platforms drawing on peer to peer diffusion. By contrast, companies traditionally pursue producer innovation through investments in R&D, patents, and other methods to keep secret the changes aimed to strengthen their market position.²⁰

Yet, most dynamic companies within the region surrounding the campus have increasingly hybridised these two models to solve production problems and tap into broader user networks. Innovation draws on R&D investments and mobilises internal resources to increase the company's profitability. Innovation also fertilises production from the outside world through tacit adaptations of production techniques and organisational know-how to the needs of the company in dealing with customers and suppliers. For instance, a regional company producing electricity generators showed that from design to delivery, innovation meant crafting a unique product to assure the technical characteristics of generators, but also to offer additional features of transportability, usability, and environmental sustainability. In experimenting with electric charging stations, the problem for the entrepreneur was to acquire secure digital payment systems to scale up both production and sales — that required a user innovation solution.²¹

To help the user and producer innovation complement each other, both Campania and Apulia Regions — in the South of Italy — have created Meditech,²² the competence centre that collaborates with eight universities (including the University of Naples), 22 companies, plus 109 other associated national and

¹⁹ This information is based on semi-structured interviews conducted between April 2019 and March 2020 with faculties and instructors that belong to campus of San Giovanni. For more information in Italian, see also on Twitter @devacademyunina, and @DigitaAcademy plus the information campaign by Campania Region on the following website: shorturl.at/cprBR

²⁰ See Von Hippel, E. (2017) Free Innovation, The MIT Press, Cambridge Massachusetts.

²¹ Further cases include the aero-space companies of the region, where innovation was pursued through the secret re-engineering of production, but it was also brought from the outside to bear on designing and testing avio components and materials. See Marra, M. (2020) Closing the Loop between Producer and User Innovation, available at <https://rb.gy/vfkowo>

²² For more information available in Italian, see the following link: shorturl.at/vLUV9

regional firms. The plan is to enact specific measures for Industry 4.0, including tax credit and credit incentives for Innovation, and R&D, innovation agreements for industrial research and experimental development projects, and acceleration for startups and innovative SMEs. The impact of these policy measures is expected to integrate user and producer innovation particularly for SMEs, which present the highest need for digital transformation.

With its focus on digital skilling and up-skilling, the digital academy programme of San Giovanni has contributed to spreading technological abilities over time; hence, reducing production costs for the benefit of both users and producers throughout different scales and contexts. As digital skills increase and diffuse, so can firms successfully pursue the strategic transformation of production within an ecosystem that favours knowledge and risk-sharing in Industry 4.0 transitions. And cooperation among businesses, universities, and regional government institutions can further move the production system towards higher and more inclusive levels of growth.²³

The impact of knowledge spillovers of the digital academy programme on local and global businesses travels through the often *emergent* interconnections between the user and producer innovation. A systemic evaluation²⁴ will have to reconstruct the dense knowledge networks featuring the University engagement with local productive activities. And new metrics will account for the social impact of the digital education programme on innovation and regional development.

7. Conclusions

The digital education programme carried out by the campus of San Giovanni is a strategic investment in education, infrastructure, and applied research that has had a promising return in terms of growth, jobs, and productivity. The campus has benefitted from the collaboration between the University, the regional government, and international IT companies. In particular, the presence of Apple, Cisco, Deloitte, and other global tech companies as well as local, regional, and state institutions has guaranteed the success of the programme, scaling-up university-industry collaborations.

Research on knowledge spillovers has not yet fully identified the mechanisms by which the main knowledge flows occur across countries and regions. Geographical proximity within and between regions (i.e., spatial interaction) per se does not automatically induce knowledge spillovers or innovation diffusion. As the digital academy programme of the University of Naples shows, additional conditions must be fulfilled, ranging from the existence of strong organisational channels (such as firms), to dense knowledge community networks and skills, for knowledge to travel.²⁵ Less dynamic cities and regions should, therefore, enhance knowledge

²³ See Etzkowitz, H., & Leydesdorff, L. (2000). The Dynamics of Innovation: From National Systems and 'Mode 2' to a Triple Helix of University-Industry-Government Relations. *Research Policy*, 29(2): 109-123.

²⁴ See Reynolds, M., Gates, E., Hummelbrunner, R., Marra, M., Williams, R. (2016) Towards Systemic Evaluation, in *Behavioral Science*, 33(5):662-673, DOI: [10.1002/sres.2423](https://doi.org/10.1002/sres.2423)

²⁵ Iammarino, S., Rodriguez-Pose, A., Storper, M. (2019) Regional inequality in Europe: evidence, theory and policy implications, *Journal of Economic Geography*, 19(2): 273–298, <https://doi.org/10.1093/jeg/lby021>

spillovers alongside many types of transmission channels—cognitive, institutional, organisation and social²⁶— to fully benefit from user and producer innovation.

Source

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²⁶ See on institutional/organisational coordination dimensions Marra, M. (2014) What coordination mechanisms work to manage regional development programmes? Insights from Southern Italian regions. *European Urban and Regional Studies* 21: 254–71.