

Case study of the “University of Bologna”

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1. Introduction of the university in its regional context

The University of Bologna – the oldest home of free teaching founded in 1088– is a multi-secular generalist public Italian university, the second largest in the country with 85,244 students, 2,781 faculty and 2,975 staff. Its 32 Departments offer 92 undergraduate degrees, 110 graduate degrees and 41 PhD programs covering all fields of studies from arts to medicine. Since 1989 it operates through a multi-campus structure, with courses and facilities in five locations in the Emilia Romagna Region: Bologna, Forlì, Cesena, Ravenna and Rimini.

According to the 2018 QS World University Ranking, it is among the first 200 universities in the world, with better performances when looking at specific disciplines such as Arts & Humanities (59°), Social Sciences & Management (70°), Natural Sciences (77°), Engineering & Technology (100°) and Life Sciences & Medicine (101°). Its reputation among colleagues, stakeholders and students places it at the 69th place in the overall ranking. At national level, according to the 2018th CENSIS report, it is the first Italian large University (i.e. those with more than 40.000 students).

Like all public universities in the country, a significant portion of its annual operating budget comes from the Central Government through the Ministry of Education, University and Research. In 2003 Italy introduced its first national research assessment exercise, which was repeated in 2011 and 2016. Since 2005 a growing portion of this funding has been determined on the basis of the university’s performance on research, education and internationalization. University of Bologna has been consistently among the top three best performing universities in the country and such a result had a clear impact on its funding. In 2017, its public funding amounted to more than €376m, a quarter of which, more than €94m, due to its performance rewarding. In addition, in 2018 the University also secured the largest share of a special funding measure introduced to support the best 180 Departments in the country; 14 out of its 33 Departments received around €114m to further support their development in the next five years. In addition to research productivity, in the last round of the national research assessment exercise, there was a more thorough attempt to consider third mission activities as well. The University of Bologna ranked 7th (out of 67) in IP management, spin-off companies, and contract research, with less satisfactory evaluations on the management of cultural goods and public engagement activities. In 1996 it was a pioneer in the country introducing its first internal patent regulation, while few years later, in 2001, it launched the first edition of Start-Cup, then the first business plan competition targeting university communities, as well as its incubator, Almacube, where now the local Industry Association participates.

As in any large generalist university, the relevance and impact of the different areas emerges in greater detail to be considered with more fine-grained analyses. One example is the Medical School, which operates through two Scientific Institutes of Hospitalization and Care - IRCSS (Istituto Ortopedico Rizzoli and Neuroscienze-Bellaria), clinical facilities awarded a special status by the Ministry of Health thanks to their excellence in research and medical practice, and the Sant’Orsola Hospital, which was ranked the best research hospital in the country in 2016.

¹ The views expressed here are our own and do not reflect any official position of the University of Bologna.

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University of Bologna: key facts and figures		
	2005	2015 ³
Budget	921.076.225 euro	871.898.369 euro
# staff (FTE)	6.776	7.124
# of research staff (FTE)	1.882	2.118
# students	97.040	81.494
# publications*	3550	6019
% top 10% publications	1019 (34,5%)	1677 (32,3%)

*source SciVal

2. Regional orientation, strategic development and knowledge infrastructure

The University is part of the rich research and innovation system of the Emilia-Romagna Region, including 6 universities, together with branches of the major national research institutes (CNR, ENEA and INFN). Taken together they represent the public contribution to the Regional high-tech research and innovation network, developed during the last twenty years through different Regional policies and with the direct participation of all universities and research institutions, together with different private stakeholders. Emilia-Romagna was considered the most innovative Italian Region according to the European Regional Innovation Scoreboard in 2017 and is consistently among the most innovative regions in Europe according to different indicators such as It hosts almost 10% of the country's manufacturing capacity which contributes to 11% of its GNP and 13,4% of the country's exports. With a ratio of 1 company for every 10 citizens, the unemployment rate of 6.5% is the second lowest in the country, almost five points lower than the national average and more than one point lower than the Euro28 average.

Striking a balance between a better fit with the needs and specialization of the local economy and the future trends in science and technology is a clear challenge for any large, multi-disciplinary university focused on playing an increasingly major role in the global educational arena. The University of Bologna is no exception, but has clearly benefited from a structured long-term approach at the regional level targeted at aligning local policies with the EU Framework programs. This strong link with a supra-national programming context has made it easier to reconcile the short-term quest of an advanced industrial system mainly based on SMEs, with the participation to long term innovation challenges. The University has therefore both played a key role in the creation and development of the Emilia-Romagna High Technology Network and actively intervened in the policy development process at the EU level. In either setting, its participation occurred through a mix of formal activities directly steered by its leadership, and the involvement in different roles (expert, evaluators, committee members etc.) of its faculty within regional, national and international governing bodies.

As discussed at more length in Sala and Sobrero (2018), the regional innovation policy could be characterized by three different stages. The 2003-2007 period was marked by actions focusing on strengthening the supply and demand of innovative activities. The Region acted as a funder using a dedicated budget and a set of competitive calls administered by an Expert Committee operating in coordination with the Regional Government, but with a high degree of autonomy and responsibility. The 2007-2013 program focused on the creation of a dedicated regional infrastructure under the direct control of the Region to solve the problem of connecting public research activities and companies, with the Regional Government acting as a central planner and pushing for a hierarchical dependence of local Universities and PRIs. The 2014-2020 program, on the contrary, took for granted the presence of a strong set of actors playing different roles along the innovation process and acted as a facilitator investing in a preparatory phase based on public consultation to build consensus.

³ Due to data collection hurdles we were not able to collect all figures for more recent years. They could be available in the near future

The University of Bologna, like the other universities and research centers in the Region, benefited and contributed to the different phases of regional innovation policy not only by increasing their funding opportunities, their patenting activities, their start-up creation, but also by creating new organizational entities dedicated to improve the industry-academy link. The current Emilia-Romagna High Technology Network leverages the activities of several new laboratories dedicated to supporting the innovation process of the regional economy clustered in 6 areas (agriculture, constructions, energy and environment, ICT and design, mechanics and materials, life sciences). The University of Bologna is active in all these areas through its Interdepartmental Industrial Research Centers - CIRI, which involve more than 400 faculty members belonging to 24 different Departments.

With its Museum and Library systems the University provides resources that are accessible not only to its community, but also to the different municipalities where they are located. The Library System includes almost 6 million documents and electronic resources and 27 main libraries which are spread in 71 different locations/service points and serve more than 92,000 individuals per year. The University Museum System includes 14 entities, between museums and discipline specific collections such as: the European Museum of Students (MEUS), with a unique collection of more than 400 objects, manuscripts, sculptures covering 800 years of students' history at the University of Bologna; the zoology museum offering the most important collection in the country; the Museum of Specola offering the possibility to see several tools and instruments used in the past for astronomical observations. The University Museum System is targeted to supporting education activities for students, the conservation of artifacts, the restauration and cataloging for research and study purposes. It promotes in different forms public engagement activities and the spreading of scientific culture in collaboration with public, private, national and international institutions. Every year 130.000 visitors access its facilities offering about 65 educational programs (laboratories and guided tour for students and for citizens) and 95 events and specific activities tailored for different groups of the 5-16 years range.

The University through its medical faculty is also critical to support the Regional health system. Out of a total of around half a million patients treated in the region, around 14% is managed by its main research hospital and the network of medical facilities connected through teaching and research activities, which offers about the same amount of productive capacity. Moreover, with around 300 medical residencies fully financed in 2018 the University hosts around 50% of all new residencies in the Region.

Focusing on the specific characteristics of the regional ecosystem, the University directly participates in several coordination bodies. Its Rector sits together with all other Rectors of the Region in the Emilia Romagna University Coordination Committee, a governing body present in all Italian Regions. A similar body specifically dedicated to the coordination of the Medical Schools and their direct contribution to the Regional health network has also been established in 2016 and is chaired by the Regional Health Minister. The University is one of the founders and shareholders of the Regional Coordination Agency for Technological Innovation, ASTER, which steers all the activities of the ER High Tech Network, and acts as the Scientific Advisor for the Strategic Plan of the large Bologna Metropolitan Area.

3. Education and Human capital development

The quality of the education of the University of Bologna is rated high both in national and international rankings. In 2018 CENSIS confirmed it at the top among Italian mega universities according to the availability of its facilities, services provided, level of internationalization and communication efficacy. According to national surveys carried yearly on all Italian graduates by AlmaLaurea, in 2018 89% of the students are generally satisfied with their degree programs (compared to 86% in mega universities and 88% overall in Italy). The University's national reputation is also reflected in the composition of its community, with 42.7% of its students coming out of Emilia-Romagna, and 6.7% out of the rest of Italy. i.e. over 50 % of its students came from abroad, an indication of the efforts made in recent years in the internationalization of its educational offer and one of the highest in the country.

The University's graduates are mainly employed in the private sector (76.7%), while 14.7% are working in the public sector and 8.3% in the nonprofit sector. These figures are in line with the overall rates reported for the whole Italian university system by AlmaLaurea's yearly survey. A greater portion of employment in the nonprofit sector reflects the peculiarity of the regional territory, where nonprofit organizations are more deeply-rooted than in other Italian regions. The most common fields of work are services with 77.2% (17.5% other services, 15.7% commerce, 10.9% education, 10.7% health, 7.2% consultancy and 4.4% computer science) and industry with 17.6% (6% in mechanics and precision mechanics, 4% in constructions, 3.1% in chemistry and energy). Overall, 73.3% work in the North-East, 7.8% in the Center and 7.5% in the North-West of Italy. A smaller but increasing percentage (around 7%) find their first job abroad. One year after graduation the overall employment rate of the University's alumni is 58.7%, which increases to 76.6% if we look at master level graduates. Both figures are higher than national values (respectively 55.1% and 73%). Those who are not working report to be engaged in additional studies (90%), waiting for an employer's call (3.4%), or not employed as a personal choice (3.3%).

As previously mentioned, the willingness to attract international students is clearly shown by the increasing number of degrees offered in English (from 2 in 2004, to 21 in 2010 and 48 in 2017). International programs are spread in all the Schools and campuses, with a particular focus on Economics, Management and Statistics, Engineering and Architecture, Literature and Cultural Heritage, Languages, Science, and Political Science. Accordingly, a specific effort was dedicated to the number of Erasmus agreements for students exchange with European and international Universities, with more than 1800 agreements active since 2016, leading to an incoming cohort of over 2000 students 2017, doubling the 2001 level.

Moving at the course level, an example of the University of Bologna's involvement in multi-stakeholder projects is its participation, together with other three universities in the region (University of Modena and Reggio Emilia, University of Ferrara and University of Parma) and with the support of the Regional government, in the co-design and implementation of an international master program called MUNER (Motorvehicle University of Emilia-Romagna). Spread across the regional territory and rooted in its motor valley technology and history it engages the most famous automotive companies in the world (e.g. Lamborghini, Ducati, Ferrari, Maserati among others) which contribute with their know-how and the most innovative technologies to train the new professionals in the field. Another example is the PhD in Data Science and Computation, activated by a Consortium founded by University of Bologna, Polytechnic of Milan and Golinelli Foundation of Bologna. The three institutions wanted to create a world class center of excellence in this field, together with the National Institute of Nuclear Physics (INFN), the Italian Institute of Technology, and several private companies interested in joining the initiative. A third example is the University's Business School, BBS, which offers over 40 programs, engaging more than 600 students each year coming from all five continents, interacting with more than 500 companies in its network, and through 14 international collaborations which provide a key link with the world to the local business community.

The commitment of the University in collaborating with companies provides additional externalities. The University offers job-placement services to its students directly and in collaboration with other institutions. Moreover, it has introduced a compulsory internship requirement in most of the programs.

Focusing on entrepreneurship courses, the University hosts a set of different initiatives. First, all engineering students are required to take

StartUp Day is one of the most important events for student entrepreneurship in the country. It is meant to scout entrepreneurial ideas on the students' site (from undergraduates to PhD students). 30 ideas are selected every year and introduced to a training program aimed at developing further the ideas and help students to pitch their ideas to institutional investors. Selected start-uppers get a round table where they can get to know the players during two pitching sessions of 30 minutes each. The matching is managed by an electronic agenda which connects start-uppers and players who are really interested in meeting each other.

In 2018 the event, which is now at the fourth edition, was attended by more than 2000 students, and more than 50 supporters (business angels and supporting agencies from the region, from the entire country and from abroad).

an introductory course in management and several programs offer additional courses in the field, with three additional courses on the topic of entrepreneurship introduced after 2016. The University also offers to students willing to develop entrepreneurial ideas specific support and training for business plan development (see section 4). In addition to focusing on increasing entrepreneurial awareness in students through dedicated training, the University organizes events for ideas scouting and creates opportunities for students to interact with national and international financial investors and business community. A particularly successful initiative is the Start Up Day (see adjacent box), a get-together event that the University organizes once a year in Bologna together with a student association. Another initiative targeting PhD candidates, fellows and young researchers, called Launch Pad, is organized for scouting innovative ideas with high growth potential in the creation of new businesses. A business start-up program is also implemented by the University in collaboration with its incubator AlmaCube, founded in 2001 as the first one in the country together with the one launched by the Politecnico of Turin. Similar initiatives are also organized for more traditional university spin-off companies aimed at commercial exploitation of research results.

4. Research, technological development and knowledge transfer

Considering the overall amount of research funding (around €74m) raised through competitive calls, grants and tenders, around 68% comes from abroad, 20% from regional sources and 12% from national ones. Funding from abroad includes mostly EU financed projects H2020 with an overall funding attraction which has long been the first in the country and in 2017 was second only to the Polytechnic of Milan. Moreover, following a dedicated effort targeted to strengthen bilateral agreements with large companies, in the last two years 12 new contracts have been signed for around €6m.

As previously mentioned (section 2), the University hosts seven industrial interdepartmental research centers (CIRI), where applied research is carried out in collaboration with local companies. These centers are part of the regional High Technology Network and are aimed at increasing knowledge transfer towards the regional industry. CIRI are located in the five towns in which the University is present with its branches, where research is specifically targeting local industry specific needs. A brand-new maker space (AlmaLABor) will open by the end of 2018, targeting mainly students and young scholars and offering spaces equipped with different tools for prototyping. AlmaLABor will collaborate with some of the companies which already have long-term institutional agreements with the University of Bologna and are interested in corporate acceleration. Furthermore, in 2018 the University launched a Competence Center Industry 4.0 selected by the Ministry of Industry and Economic Development through a competitive call and founded with a grant of €8m. The Center will offer dedicated facilities and training activities to companies, and will be involved in the implementation of innovation projects, industrial research and experimental development on innovative technologies such as Big Data, Industrial Internet of Things, Industrial Cloud systems, Cyber Security, robotics and additive manufacturing (3D printing).

The University is considered a reference point at national and regional level, thanks to its contribution to the development and the enhancement of the university community norms and practices in terms of IPR and knowledge transfer. It is a pioneer at national level in terms of University IPR and knowledge transfer. Indeed, it was one of the first Italian Universities issuing an IPR regulation in 1996 and engaging in innovative initiatives for transferring the results of the research through the promotion of spinoffs (see section 5).

The University of Bologna established its first IPR office in the late 1990s. It was subsequently transformed into a Knowledge Transfer Office (KTO), working specifically on IP protection and enhancement of patents and spinoffs. Since 2015, thanks to the push of a new Rector and his appointment of a Deputy Rector dedicated to entrepreneurship and relations with companies, the KTO widened its span of activities organizing its services along three areas: new spin-off and start-up companies, support of entrepreneurial ideas born within the university; intellectual property management, increasing awareness and support to research results valorization; industrial liaison

activities, promotion and support of the cooperation with private companies. The KTO works closely with AlmaCube, the business incubator of the University of Bologna.

The University holds 165 patents applications, and a portfolio of 204 patents. In 2017, 19 licensing contracts were signed for an annual income of €600k, more than doubling the results obtained in 2014, although still far from becoming a significant complementary source of funding. In the same year, the office filed 99 patent applications in 63 patent families, with an increase of 22% with respect to 2016 and of 94% with respect to 2014.

Since 2016 the University of Bologna has adopted an innovative way to report the contributions generated by its institutional activities, including training, research and social and public engagement, to align with the United Nations' 17 Sustainable Development Goals (SDGs) achievement framework. The report, prepared by the University's Technical Scientific Committee for Social Reporting in collaboration with the University's academic and administration community, is released yearly and disentangle the direct and indirect impact produced by the university through teaching, research, third mission, and institutional activities.

5. Enterprise development and entrepreneurship

At the beginning of this century, the University of Bologna has been pioneering innovative initiatives to support academic spinoffs, launching in 2000 the first business plan competition (Start Cup), later embraced at regional and national level within PNI Cube (the Italian national innovation award), and its incubator AlmaCube, in collaboration with the regional Industrial Associations. It introduced the first spinoff regulation in 2002, clarifying how to establish spinoffs, how the faculty and staff could participate in their activities and how they could use the University's facilities. Some years later the KTO started providing support and services to those companies. Following the new provisions introduced in 2010 by the law reforming the Italian University system, in 2013 a new spinoff regulation distinguished between start-ups (i.e. companies launched by university students and graduates based on the enhancing knowledge and skills acquired within the University during their studies), and spinoffs (i.e. companies launched by faculty and other staff based research results). A second incubator, Cesenalab, started jointly with the local industry association was launched in 2013 and focused on digital technologies. In 2015 the new Rector nominated for the first time a Vice-Rector for Entrepreneurship and a new plan to further enhance its activities developed a diversified set of agreements locally and abroad to create a network able to support start-ups in their development. In 2017 she started AlmaEClub to increase the awareness on entrepreneurship and promote a focused networking on the matter among the faculties. More than 200 faculty members coming from all Departments have joined AlmaEClub, getting together every other month to share ideas (and contribute) on specific projects in entrepreneurship carried out in the University.

Longitudinal data between 2000 and 2013 show the leadership in Italy of the University of Bologna as of number of spin-offs activated (67 spin-offs in total). Data on student startups coming from the four editions of the Start Up day (since 2015) involve the application of 838 startup projects, 126 of which were selected and received a customized support in building the co-founders' team and 100 attended the incubation programs of Almacube. So far, more than 3 million Euros have been raised by the companies that applied to StartUp Day, a quite small amount compared to what happens in other countries, but a significant achievement given the limited development of the Italian Venture Capital market.

6. Vision and strategy for the near future

The strategic plan of the University of Bologna identifies as one of its main targets the University's consolidation and improvement of the degree of internationalization of its scientific and educational programs, and of its organization.

Indeed, a strong emphasis is put on the need to consolidate the dense network of relationships with Universities all over the world, but also to become a greater laboratory of ideas to be made available to and to be exchanged with the subjects acting on the local territory, including industry, business and cultural investment. Thus, the University puts at the center of its strategic plan the

importance of an international development, maintaining a focus on the production of new humanistic, scientific and technological knowledge for the country and for Emilia Romagna, paying particular attention to the adoption of innovative teaching methods and innovative training activities, enriched through the introduction of cross-disciplinary skills and a global mindset.

Annex