

Preparing IMT School for the future

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1. How things started

IMT School was founded in 2005 as an institute of advanced doctoral education, aiming:

- To a high international standing in research and education, in terms of quality and innovation, and to become a reference point for institutions, policy-makers and companies.
- To combine the highest disciplinary rigour and excellence with an innovative interdisciplinary model, arranging the conditions for pursuing highly innovative research.
- To select a few well-defined methodological and application areas that share an interest in the analysis of data and empirical evidence, have significant impacts on society and can contribute to technological, social, economic, and cultural progress.
- To define innovative PhD programmes grounded on traditional top-level disciplinary training to nurture innovative and transversal research and training.
- To contribute to the development of Lucca and the surrounding areas in collaboration with local stakeholders and an extensive network of external partners.

The success of such an innovative project, i.e., targeting the complex problems that mark the contemporary world and training the skills needed to tackle them, requires a careful balance between the three main missions of university institutions: research, education and the so-called third mission of putting knowledge at the service of society at large. However, the project has also required, and will require, constant attention to reconciling the specialist nature of the individual disciplines with the interdisciplinary approach. IMT project's implementation has confronted strong resistances, such as, e.g., those induced by the Italian university assessment system, still centred on rigidly defined traditional scientific disciplines.

In its first 15 years of existence, IMT has achieved excellent international visibility, with proven recognition of excellence in research and teaching, as demonstrated by Ministerial evaluations (VQR), numerous projects at the European, national, and regional level, and placement of alumni and researchers. The actual success is due not only to the quality of individuals and research units but also to the interdisciplinary scientific vision of the School. We must continue along this path.

2. Current challenges

The digital transformation and the challenge of globalisation, already underway when the School was first established, are even more evident today. Indeed, they have an undeniable disruptive impact on contemporary societies' cultural, social, economic and technological phenomena, and thus on Institutions, Markets, and Technologies. Technological advances, on the one hand, and socio-economic and cultural changes, on the other, have amplified the number and complexity of these phenomena.

Heterogeneous, interconnected and interacting systems permeate all critical sectors of society such as economy, industry, infrastructures, finance, culture, politics, individual, social and institutional practices and interactions, health, research, professions, the perception of the relationship between social and individual space, between local and global, between man and machine, between natural and artificial, between fiction and reality, between physical and virtual. Complex socio-technological systems thus emerge as contexts that require integrated analytical approaches, which are both rigorous and creative, and combine basic methodological skills with specific-domain-based knowledge. In these contexts, and with these approaches, it becomes possible to effectively analyse and solve problems related to social cohesion and well-being, security, sustainability, resilience, systemic risk, decision-making processes, institutional practices, public opinion formation, cultural heritage, activities and phenomena, social interactions and integration, the role of knowledge and skills, the role of communities, institutions and individuals, and the role of media. The School is already well-positioned in these areas. We must continue to focus on analysing natural or artificial, human or social systems, creating and using appropriate models and developing new analytical tools.

We must ensure that IMT's researchers nurture and refine their skills, research and disciplinary methodologies. However, the time seems ripe to apply these skills to challenging, highly complex problems and projects, which require an interdisciplinary approach to enhance transversal lines of development pursued by the research units. At this stage, it seems crucial to focus our action on two main research directions in a continuous reciprocal dialogue and already rooted in the School's vocation. The two directions should not be seen as rigidly distinct, as they are intimately interconnected and present many overlaps:

- 1) Qualitative and quantitative methods and tools for analysing, measuring, modelling and forecasting the evolution of complex socio-technological, economic and cultural systems and regulating and optimising them.
- 2) Analysis, management and innovation (using data, information and methods of contextual analysis) for economy, institutions, production systems, social behaviour, cultural- and

cultural heritage related- phenomena, including practices induced or profoundly modified by digital transformation, globalisation and social, economic and cultural change.

Many and multifarious research lines can be developed along and between both directions to leverage the existing skills and face today's societal challenges. Some areas are listed below, in which IMT School could strengthen and concentrate its efforts to contribute to the country's advancement and training of academics and professionals capable of dealing with the complexity of new contexts. It is important to remark again that the following list is by no means exhaustive and that basic and applied research, curiosity-driven high-risk research, disciplinary excellence, interdisciplinary, innovative and experimental research are all essential and must all be supported. In this context, IMT should aim to:

- develop techniques based on machine learning, optimisation, simulation, statistics, econometrics, physics of complex networks and contextual analysis to build, analyse and validate systems' models;
- use models and data analysis to make predictions and contextual analysis to analyse systems and suggest optimal policies or evaluate existing policies;
- develop methods or identify case studies for analysing mechanisms, practices and contexts (economic, institutional, juridical, social, technological and cultural) of the production, use, manipulation, circulation and re-use of cultural heritage, of cultural activities and management of cultural heritage, institutions and phenomena;
- analyse and evaluate cultural and individual variables in social phenomena and practices (media and communication, job market, innovation, mobility, sustainability, automation, security, data management, sensing and finance, use protection and enhancement of cultural heritage, role of institutions) using different methods;
- study, by integrating different domain-specific knowledge and methodologies, interaction networks, innovation tools, social media, information flow, ... ;
- effectively transfer the results of the analyses to institutional policy-makers in the economic, financial, industrial, institutional, juridical, administrative and cultural fields;
- identify appropriate policies in the economic, management, cultural and institutional sectors and develop techniques and modalities to support strategic decision processes of national and international companies and institutions;
- study the impact of technological changes and digital transformation on the job market, training, research, professions, and new models of sustainable development.

3. How to grow

The challenges mentioned above require the adoption of a policy to strengthen, support, and institutionalise relations with international academic communities, thus reinforcing the

School's position on the international scene with a recognisable and defined identity. For this reason, PhD students, alumni, researchers and professors must actively participate in the School's project and become its ambassadors in international and national contexts.

At the international level, we need to forge collaboration agreements with prestigious foreign universities for training and research activities and build strong networks between researchers. This will improve performance and increase visibility and research collaborations.

At the national level, we need to enter qualified post-graduate training networks and establish a nationwide network of "Scuole a Ordinamento Speciale", which will allow the development of joint projects and share services for supporting teaching, research, and placement. We must not limit ourselves, though, to a network of "Scuole a Ordinamento Speciale": it is also necessary to establish close relations with other Italian academic institutions, not only in Tuscany, through agreements for collaboration on master's degrees, which can be an instrument to promote knowledge transfer and to introduce our School and our researchers to potential candidates for our doctoral programs.

Collaboration agreements at the national and international level could be fostered by networking with the many researchers or PhDs alumni who are now active in other institutions or companies. To this end, the possibility of establishing an association of former IMT researchers, parallel to the alumni association and linked to it, should be considered.

4. Lucca as a research and innovation lab

IMT School is the only advanced-education School located in an Italian city that is not also the seat of a university offering undergraduate and graduate training; Lucca cannot count on a tradition of interaction between academia and the city. This circumstance has led to misunderstandings about the driving role that advanced training and research can play in territorial development and the importance of setting up a laboratory in which ideas are developed and tested with the ambition of becoming a model for the country. The synergy and collaboration between the city and the School is a precious asset, which must be cultivated, safeguarded and valued: for the School, the city must not be simply the place where it is accidentally located but a value. It is also desirable that Lucca increasingly perceives the School as a value by itself, in terms of its visibility in the world, as a porous surface for a two-way exchange between the world and the city and as a place where ideas, innovations and pioneering solutions on crucial issues of contemporary societies are elaborated and tested. With its international and lively talents and activities, IMT's community, year after year, becomes Lucca's community through its new students, researchers and teachers who take in their turn this sense of belonging to the world.

The characteristics of the city of Lucca, common to many Italian provinces, make it an ideal City Lab to test the results of research through innovative collaborations between different actors, be they institutions or companies. The topics investigated by the School may impact the competitiveness of the territory in various sectors. The relations between the School and the city shall be strengthened by multiplying the chances of exchange between the School's researchers, entrepreneurs and administrators to discuss development prospects and elaborate concrete initiatives able to meet the priorities of the local stakeholders. Few targeted actions should be selected, like, e.g.:

- sustainable territorial development, employment and innovation;
- new professions, digitalisation, industrial development;
- social cohesion, health, training, human capital;
- sustainable mobility, services to the citizen, critical infrastructure;
- cultural heritage and its protection, management, enhancement and use, tourism;
- cultural, social and dissemination activities and events.

If successful, the results of the experiments will lead to institutional, social, economic and technological innovations that can be adopted at the national and international level and can also be exploited through virtual laboratories made available to public and private entities.

5. Resource Management

The actions aimed at fostering the School's identity must be accompanied by a review of the strategic planning processes, internal organisation, resource allocation and staff recruitment models. Healthy growth must be based on clear, stable, and widely shared objectives and rules for planning and allocating resources according to the meritocratic principles of the best academic practices.

It is also vital to provide incentive mechanisms in addition to a basic endowment guaranteed to all researchers in the School, regardless of their role. The instruments may be varied and must, in any case, be deeply respectful of the specific features of each discipline, considering the substantial differences in types, methods and intensity of scientific production, teaching activities and third mission-related activities.

To this end, it is crucial to identify a shared system of indicators linked to the development plans and able to measure the contributions of research groups to the three missions of the School. The internal evaluation should not be conceived as a competition tool between different parts of the School, let alone between the School's researchers. It should, instead, represent a stimulus to improve and maintain competitive positions of excellence, especially when

compared to other Schools and other Italian universities. In addition, evaluation should be used as an instrument to choose the appropriate and effective tool to target the different sectors of activity.

Central to the definition of objectives and evaluation criteria should be the Research Units. They shall draw up activity plans, describe their contributions to research, training and the third mission, and propose criteria for assessing the level of success of their activities. These plans will be synthesised in the School's development plan through a wide-ranging and transversal debate. Resources needed to achieve the proposed objectives will be allocated gradually and based on the ongoing verification of the intermediate objectives achieved.

6. Recruiting Model

Recruitment of new professors and researchers, as well as internal career advancement, should aim at strengthening the existing disciplines by favouring profiles of researchers who can develop tools to analyse highly complex systems, and profiles of domain expert researchers able to use or develop the afore-mentioned and disciplinary tools, to produce case studies and to use and/or develop methodologies for the analysis of systems of interest.

Therefore, it will be necessary to recruit researchers with expertise enriching those already present in the School, who can develop methods, case studies, techniques, and models to analyse systems, favouring the ability and attitude to interact with experts of different application domains. It will also be necessary to recruit researchers who can use innovative tools to build models to analyse and forecast systems' behaviour and to assess their relevance and reliability.

Since the beginning, IMT's has chosen an international scouting recruitment system. An essential condition for the future of IMT is a rigorous, merit driven selection at all levels of recruitment, from PhD students to full professors. In this way, we will consolidate IMT School's position in the international scientific arena and make it a valuable model for other institutions to follow.

Precise criteria should be established beforehand for recruitment at all levels, from new researchers and professors to internal career advancement. Permanent or tenure-track positions will be filled only with the broad support of the School's faculty, in compliance with the current national regulations, and adopting an evaluation process that includes significant interaction of potential candidates with the School's academic body. Consideration should also be given to defining guidelines for recruitment which would discourage continuity in the path from doctorate to a permanent position within the same institution.

7. The Administration

Over the years, IMT School has promoted, also with national institutions, the vision of an administration at the service of the School's scientific and educational project and, in particular, of its strong international and interdisciplinary vocation. The School's intuitions have proved to be anticipatory of many phenomena and best practices now recognised as central by most research and government institutions. For this reason, it is desirable to establish a continuous dialogue with the national governmental and regulatory institutions of Research and University as to contribute to the improvement of the procedures and mechanisms of evaluation, management and recruitment, and to promote experimentation and innovation in research and training, thus fostering schemes and procedures more in tune with our innovative and interdisciplinary project.

In recent years, the School's effort to reduce bureaucracy has given way to the increasingly pressing national rules and procedures. This circumstance has made it more challenging to take advantage of international scouting, participate in the job market, advertise interdisciplinary positions, and to implement innovative training initiatives as well as technology and methodological transfer. After the first propulsive phase, the School entered a phase of rigidity and proceduralism that distorted the physiological relationship between function and administration. This approach has led to a bureaucracy encumbrance that has limited agility in research, innovation, doctoral teaching and training, and collaboration with third parties. The School's high rhythm of turnover of experienced and trained staff has also deprived it of valuable technical-administrative expertise. Together we need to overcome this phase, simplify procedures and regulations, and find ways to recover the original spirit of the School.

On the organisational side, the offices in charge of the School's main institutional functions should be strengthened, while the communication strategy should be reconsidered through interventions coordinated with the administrative management, for example, in the following contexts:

- The project office, given its skills and excellent functioning, should make a further qualitative leap by guaranteeing not only a support to the management of projects but also to the definition of the projects themselves, with contributions to the writing and to institutional interactions of professors with external organisations or companies.
- The IT office should have the budget and personnel to create and manage a data analysis centre and acquire resources through agreements with public or private centres, strengthening and managing the infrastructure for distance and blended learning that will undoubtedly be useful in the post-pandemic period.

- The offices in charge of supporting teaching should be reorganised by strengthening the placement and students' support. At the same time, the cost/benefit ratio of some IT tools for teaching management and evaluation of research should be reconsidered.
- The organisation of the School's communication could be reconsidered so that it contributes nationally and internationally to strengthen the School's identity and improves internal communication towards a more effective and timely transmission of information.

The reorganisation process and the additional efforts required of the technical-administrative staff (who always distinguished itself for the spirit of service and availability of its members) will be accompanied by new reward mechanisms and new ways to increase related funds.

8. Organisation

The current official research areas (Computer Science and Applications and Economics and Institutional Change) no longer represent the School, to the point that several colleagues are not assigned any area on the CINECA website. New areas should be designed, and they shall become the Research Units' hinge. Research Units, in their turn, will represent the places of aggregation of researchers who share scientific and cultural projects and consider the unit as functional to improve the group's image and external impact. The Units' dimension may be significantly different from one another, and it shall be dictated exclusively by the existence of an advantageous sharing of lines of action and research.

The Areas (once redefined) and the Research Units will have to become the instruments for sharing information and elaborating strategies in continuous collaboration and dialogue with the School's director. The latter will report instances and projects to the governing bodies of the School and will use them as a basis for the elaboration of annual and triennial strategic plans and programs.

An international advisory board with qualified members representing all research lines active in the School will have to support the School's management in defining future strategies. The board is essential to avoid the risk, inevitably linked to the low number of faculty members, that personalistic and self-referential biases condition discussions on strategic choices.

9. Educational Offering

The current doctoral programs in Cognitive and Cultural Systems and Systems Science are successful tools that attract many applicants. It is necessary to consider the opportunity to enrich the School's offer with new doctoral tracks to tackle new educational needs and

occupational demands. Like Areas and Research Units, the Doctoral Programs should be seen not as barriers and limits to collaboration. The activation of common courses between different tracks and different doctoral programs and the creation of interdisciplinary training and educational programs should be encouraged to increase interdisciplinary approaches and skills. These, if also chosen based on the analysis of international placement procedures and job market needs, can ensure a significant added value and a distinctive feature for our students. Thus, we need to increase the number of courses on transversal skills concerning interpersonal communication, innovation management, intellectual property, and aim at the development of self-entrepreneurship and the valorisation of people, bearing in mind that a PhD, today, is no longer just 'destined' to an academic career but can be employed also in other public and private sectors.

The School's network can also be enhanced by participating in joint doctoral programs at both the national and international levels. The activation of industrial or public administration doctoral programs will further allow the School to take advantage of the National Plan for Recovery and Resilience opportunities, which strongly focuses on applied research and collaborations between the public and private sectors.

To keep a high international standing in research, in terms of quality and innovation, and becoming a point of reference for institutions, policy-makers and companies, it is also necessary to ensure that the School maintains its capacity to attract excellent students. In addition to doctoral Programs, moreover, the School shall establish educational programs that target public administrations' institutions' and companies' training needs. These objectives can be obtained through actions such as:

- Participation of IMT School's professors and researchers in courses offered by other Italian universities to let students know IMT School and stimulate them to consider it for possible post-graduate studies.
- Activation of second-level master's courses at the School with educational objectives aligned to those of our doctoral programs, with the provision of path-shortening measures for students who are subsequently admitted to IMT doctoral programs.
- Activation of Executive Masters and other courses of high professional training that allow the transfer of approaches, methods, and knowledge available at our School to the staff of other public or private entities.
- Offer of short-term research internships to Italian and international graduate students (Master level) for their participation in projects proposed by our researchers or by the interns themselves. This action might prove instrumental in raising and widening awareness of research methodologies, practices, and "cultures" and increasing IMT School's capacity to attract excellent PhD students.

- Increasing short-term training activities aimed at an international audience such as Seasonal Schools and similar initiatives.

10. About the Campus

IMT School was first established counting on the Campus Model, i.e. an educational model able to create, within the city walls of Lucca, an environment in which students, researchers and professors could live together in a continuous and dense exchange of experiences, knowledge, scientific questions and projects. The San Francesco complex, with its cafeteria, rooms, offices and classrooms, is, in this sense, an ideal setting. However, it is insufficient if we consider the growth prospects of the School. The renovation of the building in Via Brunero Paoli represents an initial response to our future needs. Still, together with the proper public administrations and other entities interested in the territorial development of Lucca and the recovery of areas of the city, new spaces must be identified to extend the campus. Such actions would allow the School to:

- provide adequate housing for all students;
- increase the number of professors and researchers housed in the School's facilities;
- organise training initiatives, including short-term courses, based on the Campus Model.

In this way, we can achieve the ambitious plans of the School's growth in terms of personnel and impact. The scientific potential, the quality of faculty members and all administrative and technical staff, the available funding make certainly this feasible.

11. Concluding remarks

Last November 18, the School turned 15 years old. In the long life of institutions, this is a very short time, a breath. To those who, like me, have seen IMT come into being and have also participated in the life of much older and established institutions, the positioning and the results achieved by the School in such a short time and such a competitive local and global context still arise surprise and admiration. On what I have seen built and achieved by the School's faculty, researchers, young research collaborators, administrative and technical staff, and students, I base my optimism and conviction that the next three years will be crucial and exciting.

During the phase of rugged, energetic and concentrated construction of the School, there were moments of internal tension and moments of rethinking, which led, for example, to the closure of some lines of research and the opening of other initiatives: these are entirely physiological processes in the context of a profound and intellectually honest approach of trial and error. There have been misunderstandings with the city's institutions and some essential players in

the area of Lucca. They could have been better informed about the extent of the effort needed to build a new school from scratch and give it visibility and recognition at the national and international levels. Such misunderstandings are entirely physiological and understandable: they are a tangible signal of the vast amount of energy concentrated in and around the School.

Now the time has come for us, together, to build on the much that we have and develop it further. Every member of the IMT community, in whatever role, must not only feel "at home" in the School but also feel called upon to make it grow: if the School succeeds, we all succeed. In the same way, it is necessary to make those who have temporarily been part of IMT (doctoral students, researchers, fellows, etc.) feel at home in IMT and be its ambassadors in the world. Finally, we need to reinforce the sense of affection and pride of the city of Lucca for the School, involving the different members of its community in our research activities and increasing our institutional, social, cultural and economic commitment.

We can count on an uncommonly high quantity of resources and talents. Additional resources can be acquired by taking advantage of opportunities provided by the National Recovery and Resilience Plan. The School will certainly grow if we work well, harmoniously and towards clear and shared objectives. Mutual respect, the willingness to serve the School as an institution, and a great deal of perseverance are all we need. Looking at what has been built from scratch, looking at the tremendous propulsive, creative and visionary energy that the members of the School's and the city communities have been able to mobilise to bring IMT into being and to accompany it during its first fifteen years of life, I can only be optimistic that together we will be able to seize the many opportunities that are on the horizon of the next three years of the IMT's institutional life.