

REPORT OF THE  
EVALUATION COMMITTEE  
FOR THE PERIOD  
2012 – 2014

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# PART ONE

## INTRODUCTION





## 1. EXECUTIVE SUMMARY

- ¶ This is the third evaluation of IIT. The first took place immediately after the start (Evaluation 2006-2008) when there was no track record of research and scientific production yet, while the second was done at a early stage of IIT activity (Evaluation 2009-2011).
- ¶ This third evaluation covers a period of strong development of IIT research, technology transfer, contribution to high level education and organization. It is released at a point of maturity of IIT, when a new potential discontinuity may occur given the role IIT could play in the Human Technopole project.
- ¶ Therefore this Committee has the challenge to evaluate the accomplishments of IIT and the effectiveness in the use of resources in adherence to its mission, with a view to the transformation occurred in the recent past as well as with a look to a new potential discontinuity that might occur in the near future.
- ¶ Within this context the mindset adopted by the Committee has not only been to execute an audit for detecting strenghts and weaknesses in the strategy, performance and organization of IIT (there is ample factual evidence that IIT is a positive story of scientific research in Italy) but also to offer the leadership of the Foundation forward looking recommendations to shape the future of IIT.
- ¶ The EC realises that several recommendations hereby reported do not represents quick fixes and may require a fundamental renewal of policies, systems, roles and responsibility assignments. An indepth analysis may be required to specify the technical solutions and the appropriate timeline before moving to implementantion.

### ¶ **Outstanding progress on recommandations of previous Committee and a special praise for a number of additional achievements.**

- A remarkable growth of the research staff with an even higher growth of scientific production.
- A confirmation of the high quality of scientific production by international standards in almost all scientific domains
- Increasing visibility of a new generation of scientific leaders representing the platform for continuity and growth of IIT in the future.
- A remarkable increase of the acquisition of prestigious ERC grants by IIT researchers.
- Confirmation of ICUBE as an accepted platform worldwide used as substructure for new research projects in robotics by many universities.
- Estabilishment of a network with 15 national universities for the creation of joint research centers and the cooperation on joint PhD programs.
- Growth and strengthening of almost all the Departments and integration of 6 out of 10 established Centers into an effective nationwide IIT system.
- Implementation of the new matrix structure based on vertical Programs and

interdisciplinary Research Groups with the growth of leadership opportunities for young scientists.

- A robust advancement in Technology Transfer by all dimensions (invention disclosures, patents, licensing, spin offs,...).
- Establishment of long term cooperation agreements with corporations and the adoption of a new liberal policy for IP transfer to them.
- Implementation of a Tenure Track system organized according to first rate international standards.
- Preservation of a healthy balance of low age and mix of tenures within the pool of researchers at all level.
- Assignment by the Government of a leading role in the design of the Human Technopole Italy 2040 project in cooperation with several universities.

#### ¶ **Issues that justify a proper attention.**

- Vision and IIT identity in the scientific domain of Life Science being shaped now after several adjustments of direction.
- A still modest orientation on bridging from scientific research to industry (gap in educational programs, researchers' mindset, scientific strategy).
- Technology Transfer coming out from its early stage in a configuration still not comparable to other peer international institutions
- Future role of Departments and Centers in the new matrix organization not clarified, yet.
- Supervision of Human Capital (planning, mentoring and coaching, career management at all level in the organization, performance pay system) not fully aligned to the challenges of the larger size, yet.
- Uneven quality and performance of PhD students and inhomogeneous implementation of the cooperation agreement with universities.
- Replacement of departed Director of Tenure Track program still pending (recent gap)
- Level of expenditures higher than the public allocation of funds since 2012, coverage of gap ensured by the external budget, increasing importance of short and long term planning and preservation of flexibility.
- Consistency of the criteria for decisions on resources allocation (i.e. the link between scientific strategy and financial planning) and project management with future IIT needs to be tested.
- Clear signals about the need of an organic review of the governance.

#### ¶ **Main recommendations for a guidance of the future of IIT**

- Develop a vision of IIT (even without considering HT 2040) for the next 10 years according to the new paradigm ***"control of growth, boost of quality"***.
- Capitalize on the undergoing effort for the design of HT 2040 to shape a

comprehensive vision on IIT aspirations in Life Science for the long term.

- Continue the program for the formal accreditation as an institution authorized to release PhD degrees and become more selective in cooperation agreements with universities in Italy and overseas.
- Implement a program for the researchers interested in a successful career in industrial research, supplying training on the necessary skills and creating links to corporations interested to an education in technology and science.
- Invest in the growth of Technology Transfer to a new stage of maturity (stimulation program on entrepreneurship, promotion of large scale licensing, attraction of VC capital, sponsorship of a technology park).
- Intensify the long term cooperation with national and international corporations on joint research programs.
- Recalibrate the processes of financial planning and resources allocation to research projects and increase the focus on Human Capital in the strategy planning
- Ensure a quick and appropriate coverage of the two roles of Director of PhDs and Director of Tenure Track (gap occurred after 2012-2014).
- Review the overall governance (time allocation of leadership, role of Scientific Director, senior responsibilities for Human Capital and Technology Transfer, higher weight of scientists in the Board, establishment of a regular, periodic, integrated review of all risk and control outcomes by the relevant entities on behalf of the Board).

## 2. COMMITTEE, METHODOLOGY AND WORKPLAN

The mandate of EC as stated by the art. 14 of the “*Regolamento di funzionamento generale*” of the IIT Foundation is to evaluate quality, relevance and potential of future development of the IIT research activities as well as the effectiveness of the management of the Foundation and its organization. This mandate implies a broad, 360° assessment of the IIT strategy, performance and organization having as a reference the IIT mission as specified by the by-law “*The Foundation has the objective to promote the technological development of the country and the high level technological education, in conformity with the guidelines of the national scientific and technological policy, in order to promote the development of the national economic system*”. In performing his mandate the EC has considered that IIT is still a new, young research organization, created 10 years ago with the goal to test new research strategies and to adopt international practices and standards into an environment not biased by the legacies of the past. The Evaluation Committee has used as a starting point the work done by the previous Evaluation Committees and more specifically the recommendations issued in the 2009-2011 cycle. These inputs have been the key determinant for the composition of the Evaluation Committee for this cycle, the choice of the evaluation framework and the workplan of this evaluation.

### 2.1 Evaluation Committee

¶ The EC members have been selected with the goal to have a mix of competencies, experiences and profiles consistent with the breadth and variety of themes under evaluation. The EC proposed to the Board of the Foundation included 9 members:

Davide Bassi (Member of USI Council, Chairman of Pescoller Foundation)

Sandro De Poli (Chairman and CEO of General Electric for Italy and Israel)

Giancarlo Ghislanzoni (Senior Partner of McKinsey & Company)

Milena Grifoni (Institut I-Theoretische Physik Universitat)

Paolo Lugli (Head of the Department of Electrical and Computer Engineering and Director of the Institute for Nanoelectronics of the Technical University of Munich)

Andrea Montanino (Director of Global Business & Economics Program of Atlantic Council)

Francesco Profumo (Chairman of Gruppo Iren S.p.A.)

Vittorio Terzi (Director Emeritus McKinsey, Terzi&Partners S.r.l.)

Chiara Zuccato (Università degli Studi di Milano – Bioscience department and

The EC decided to adopt as *advisor to the Committee* Giorgio Margaritondo, chair of the Comitato Tecnico Scientifico since 2011 and chair of the 2009-2011 EC who has ensured continuity with the previous evaluation and has contributed to accelerate the acquaintanance of the Committee with the evaluation themes. MIUR, one of the 2 Ministries supervising IIT, has designated prof. Mario Calderini as an observer who has participated to several of the activities and meetings of the EC.

## 2.2 Evaluation framework

- ¶ Considering the breadth of the assessment and the increasing complexity of IIT (due to the boost of its development on the last period) EC decided to adopt a modular approach by splitting the evaluation themes and assignments in six modules with specific and complimentary objectives and a dedicated working group for each module.
- *M1. Mission.* The goal of this module has been to ensure that all the EC members get familiar with the first and second order implications of IIT Mission and to assess its current status, after 10 years of experience since its conceivment.
  - *M2. Scientific production and research.* The goal of this module has been to evaluate the quality and relevance of one of the main output of IIT activities ie the scientific production as well as the effectiveness and productivity of the research core process and organization.
  - *M3. High level education.* The goal of this module has been to evaluate the quality of a second output of IIT activities ie the contribution of IIT to the education of PhD Students as well as Post Doc in the early stage of their developement as reseachers with a future destination in the scientific system as well as in the industrial world. The focus of the evaluation has been on the quality of the educational results as well as on the core processes adopted for achieving these results.
  - *M4. Technology transfer.* The goal of this module has been to evauate the quality of a third output of the IIT activities ie the transfer of the intellectual and scientific achievements to the economic system and the consequent contribution to the economic growth of the Nation. Even in this case the evaluation has included an assessment of the core processes backing the technology transfer as well as the ecosystem developed by IIT to promote a closer interconnection between the scientific and the economic world.
  - *M5. Human capital management.* The goal of this module has been to evaluate the effectiveness of IIT in managing its key input factor ie the human capital, including all the resources that at different level in the organization, with different profiles and at a different stage in their development represent the key asset at the core of IIT overall performance. The resources pool considered in this module include all the organization but PhD Students (in

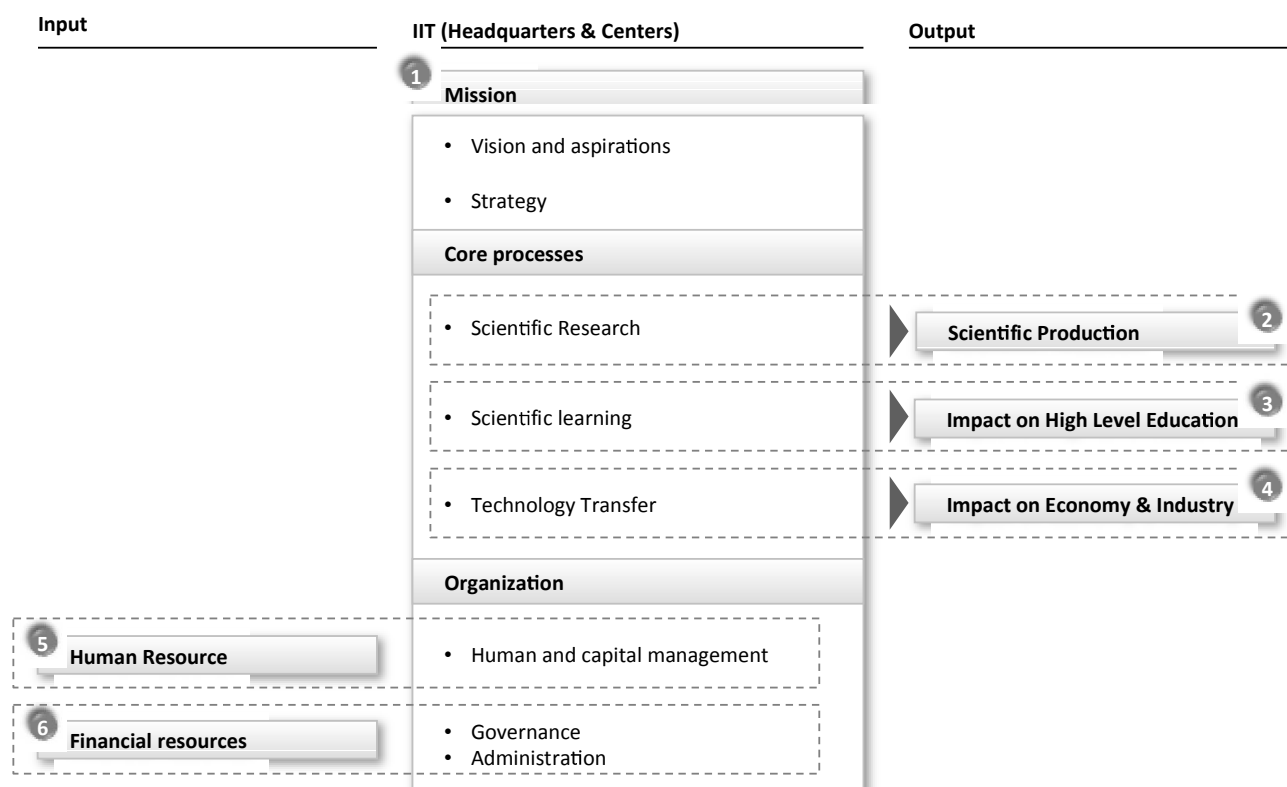
M3) ie the Post Doc, the Tenuring PIs, the Tenure Track PI, the Technologist team, the Staff, Service and Administration Units.

- *M6. Governance.* The goal of this module has been to evaluate the effectiveness of IIT in managing a second key input factor ie the financial resources as well as the quality and performance of its governance system as defined by the by-law and internal rulebooks.

## Exhibit 1

### EVALUATION FRAMEWORK

2012-2014



- ¶ The work of the EC has been organized by assigning each member to 1 or 2 modules to ensure focus and depth of the assessment and by arranging regular plenary gathering to provide continuous alignment among the 6 workstreams (Appendix A).
- ¶ The EC has been supported in its work by ad hoc units including resources from IIT ie a Technical Office led by prof. Francesca Cagnoni, Director of the Research Organization Office of IIT, and with the participation of Elisa Molinari, Gabriele Ballero, Simone Collobiano, and an Administrative Office, in particular Valentina Camero, Cinzia Scrocca, Stefano Bencetti, led by avv. Raffaele Cusmai, General Counsel of IIT as well as by the ITC team of IIT lead by dott. Russo and dott. Zelaschi under the supervision of dott. Simone Ungaro. We are immensely grateful to them and to prof. R. Cingolani, IIT Scientific Director and leader of the overall organization for the high quality support offered throughout the evaluation process, particularly in providing all the info and data required for the technical and organizational analysis. Without them the evaluation would have not been possible.

¶ A special praise goes to G. Margaritondo, the Chairman of the Comitato Tecnico Scientifico and Chairman of the Evaluation Committee for 2009-2011.

Giorgio accepted to serve as counselor to this Evaluation Committee notwithstanding the countless commitments in his profession and personal agenda. His competence, experience, wisdom have been invaluable and without him the quality of this evaluation would have suffered in breath and depth.

## 2.3 Workplan of the evaluation

¶ The evaluation has been executed in the period going from March 31st, 2015 to April 29th, 2016 and it has been organized into 4 cycles.

- *C1. Committee set up and input collections (April to June 2015).* This cycle has been devoted to the organization of the work and to the collection and review of all the information and data required for the assessment (Appendix B)
- *C2. Evaluations by Module Teams (July to October 2015).* This cycle has been devoted by each Module Team to the execution of a deep analytical assessment of the area of work under assignment. The core of this work has included desktop analysis, interviews to representatives of IIT and to representatives of international research centers comparable to IIT, visits to these centers in EU and USA, group meetings with leader of IIT Departments and Excellence Centers. (Appendix C)
- *C3 Consolidation and development of a preliminary draft (November to January 2016).* This cycle has been devoted to the alignment of the work done by the 6 Module Teams and its consolidation into a first draft of preliminary evaluation which has been tested for consistency and comprehensiveness among all the EC members.
- *C4. Syndication and development of the final report (February to April 2016).* The cycle has been devoted to the syndication of the conclusions with the internal stakeholders particularly the leadership of IIT (that shall plan the implementation of the key recommendations coming out of the evaluation). This cycle has included a preliminary presentation to the Board.

¶ All the EC meetings have been organized in IIT Centers to give the opportunity to the Committee to visit them (Appendix D). During this period the EC has visited several IIT sites as well as international research institutions (MIT Boston, EPFL Lausanne, Northwestern Chicago, University of Chicago, ETH Zurich) in order to have a direct view on the practices and standards applied by some of the leading research institutions in the world. One of the (non secondary) by-products resulting from the work of EC is the development of a comprehensive database that can represent the basis for a platform to be used for the build up of a Management Information System (MIS) that may provide the information required for the evaluation on a continuing, efficient basis (instead of the ad hoc, heavy analytical effort required every 3 year for the formal evaluation).

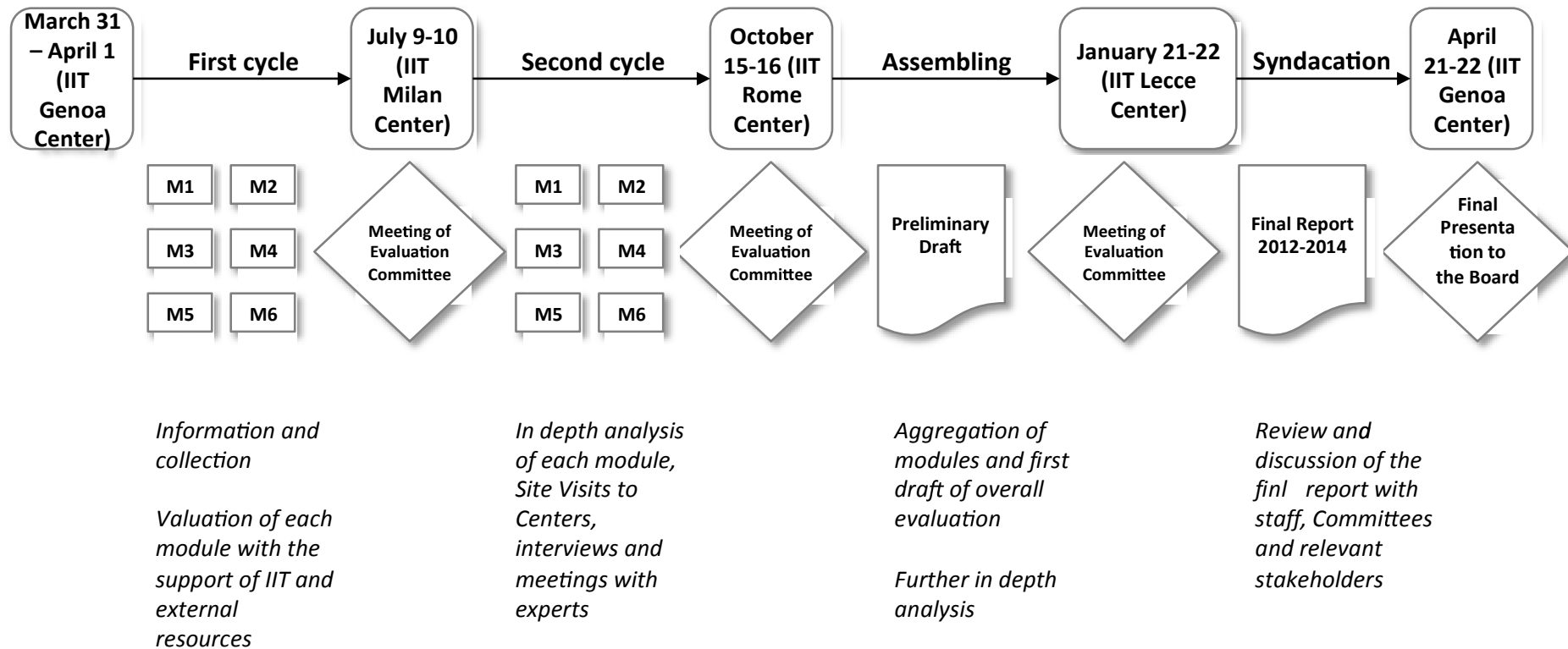
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The Part Two of this report presents the Main Findings of the evaluation with an evidence of the recommendations presented by the EC to the Board of the Foundation. A separate document aggregates the Evaluations Papers of each evaluation module with the details of the analytical work conducted by each Module Team.



## Exhibit 2

### EVALUATION COMMITTEE WORKING PLAN



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## PART TWO

### MAIN FINDINGS



### 3. MAIN ACCOMPLISHMENTS IN 2012-2014

2012-2014 has been a period of high acceleration of IIT development (in comparison to 2009-2011) and outstanding achievements at all levels, with an effective utilization of the committed resources. In particular IIT has done remarkable progress in the implementation of the 50 recommendations of the 2009-2011 EC and has gone well beyond with a number of additional achievements that deserve a special praise.

- ¶ Robust growth of scientific production (44% in publications), higher than the increase of the researchers (42%), with a tendency to publish in high impact factor journals and the success in international competition for resources (from 1 ERC award in 2009-2011 to 5 in 2012-2014, with 5 additional in 2015; numerous EU projects over the years).
- ¶ Strengthening of network and relationship with the national research and academic system (joint research poles with 9 universities, agreements for PhD joint grants with 15 universities) with strong growth of the concession of PhD grants (from 71 to 266) in cooperation with the partner universities.
- ¶ Growth from 4 to 9 Departments and full integration of 6 out of 10 centers within the IIT research system (integration of 3 other centers under completion and closure of 1 center.).
- ¶ Transformation of the research organization from 7 Platforms to a matrix of around 50 PIs Research Projects on 11 Interdisciplinary Programs, with a wide enlargement of research leadership opportunities for high performing researchers of all ages.
- ¶ Growth of the population of the PhD candidates from 199 (2009-2011) to 605 with a relevant increase of the contribution to High Level Education and the expansion of the basis for the recruiting of young researcher candidates.
- ¶ Launch of the Tenure Track program with the execution of two cycles, one for internal candidates and one for all candidates, leading to an expansion of the pool of researchers with full financial and managerial autonomy on their research projects (from 0 to 10 tenured PI and 31 tenuring at T1 or T2 level).
- ¶ Upswing of the technology transfer with a remarkable increase of invention disclosures (+75%) and patents filings (+81%), activation of 2 long term industrial partnerships (5 as of today), implementation of a internal mechanism of pre-seed financing, start of the licensing activity and launch of the first 7 spin offs (with a robust pipeline of 13 new projects upcoming).
- ¶ Relevant contribution to economic development and job creation with employment growing from around 900 (end of 2011) to over 1400 (end of 2014).
- ¶ Growth of external financing of the research from €44mio or 14,6% of total budget in 2009-2011 to € 62mio or 20.9% of total budget in 2012-2014, growth achieved as a result of both award of international research projects and commercial activity.

- ¶ Outstanding outreach and dissemination activities that have greatly enhanced the IIT visibility.
- ¶ Full development of the overall control and governance systems (organization model ex DL 231/2001, anticorruption procedures and tools ex law 190/2012 as suggested by ANAC, General Code of Conduct, new policy and system for Conflict of Interest, budgeting and dashboard, CSR system) in line with the remarks of Corte dei Conti in 2012 and 2013.

The swift advancement of IIT in all areas is pushing the Institute to a new level of maturity and at the same time is raising a number of points to be considered for the consolidation of what achieved so far.

#### 4. MISSION (M1)

The EC has reviewed the IIT Mission with the goal to assess its consistency after over 10 years of experience since the conceivment of IIT in light of the demand of scientific research at national level and the current status of the national research system.

As reported in constitutional law 326/2003 and in the IIT By-Law, the Foundation mission is *to promote Italy's technological development and advanced education, consistent with the national policies for scientific and technological development, thus strenghtening the national production system.*

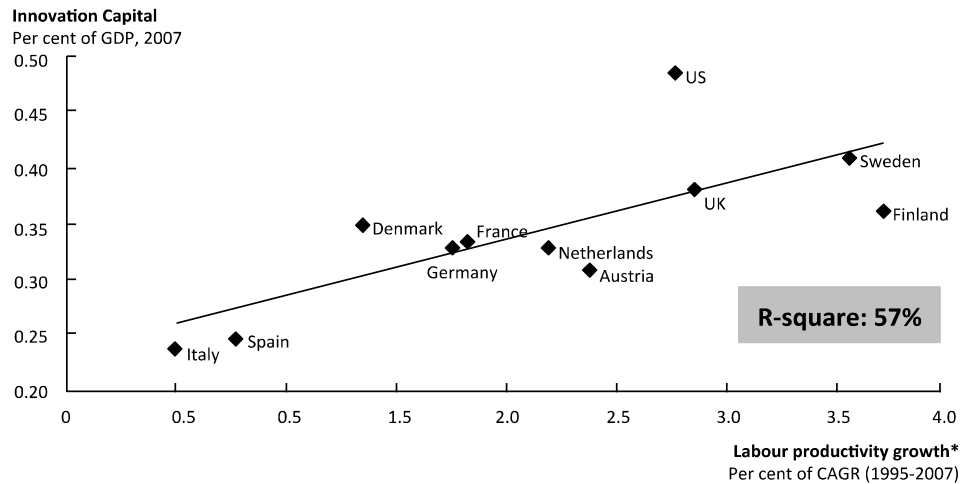
This Mission specifies a number of details about the role that IIT shall play i.e. the advancement of technological research and innovation, the application of a modern multidisciplinary approach to research, the development of innovative methodologies and know how, growth of a new generation of technological scientists, the transfer of research driven by innovations to the national economic and production systems.

The EC conclusion is that the IIT Mission continues to be highly relevant since the need of technological innovation at national and international level continues to be very high and IIT is demonstrating that can offer an outstanding contribution to the coverage of this need.

Technological innovation is a key lever of economic growth, one of the key challenges of this country and Europe at large. In fact technological innovation is key for advancing the productivity of enterprises and economic activities and for improving the life quality of the society, key determinants of economic growth (Ex. 3).

### Exhibit 3

## STRONG CORRELATION OF INNOVATION CAPITAL WITH PRODUCTIVITY GROWTH



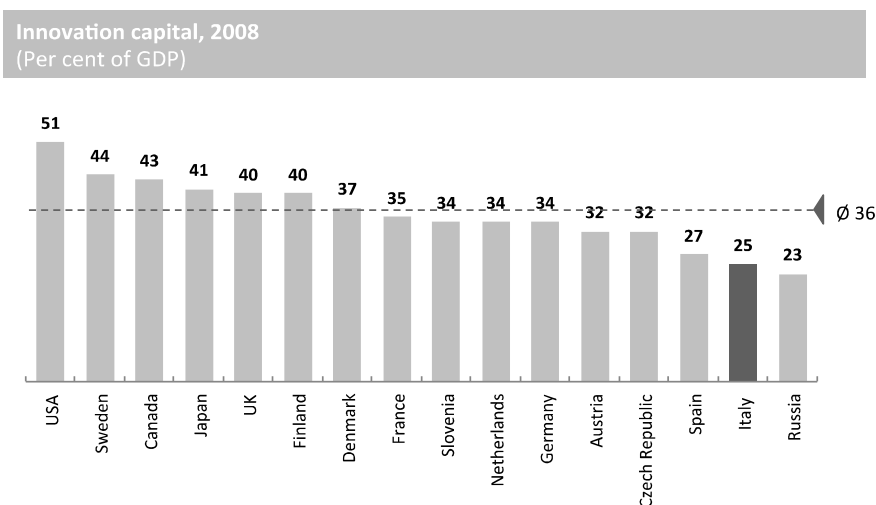
\* 2005 real prices

Source: Corrado, Carol, Jonathan Haskel, Cecilia Jona-Lasinio and Massimiliano Iommi (2012), «Intangible Capital and Growth Advanced Economies: Measurement Methods and Comparative Results» available at [www.INTAN-Invest.net](http://www.INTAN-Invest.net): McKinsey analysis

The investments and the rate of technological innovations in Italy is lagging behind the high demand that is coming from the society and unfortunately the country is in the bottom range of any ranking related to investments in technological innovation (*Ex. 4*).

### Exhibit 4

## INNOVATION CAPITAL AS A PROPORTION OF GDP



Source: Corrado, Carol, Jonathan Haskel, Cecilia Jona-Lasinio and Massimiliano Iommi (2012), «Intangible Capital and Growth Advanced Economies: Measurement Methods and Comparative Results» available at [www.INTAN-Invest.net](http://www.INTAN-Invest.net): McKinsey analysis

As explained in this report, IIT is offering a great contribution to the advancement of technological research, particularly in Advanced Robotics, Nanoscience and Materials. More recently, has started to outline programs in the field of Technology on Humans focused on topics related to its mission. Also, since 2012 has accelerated the bridging between research and economic system. The quality of the scientific production of IIT is at the state of the art in many research areas and propagates to the national research system through the cooperation and network of relationships established with most of the leading national universities.

IIT is also a reference model of innovation in the management of research with the application of methodologies, procedures and tools at level of best practice by international standards and can be considered a laboratory for testing a modern approach to research in Italy.

In light of these considerations the EC conclusion\* on IIT Mission is that it can be confirmed *as is* and its achievements will continue to represent an effective outcome of the use of the allocated public resources.

\* Prof. Zuccato disagrees with this statement, because not supported by qualitative and quantitative data that should be the basis.



## 5. RESEARCH AND SCIENTIFIC PRODUCTION (M2)

¶ The output of Research and Scientific Production in the period has been remarkable. Notwithstanding the high growth of the research staff (+69% in 3 years, from 625 to 1060) the productivity has remained unchanged, in line with international standards, and the quality measured by the most relevant bibliometric indicators like the Impact Factor and the Field Weighted Citation Impact confirms that the relevance of the scientific production continues to be comparable to the best institutions worldwide and higher than most of the national research organization (*Ex. 5, Ex. 6*).

### Exhibit 5

#### INTERNATIONAL COMPARISON OF BIBLIOMETRIC INDICATORS

Institutions	Citations per publication	Field-weighted Citation impact
IIT	9.06	2.08
MIT	14.4	2.44
EPFL	11.4	2.13
Weizmann	16.2	2.16
CALTECH	18.1	2.50
Georgia TECH	7.8	1.80
STANFORD	14.5	2.50
CNR	7.5	1.5
POLIMI	4.9	1.68
POLITO	4.8	1.58
SNS Pisa	13.6	2.05

Source: SciVal – Scopus (Elsevier)

### Exhibit 6

#### IIT SCIENTIFIC PRODUCTION

Year	Publications	Staff +PhD	Staff	Public/ staff +PhD	Public/staff
2009	461	304	213	1.52	2.16
2010	692	509	353	1.36	1.96
2011	860	625	391	1.38	2.20
2012	980	773	462	1.26	2.12
2013	1074	918	494	1.17	2.17
2014	1242	1060	558	1.17	2.22

Source: IIT

This conclusion is also substantiated by the non bibliometric indicators, the peer review performed by the CTS, the high rate of patent filings and the success of

fund raising through competitive projects. A recommendation on this point. The measurement of the quality of IIT scientific production has required an intense analytical work by the Committee and the IIT Offices with lot of ad hoc handwork that cannot be repeated with high frequency.

**R1. Expand and organize the database (that should include bibliometric and non bibliometric indicators like invitation to flagship conferences, organization of seminars and meetings, prizes and awards, patents and licences, participation to spin offs ecc.) that is used for the monitoring of the quality of the research in continuity and not only at the moment of the periodic assessments.** A regular monitoring will consent a more timely action on the areas of underperformance. This is an issue for many research institutions worldwide (particularly in Europe) and by developing a state-of-the-art database for monitoring the quality of scientific production IIT will confirm to be a best practice as to procedures and organisation.

- ¶ The productivity and the quality of the scientific production is remarkably high also if the measure is done at a more granular level ie Research Areas, Departments, Centers. In this period IIT has made many important additions of the research strategy and organization (full establishment of the departments on Materials and on Nanotechnologies in 2012, the transformation of 2 facilities into new departments in same year, full integration of 6 Centers out of 10 within the overall IIT System throughout, new push to the Life Science area from 2014 on). The result is that, in the period, *i)* the Materials and Nanotechnologies departments have increased their productivity and citation indicators, *ii)* the Life Science departments, notwithstanding a lower publication rate (it takes at least 2-3 years in this field to produce top articles), has high citations and *iii)* the Centers demonstrate a productivity comparable to the Departments and a higher citation rate (with a variance among those that are fully integrated and those who are still under scrutiny) (*Ex. 7, Ex. 8*).

## Exhibit 7

### SCIENTIFIC PRODUCTION BY RESEARCH DOMAIN

as of 2015

2012	Public	Staff	Staff + PhD	Public/ Staff	Public/ Staff + PhD	Cit	Cit/Public
Life Science	372	214	374	1,74	0,99	3641	9.78
Robotics	321	92	198	3,51	1,62	1417	4.41
Nanotechnology	390	148	270	2,63	1,44	3698	9.48

2013	Public	Staff	Staff + PhD	Public/ Staff	Public/ Staff + PhD	Cit	Cit/Public
Life Science	369	220	444	1,67	0,83	2301	6.23
Robotics	343	101	248	3,39	1,39	1013	2.95
Nanotechnology	479	248	343	2,97	1,40	3636	7.59

2014	Public	Staff	Staff + PhD	Public/ Staff	Public/ Staff + PhD	Cit	Cit/Public
Life Science	467	250	440	1,87	1,06	839	1.79
Robotics	345	105	228	3,27	1,51	367	1.06
Nanotechnology	556	184	368	3,02	1,51	1660	2.98

Source: IIT and Scopus (Elsevier) for Citations

## Exhibit 8

### SCIENTIFIC PRODUCTION BY DEPARTMENTS AND CENTERS

	Public/staff	Public/staff + PhD	Average IF	Citations per publication
Departments	3.00	1.59	3.01	5.72
Centers	2.63	1.56	4.69	8.26

Source: IIT, Web of Science (Thomson) for IF, Scopus (Elsevier) for citations

Even though these indicators give only a partial proof of thesis, they signal that the IIT staff on average generates results of remarkable scientific relevance across the board, an indication of high individuals' quality. There is still limited evidence, though, of contributions with industrial and societal relevance, an important part of IIT mission. The return on the investment in research at IIT cannot only come from the recognition of a high scientific value but shall also be measured in terms of potential impact on technology transfer and economic development.

**R2. Accentuate the monitoring of the technological relevance of the output of each PI (in addition to the scientific relevance) by introducing “smart” indicators of the economic impact of research and give more visibility to the cases of excellent performance.** Of course it cannot be expected that every researcher contributes with high impact on both dimensions but this remark shall not prevent to have a comprehensive measure of both contributions for each staff member.

- ¶ The IIT research strategy 2012-2014 is based on a proper balance of continuity in areas where IIT has an established international scientific leadership (e.g. Robotics, devices for High Resolution Measurements, Nanotechnology) and

areas of new exploration (e.g. Human Technology and the broader Life Science areas). Today the common denominators of IIT research strategy are the interdisciplinary approach, the aim for an international reach and the setting of ambitious goals for the core research areas. With the recent implementation of the Tenure Track the IIT research strategy has been shaped around the potential contribution of each PI in Tenure Track, according to the principle that a rigorous selection of the TT candidates, their budgetary autonomy and a wide degree of freedom in research are a prerequisite for their scientific success and therefore for IIT strategy. The application of this approach, though, may lead to an extreme contingency of great individual achievements by the PIs but a not comparable accomplishment for IIT at scale. A successful outcome of the overall IIT strategy requires for each research area ambitious aspirations, a high quality vision, a strong thought leadership and a curiosity driven approach. It also demands an intense cross fertilization among different areas. These elements are evident in the domains of traditional strength of IIT (Robotic/Engineering and New Materials/Nanotechnology) where the research of IIT is innovative and at the leading edge. The Robotic ecosystem (including plantoids, humanoids, animaloids) by merging biomechanics, mechatronics, material science, cognition, artificial intelligence in a unique blend is at the state-of-the-art. The research in colloidal nanostructures, optical nanoscopy, graphene, nanostructures for drug delivery are at the cutting edge in the international arena and qualify Nanotechnology, same as Robotics, as one of the pillars of IIT. The high quality in these research areas is also a boost for technology transfer (INAIL Robotic Rehab, Nikon Imaging Center, ICUBE, Directa Plus Lab for Graphene). A group of new scientific leaders is emerging in these research domains (L. Manna, D. Caldwell, T. Pellegrino, A. Diaspro, F. De Angelis, G. Lanzani, G. Metta, S. Gustincich, Fellin, Decuzzi) that embody the next generation of researchers guaranteeing the continuity of IIT excellence in research. In the wide domain of Life Science, the IIT strategy has become visible recently. The activity of this macroarea has suffered for fragmentation on a wide range of research lines and for a leadership not perfectly focused on the overall mission envisaged for this area, i.e. developing cutting edge research on technology for humans. The recent recalibration of the research activity on technology oriented programs (nanostructures for drug delivery, radio and chemotherapy, and imaging, optical technologies for neuro investigation), the introduction of new outstanding PIs (as confirmed by their high bibliometric rates and the 6 ERC grants won in this area), the transition out of the incumbement leaders and the restructuring of the pool of tenure track PIs from 21 to 8 (following the recommendations of ad hoc evaluation panels) are all right steps in the direction of a renewal consistent with the aspiration for scientific leadership. At the moment of this valuation positive elements came to light, but the confirmation that the measures taken for the reorientation and the new focus in the field of Technology on Humans are effective is still pending. In general the sustainability of the success achieved in research should not be given for granted and requires a continuous renewal of the aspiration strategy and leadership even in the areas of traditional success.

**R3. The research strategy must be continuously reviewed as to aspiration and vision both in the established areas of excellence as well as in the other areas. In particular, evolution, vision and strategy of Life Science area must be followed with utmost commitment.**

**R4. Ensure that the evolution of D3 and NBT, induced by the recent changes implemented in the two departments (aimed at promoting new ideas and innovation with the introduction of new lines of research) and new scientific leaders are aligned with the vision of IIT in Life Science and generates multiple, interdisciplinary contributions with other research teams.** The recent effort of IIT in leading the design of the overall Human Technopole project offers the opportunity to strengthen the global research strategy in Life Science.

¶ The evolution of Departments, Centers and Facilities has been managed with the intent of creating the right conditions for the researchers and a high productive research environment (*Ex. 6*). The transformation of 5 Facilities into Departments has contributed to the strengthening of these units and the enlargement of their scope. The successful strategy of creating technology facilities led by a senior scientist that provide services to the Departments and evolve into departments themselves should be continued. The full integration of 6 out of 10 Centers in permanent, independent units of IIT (equivalent to external departments) has increased their research power, expanded the opportunity of extramural funding and reinforced the partnership and network with the universities. The continuation of the organization of Department and Centers is important for ensuring a favourable environment for the research teams, their comprehensive integration within the IIT system and culture, a permanent interdisciplinary mindset and a correct and effective utilization of the available resources. In the continuous monitoring of Centers activities IIT has recently decided to stop funding BCMSC at the University of Parma and this Center will exit from IIT perimeter. In the Centers, it is key to monitor the scientific activity, the development of new research programs as well as the relationship with the host institutions (ie universities) in order to ensure that their research is connected in synergy with existing research activities. The reviews done by the Site Visit Panels have been very useful and shall continue.

**R5. Ensure that the 3 Centers under assessment (CGS and CNI and CLNS) are reviewed within mid 2017 for a confirmation as permanent units within IIT or for their exit from IIT perimeter.**

**R6. Clarify the expected contribution and role of the “light centers” in Harvard and MIT within the research strategy of IIT and specify a commitment of resources for them which is appropriate with their expected contribution.**

**R7. Review the situation of the presence with two centers in the same city (Pisa and Milan) and verify whether there are compelling reasons for the duplication or it is possible to unify them in the same city without**

## jeopardizing the relationship with the involved universities.

- ¶ An innovation has been implemented in the research organization of IIT in 2014 with the adoption of the matrix “Programs - Research Groups” (recommendation of the previous Evaluation Committee). The main goal of the matrix is to foster the interdisciplinary approach to research and to expand the leadership opportunities for the PIs. Cross-fertilization of the research activities in different fields is one of the pillars of IIT and the cooperation among scientists of different Departments and Centers is already an established practice (*Ex. 9*).

### Exhibit 9

#### COOPERATION IN RESEARCH AMONG DEPARTMENTS AND CENTERS

		2012	2013	2014
Interdisciplinary projects	Total	14	0	0
	D-D	6	0	0
	D-C	8	0	0
Extramural fundings (euro)	Total IIT	16.596.956	15.385.506	13.630.496
	D-D	1.163.644 (7%)	4.846.986 (31.5%)	179.999 (1.32%)
	D-C	1.642.782 (9.9%)	497.724 (3.23%)	1.055.398 (7.74%)
Publications (with IF)	Total IIT	622	725	881
	D-D	42	35	61
	D-C	30	33	25

Source: IIT

The implementation of the matrix organization will create the right environment for a stronger interdisciplinarity. In the matrix the PIs Research Groups/Projects represent the core of the organization and the main backbone for planning the funds allocation while the vertical Programs are key for orchestrating cross disciplinary teams in the development of topics of high scientific complexity and novelty and to make investment decisions on technological solutions that serve as shared utilities for all Research Groups/Projects. As remarked by the CTS the implementation of this structure is a revolution, implies a radical change in the management of research and represent a “formidable challenge” for IIT. According to the experience of other institutions going through similar transformations it may take not less than 3 years to move the IIT organization at full regime in the new set up. Today it is difficult to judge the effectiveness of this new organization since its design and implementation have just started. The details of the end state of the new organization and its operational structure are not known yet and the implementation with the key milestones is occurring while this report is being written. Since the transformation is occurring it is premature to evaluate if the matrix is being implemented as planned (in the previous evaluation, for example, the EC suggested the implementation of a proper management

structure, the designation of Research Program leaders - which has happened in the last months -, the appointment of an external advisory committee for the periodic evaluation of each Program ecc.) and is achieving the expected goals. The importance of this organizational innovation for the future management of IIT research requires an additional effort in planning and supervision to avoid the risk of high implementation costs or failure. Also, with the implementation of the matrix structure the overall IIT organization has gone under scrutiny since in the new set up the role of Departments and Centers will require a remodeling.

**R8. Develop the design at the end state of the new matrix organization and its operational structure and specify the key milestones of implementation to plan a regular monitoring.**

**R9. Clarify the role of Departments and Centers within the new matrix organization and plan their step by step transformation for the next years.**

- ¶ In the period 2012-2014 there has been increasing evidence that the availability of financial resources for the research is ensured by the contribution from extramural funding and commercial activity (from 15% to 23%) (*Ex. 10*).

## Exhibit 10

### IIT Budget Departments

	BI 2012 Actual	BE 2012 Actual	Tot 2012	BI 2013 Actual	BE 2013 Actual	Tot 2013	BI 2014 Actual	BE 2014 Actual	Tot 2014
• Departments	32.683 (37,96%)	4.492 (5,22%)	37.175 (43,18%)	31.518 (40,32%)	6.061 (7,76%)	37.579 (48,08%)	37.435 (41,65%)	9.580 (10,66%)	47.015 (52,31%)
• Facilities	7.200 (8,36%)	149 (0,18%)	7.349 (8,54%)	5.617 (7,19%)	146 (0,18%)	5.763 (7,37%)	3.734 (4,15%)	-	3.734 (4,15%)
• IIT Network	33.901 (39,38%)	7.666 (8,90%)	41.567 (48,28%)	28.293 (36,19%)	6.528 (8,36%)	34.821 (44,55%)	28.172 (31,35%)	10.956 (12,19%)	39.128 (43,54%)
<b>Total</b>	73.784 (85,70%)	12.307 (14,30%)	86.091 (100%)	65.428 (83,70%)	12.735 (16,30%)	78.163 (100%)	69.341 (77,15%)	20.536 (22,85%)	89.877 (100%)

Source: IIT

Public financing of core research of IIT will never be replaced by self generated financing (in US, the most liberal and market driven economy in the world, around 65% of national research spending is sustained by public funding) but the growth of the weight from extramural and commercial funding is an important complementary factor as well as a positive indication of distinctiveness in scientific competition and in technology transfer. Moving from sources to use of funds, the allocation of the available internal resources to the

research project is based on a top down approach lead by the DS under the supervision of the CTS. According to the interviews the formal process for resources allocation and project management seems to meet the international standards. The traceability of this process and key decision criteria though are limited. In fact there is little evidence of the details of the planning activity and of the criteria applied at the key decision points of the process. Given the size and complexity reached by IIT it is key to ensure that the Institute is equipped with flawless procedures of portfolio management (ie matching the resources allocation and the priorities of the research portfolio) as well as project management (ie use of a stage-gate process based on defined admission criteria, regular progress challenges, methodologies for high research productivity and shortened timelines).

**R10. Increase the visibility of decision making criteria for research portfolio management and for project management and review the effectiveness, accountability, sustainability of the procedures for budget allocation as well as their consistency with the future IIT needs.** Most of the IIT spending (internal and external budget) is in this area and both the decision making and the monitoring of this activity should be in line with the high aspirations of excellence of IIT.



## 6. IMPACT ON HIGH LEVEL EDUCATION (M3)

¶ The impact of IIT on High Level Education in the period 2012-2014 has remarkably advanced. Strong growth of the population of active PhD candidates (3x from 199 to 605), even higher growth in number of PhD grants in the period (3,4x from 79 to 266), subscription of cooperation agreements on PhD with 15 Universities are a clear evidence that IIT has become an important player in HLE national system. In fact IIT has established a strong association with the academic community and an access to a large pool of young fellows to recruit for its research projects. The PhD candidates arrive to IIT from a wide range of national and international universities (with an initial concentration on Genova for obvious reasons and a gradual propagation to several other universities throughout the period). This achievement has been key to support the overall growth of IIT research in the period under assessment. From a number of indicators the quality of the fellow population has not evolved with homogeneity. A high number of the 297 PhD candidates recruited in the period has decided to drop out (around 10%), 238 of the 605 active PhDs (39,3%) have recorded 0 publications, 213 (35,2%) have publications with a Impact Factor of 0. The records are only slightly better for the 283 PhD students completing their program in the 2012-2014 period (no publication for 17,0%, publications with Impact Factor of 0 for 51,6 %). Excellence of the researchers is the best guarantee for excellence in the performance of IIT scientific research (a necessary even though not sufficient conditions) and all the best research institutions worldwide have very stringent evaluation criteria for PhD Fellows both for the entry and for the admission to the discussion to their doctoral thesis.

**R11. Review the policies and criteria for selection of PhD candidates, their performance evaluation during the doctorate, the pre-qualification and admission to the final dissertation (in consultation with partner universities) and ensure appropriate quality filters.**

¶ Following the recommendation of the last Evaluation Committee in 2014 IIT has signed a cooperation agreement (Convenzioni) with 15 Universities (all italian) for joint PhD programs financed through PhD grants of IIT under the legal framework of the universities (*Ex. 11*).

## Exhibit 11

### COOPERATION AGREEMENTS WITH UNIVERSITIES

Year	University
<b>2004/2005</b>	1. Politecnico di Milano (Dipartimenti di Fisica, Chimica, Matematica, Ingegneria Elettronica, Energia) 2. Scuola Superiore Sant'Anna (Dipartimenti di Robotica e Ricerca sul Farmaco) 3. Scuola Normale Superiore
<b>2005/2006</b>	4. Università degli Studi di Genova
<b>2006/2007</b>	
<b>2007/2008</b>	
<b>2008/2009</b>	
<b>2009/2010</b>	5. Università del Salento 6. Politecnico di Torino 7. Università degli Studi di Napoli 8. Università degli Studi di Pisa
<b>2010/2011</b>	9. Università degli Studi di Trento
<b>2011/2012</b>	10. Università di Roma 1 11. Università degli Studi di Siena 12. Università degli Studi di Padova
<b>2012/2013</b>	13. Università degli Studi di Milano
<b>2013/2014</b>	14. Alma Mater – Università di Bologna 15. Università degli Studi di Parma

Source: IIT

With one (Genova) IIT has also started a procedure for the formal accreditation as an institution for high level education authorized to award a PhD degree, according to the DM MIUR 45/2013. The cooperation program has been shaped with the goal to have a much better control on the supply of PhD students, an important factor for the staffing of IIT research teams. In fact the cooperation agreement prescribes *i) IIT researchers in the university PhD Council, ii) IIT researchers into the Committee for PhDs selection, iii) IIT researchers contributing to the design of PhDs curriculum, iv) IIT researchers as faculty in the PhD courses and v) IIT researchers as supervisors of the doctoral thesis*. The cooperation with universities also expands the networking opportunities for the the overall IIT staff (PhD, researchers, PIs ecc.) in the academic world. The experience with the cooperation agreements, albeit positive, indicates that the program requires some adjustments. In fact the agreements subscribed so far not always ensure that IIT researchers can participate to the selection and control the quality of the PhD students and cannot even test their immediate interest to participate to IIT research. Furthermore the participation of IIT researchers to the design of the PhD courses and to the educational process is not always guaranteed (Ex. 12).

## Exhibit 12

### UNEQUAL COOPERATION AGREEMENTS WITH UNIVERSITIES

	IIT in PhD council	IIT in selection	IIT in Faculty	IIT courses
<b>Università Genova</b>	X	X	X	X
Poli Milano	-	-	X	X
Università Salento	-	X	X	X
<b>Scuola Sup. Sant'Anna</b>	(X)	X	X	X
Poli Torino	X	X	X	-
Scuola normale Pisa	-	-	-	-
Università Roma 1	(X)	-	X	X
<b>Università Napoli</b>	(X)	X	X	(X)
Università Studi Milano	-	-	-	-
Università Pisa	-	-	-	-
<b>Università Trento</b>	(X)	X	(X)	(X)
<b>Università Bologna</b>	X	X	X	X
Università Siena	-	-	-	-
Università Padova	-	-	-	-
Università Parma	-	-	-	-

Source: IIT

As a matter of facts the cooperation on education of PhD is well structured with some universities and much looser with others (Appendix E). These issues are more relevant with the universities without a joint research Center with IIT. Furthermore the

economic value of the PhD grants is aligned with the Italian academic system and is not competitive for the best students who have better financial packages from international universities and research centers (*Ex. 13*). With the current set up the validity and appeal of the cooperation program with universities for PhD students is penalized. The frame of cooperation agreement designed by IIT in theory would protect from these failures. As said, though, the frame has not been implemented as conceived in all circumstances.

**R12. Align all the signed PhD cooperation agreements to the standard IIT frame, verify if it is possible to implement it with equivalent impact to universities with and without a joint research pole and stop the cooperation with the Universities that do not want to accept it.**

**R13. Introduce an explicit Quality Criterium in the selection of the universities eligible for the joint PhD program and for cooperation with IIT in research.**

**R14. Continue the program for the formal accreditation as an institution authorized to release PhD degree with the goal to complement the cooperation with universities with the entitlement to autonomy in PhD education.**

**R15. Test the possibility to establish a joint PhD program with foreign universities, starting from those with a joint research center with IIT (i.e. Harvard, MIT).**

**R16. Ensure that the overall compensation package offered by IIT to a PhD student (i.e. PhD grant and value of additional benefits) is in line with the standards of European and international competitors.**

## Exhibit 13

### ACTIVE PHD GRANTS DURING 2012-2014

Universities	Biennio 2012 - 2014			
	# cycles	Agreed Phd grants	Assigned PhD grants	Value
1. Università di Genova	6	457 (57%)	323 (53%)	20.591.914,80 €
2. Politecnico di Milano	6	54 (7%)	44 (7%)	2.912.214,65 €
3. Università del Salento	6	53 (7%)	45 (7%)	2.424.179,39 €
4. Scuola Superiore Sant'Anna	6	46 (6%)	37 (6%)	2.420.000,00 €
5. Politecnico di Torino	6	44 (6%)	33 (5%)	2.048.966,36 €
6. Scuola Normale Superiore	5	21 (3%)	17 (3%)	1.850.164,00 €
7. Università degli Studi di Roma "La Sapienza"	4	32 (4%)	32 (5%)	1.735.488,20 €
8. Università degli Studi di Napoli "Federico II"	6	27 (3%)	25 (4%)	1.430.410,21 €
9. Università di Milano	3	21 (3%)	14 (2%)	1.270.068,13 €
10. Università di Pisa	6	14 (2%)	12 (2%)	643.478,41 €
11. Università di Trento	5	13 (2%)	10 (2%)	560.231,94 €
12. Alma Mater Università degli Studi di Bologna	2	6 (1%)	6 (1%)	330.955,17 €
13. Università di Siena	4	5 (1%)	5 (1%)	258.066,00 €
14. Università di Padova	1	1 (0%)	1 (0%)	53.681,82 €
15. Università studi di Parma	1	1 (0%)	0 (0%)	-
16. Università di Milano	3	21 (3%)	14 (2%)	1.270.068,13 €
		<b>795 (100%)</b>	<b>604 (100%)</b>	<b>38.529.819 €</b>

¶ As said before the growth of the PhD student population has been a fundamental enabler of the research strategy of IIT and the pace of this growth has been outstanding in the period. Anyhow the planning of the number and academic background of PhD students to recruit for a correct and balanced staffing of the research projects does not seem to be part of the overall planning of the scientific strategy of IIT. Having the aspiration to grow and achieving with success this goal even without an explicit planning procedure is commendable for IIT. Yet, given the size and complexity reached by IIT it is key to move to a more disciplined assessment of the future needs of resources, forecasting sources, timing and tools for the recruiting and outlining a comprehensive action plan. This planning should take into account also the role that will be played by the IIT PIs in the implementation of the cooperation agreements with the universities and in the tutorship of the PhD students. Today the tutorship of each PhD student is splitted between the university for the educational credits and IIT for the research credits without a unified, holistic view of his/her overall performance that might help the student to have an integral view of his/her development needs. In IIT the distribution of the tutorship responsibilities among the researchers is uneven (50% of the 605 PhD is under the tutorship of the 4% of the 591 researchers, 438 researchers are not involved in PhD tutorship at all). The governance of these processes and the overall area of PhD resources (from recruiting to the supervision of their research and educational experience and the achievement of the PhD degree) requires a dedicated supervisor with appropriate capabilities and experience. The ideal figure is a senior researcher with an attitude for this role, who is dedicating part of his time to the overall supervision of the PhD program with the support of the IIT staff. The choice of a researcher is better than an executive with an administrative CV since the former has a direct sensitivity of all the issues of PhD students and their presence in IIT. The recent designation of a Deputy SD with a direct role in PhD recruiting is an important step in this direction.

**R17. Introduce the planning of PhD students enrollment in the process IIT strategic plan and adopt appropriate instruments as a support.**

**R18. Review the approach to PhD tutorship ensuring that the supervision of the academic progress (usually under the university responsibility) and the supervision of the research progress (usually under the IIT responsibility) get unified into one comprehensive performance review (and include this into the standard cooperation agreement with universities).**

**R19. Ensure a wider participation of IIT researchers in the PhD tutorship and adopt a more balanced distribution of assignments and load among them.**

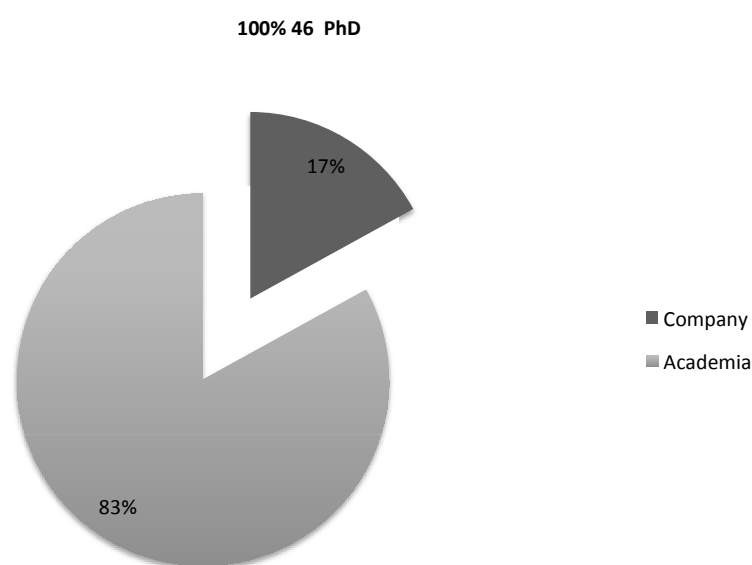
**R20. Designate a Director of PhD Activities that will be responsible of all issues related to PhD students from hiring to graduation, including the activation and administration of all the joint PhD programs with**

**universities.**

- ¶ The educational experience offered to the PhD students so far in IIT is predominantly in scientific research. This is attractive for students who aspire to a career in research while is less attractive for those who see the research experience as a step in their career progression but may be interested also to alternative track (e.g. in the industrial world) (*Ex. 14*).

#### **Exhibit 14**

##### **First Employment of IIT PhD after the graduation (Period 2012-2014)**



Source: IIT survey

The joint PhD programs with universities offer to the students the opportunity to enlarge their educational record with university classes and to gain option for a wide orientation of their career objective, if desired. IIT has to review the educational experience offered to its PhD in research by introducing a track for a possible destination to the industrial world. In other words IIT should consider to educate and develop its PhDs (and also the Post Doc) not only as a pool of potential scientists of international stature but also as the product of a high quality educational process that can have a distinctive destination in the world of corporations. The lukewarm attitude of many Italian corporations should not discourage IIT to cultivate this aspiration, given the international reach of its activity.

**R21. Implement a plan for the enrichment of the PhD education at IIT with the complementary skills required for a successfull career in research within the industrial world and specify the plan for promoting the PhDs with corporations interested to a doctorate education in science and technology.**

## 7. RESULTS OF TECHNOLOGY TRANSFER (M4)

¶ Notwithstanding the track record of IIT in Technology Transfer is still limited, the direction given to this activity is appropriate and the progress in 2012-2014 is remarkable (*Ex. 15*).

### Exhibit 15

#### TECHNOLOGY TRANSFER DASH BOARD

KPI	2013				2015Q3
	IIT	Netval		AUTM	IIT
		60 IT Universities*	TOP 5*	202 US Universities*	
<b>1 Intake</b>					
Disclosure	58	8,2	31,8	121	32
<b>2 IP Management</b>					
Patent First Filings	34	4,9	20,6	74	21
Patents Granted	24	4,5	21,8	28	21
Patent Portfolio	234	59,8	236,6	N/A	342
Legal Costs	€ 415.000	€ 51.900	€ 217.700	\$1.800.000	€ 600.000
<b>3 Licensing Activity</b>					
Commercial contract	30	-	-	-	35
Commercial contract value	€ 2.500.000	-	-	-	€ 1.400.000
Licenses/ Options executed	2	1,4	8,2	33,6	1
Licenses/ Options active	2	6,6	35,4	227,9	13
Licensing Income	€ 30.057	€ 23.300	€ 181.800	\$13.633.663	€ 74.573
Average per license	€ 15.028	€ 3.530	-	\$149.520	€ 5.736
Running Royalties	-	-	-	\$9.900.000	-
Cashed-in Equity	-	-	-	\$183.168	-
<b>4 Economic Impact</b>					
New startups	4	1,5	6	4	-
Total startups in operations	7	16	-	21	10
Net sales	700K	-	-	\$ 112.871.287	-
New commercial products	-	-	-	3,6	?
Employment from startups	15	-	-	15.335	28
<b>5 Resources for TT</b>					
TTO Staffing	8	3,5	9	11,2	12
TTO Budget	€ 1.343.000	€ 324.000	€ 1.250.600	-	-
<b>6 Total Resources for the Institution</b>					
Public research funds	€ 100.000.000	-	-	\$197.524.752	€ 100.000.000
Industry sponsored funds	€ 2.735.000	-	-	\$124.752.475	€ 2.100.000

\*average values

Source: AUTM, NETVAL, IIT

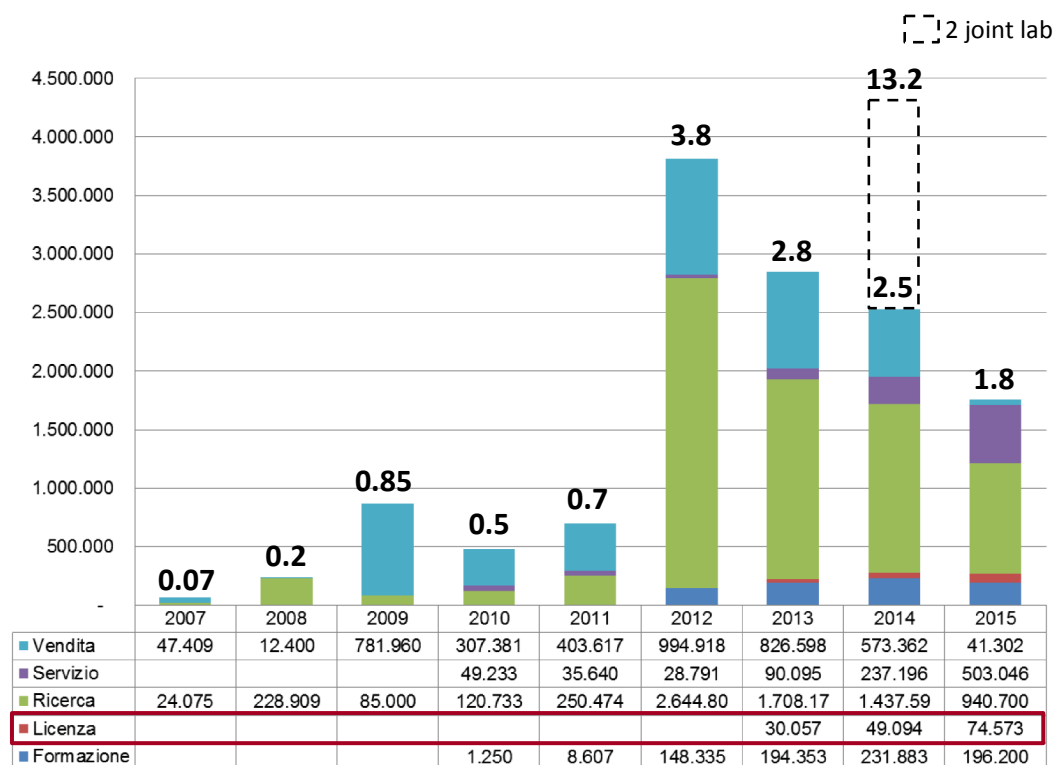
The productivity of IIT in the generation of Intellectual Property (invention disclosure, patenting) has always been preeminent since the beginning, higher than the average of the Italian universities (according to Netval) and in line with the performance of primary international universities (according to a comparison with AUTM associates). A portfolio of 340 patents granted or in the filing process compares with an average of 60 for the Italian universities (230 for the top 5) who have a much longer record and tradition of IP generation. Also, IIT has always been active in the commercial promotion of its IP through the sale of its prototypes and models and the acquisition of research contract from corporations (eg ICUBE can be considered a scientific as well as a commercial success insofar as it has become one of the standard base model in robotics, purchased by universities worldwide and used as a substructure for new research projects) (*Ex. 16*).



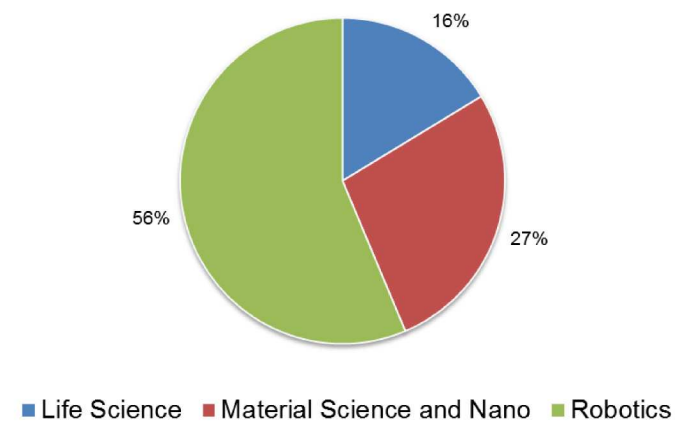
## Exhibit 16

### IIT REVENUES FROM COMMERCIAL ACTIVITIES

Commercial revenues (joint lab not included)



Portfolio breakdown by scientific area



Source: IIT

In the period 2012-2014 there has been an upsurge of TT with the signing of the first licensing contracts (15 active or as options and a regular generation of 3 licensing contracts per year since), the launch of 7 startups (with a pipeline of 13 new projects at the end of the period), the closing of 2 (5 as of today) long term partnerships with corporations driven by scientific and industrial scope (Ex. 17).

## Exhibit 17

### IIT CONTRIBUTION TO START UP (INCUBATION AND SEED)

	Spin off	Pipeline
1. Research		
2. Invention Disclosure & Patenting		<ul style="list-style-type: none"> <li>• Ribes Technology</li> <li>• Vibe</li> <li>• Force/Torque Sensors</li> <li>• Piezoskin</li> <li>• Smartissue</li> <li>• CompAct</li> <li>• Dual Cam</li> <li>• Nanochrome</li> <li>• Microendoscopy</li> </ul>
3. Incubation (derisking, proof of concept, prototypy)	<ul style="list-style-type: none"> <li>• Sensing electromagnetic (2013)</li> <li>• Advanced microturbine (2013)</li> <li>• Biki technologies (2014)</li> <li>• HiQ-Nano (2013)</li> <li>• Optogenix (2014)</li> <li>• Circle Garage (2013)</li> <li>• Antena Therapeutics (2012)</li> </ul>	<ul style="list-style-type: none"> <li>• Artificial Retina (2016 e)</li> <li>• ICub House (2016 e)</li> <li>• Rehab (2016 e)</li> <li>• Graphene (2015)</li> </ul>
4. Commercial Promise (seed)	<ul style="list-style-type: none"> <li>• 3Brain (2011)*</li> <li>• QB Robotics (2011)*</li> <li>• Politrónica Inkjet (2008)*</li> </ul>	
5. Scale To Industry		
6. Established Company		

\* not from IIT spin off

Source: IIT

The impact on economic development is becoming more and more visible (new jobs creation for a staff over 1400 by leveraging over 20% of external financing, support to the launch of innovative spin off, creation of new professional roles). The basic infrastructure of IIT in TT (policies, rulebooks, set up and capabilities of the TTO) is in line with international standards and very light and efficient (the size of the TTO is in the low range compared to international institutions). In this area the challenge for IIT is to develop a comprehensive strategy that involves the IIT leadership, researchers, venture capitalists, angel investors, key leading companies and spreads around the whole IIT organization a new mindset that scientific research and technology transfer progress hand in hand. A first important point that deserves attention is the hesitancy of IIT researchers to commit to TT. They demonstrate a professional preference, a mindset, a motivation for an excellent performance in scientific research but their sensibility for the industrial and commercial value of their output is weak. This is a recurring feature in most of the laboratories and universities worldwide that produce top quality research and this is why

there is the need for a well established ecosystem that stimulates the researchers beyond the publication of scientific results. This point was not a key priority while IIT was building its track record in research but now it deserves a specific investment. In fact the sensibility of the researchers will not grow without specific actions on a number of levers like education, performance focus, role modeling, coaching and mentorship, etc.

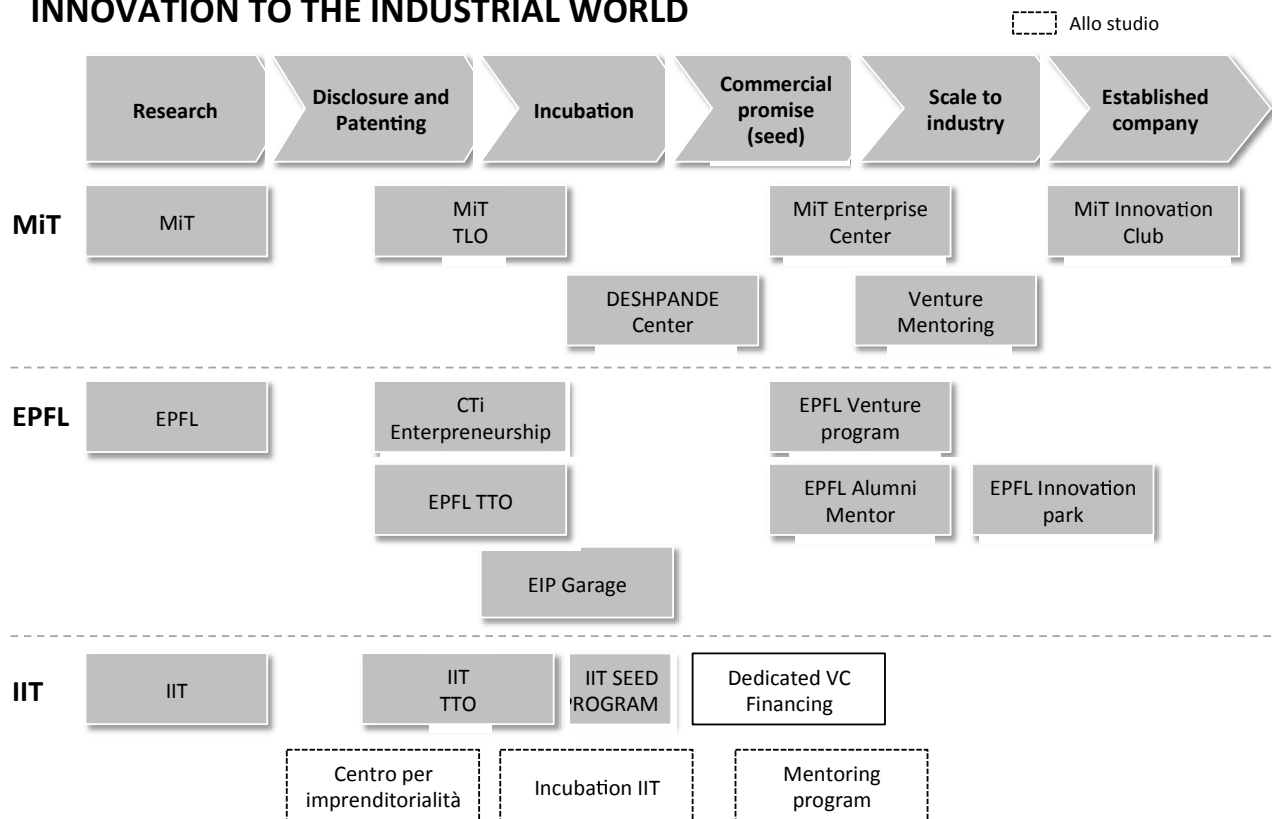
**R22. Develop a blueprint that reiterates the IIT mission to promote technological innovation and researchers entrepreneurship, specify the actions for the execution of this mission and stimulate a discussion among the researchers lead by a few “evangelists” (researchers with a personal attitude for technology transfer and commercialization of IP and with the capability to entertain their peers on the subject).**

**R23. Increase the weight of the results in Tech. Transfer in the performance evaluation of the researchers (giving a weight at least comparable to the results in research) and in the decisions for their professional advancement.**

- ¶ Focus, capabilities and size of the IIT Tech Transfer Office are in line with major international universities. The Office plays a primary role in the support to researchers in IP protection and commercialization. It adopts appropriate filters to the invention disclosures to assess in what cases they deserve to go to patent filings, it offers all the legal support for the registrations of the patents and for subsequent licensing, it takes care of the contractual aspects in licensing, commercial contracts and long term industrial partnerships, etc. it manages the patents portfolio to ensure continuation of expenditures for those with highest potential and overall efficiency. The Tech Transfer Office is an important component for the development of Tech Transfer at IIT, but this is not sufficient. Impact in Tech Transfer is not ensured by just an effective Tech Transfer Office. Successful Tech Transfer is primarily the result of the initiative originating from the individual researchers who sense the commercial potential of their ideas and decide to test it on the market, possibly suspending temporarily their scientific itinerary. The most successful institutions in Tech Transfer have developed an ecosystem that presents favourable conditions for the researchers who want to become entrepreneurs (*Ex. 18*).

## Exhibit 18

### ECOSYSTEM SUPPORTING TRANSFER OF TECHNOLOGY AND INNOVATION TO THE INDUSTRIAL WORLD



Source: MIT, EPFL, IIT

Typical components of this ecosystem include 1) educational programs on entrepreneurship to complement with capabilities not included in the ordinary curriculum, 2) incubators ie spaces, instruments, technological support for the first period of derisking of the inventions (IIT is already offering alike aids), 3) direct support in pre seed financing when the invention is still too immature for external financing (a program is in place at IIT), 4) financing program to support the researchers in the start up of a new initiative after the proof of concept 5) mentorship programs based on the commitment of expert managers to support the unexperienced researchers in moving their first steps in the commercial world. The development of this ecosystem at IIT started in the period 2012-2014 but it is still at a very early stage. IIT, for example, has a program of pre-seed financing for the projects that still are in de-risking and need to go through the proof of concept. A lot more can be done. The national landscape is poor and any infrastructure created by IIT in this area can be also to the advantage of other universities and the overall national research system. The scope should not be an exclusive involvement of IIT in all initiatives but rather playing as the architect and sponsor for the development of a range of elements that facilitate the initiative taking by researchers (to be realized with the involvement of other partners).

**R24. Design and implement a project for the development for a Tech Transfer ecosystem around IIT including at least 3 elements ie 1) an educational program on entrepreneurship (possibly in partnership with a**

qualified university with a specialization on the theme), 2) one or more incubators for facilitating the researchers at the very first steps of their industrial journey, 3) an organized mentorship program with the participation of managers with experience in advanced tech transfer and start up who commit their time as coaches of the researchers.

**R25. Transform the program for access to preseed financing into a yearly competition open to all scientists and researchers of IIT to give more visibility to the opportunity and stimulate a wider interest of the researchers in Tech Transfer.** Any initiative shall involve financial and industry experts that in this way can build a stable relation with IIT and have the chance of assessing possible investments or partnerships

¶ The relationship with corporations interested in research and innovation produced by IIT has had an upsurge in the period 2012-2014. Nevertheless, the awareness of what available in IIT by large and mid corporations seems still limited and the partnership potential with them is far from being exploited. Most commercial contracts signed by IIT in the period (and still today) have a short term scope and can be classified more as service contracts than as industrial partnerships. The 3 long term industrial cooperations of the period (5 as of today) show that stable partnerships are a smart way to transform the scientific output of research into industrial fallout (*Ex. 19*). It has proved to be an effective way of collaboration with cross benefits for both the companies and IIT.

## Exhibit 19

### LONG TERM PARTNERSHIP WITH CORPORATIONS

	INAIL	NIKON	CRESTOPTICS	DIRECTAPLUS	MOOG
Location	Genoa	Genoa	Rome	Genoa	Genoa
Starting date	January 2014	June 2014	December 2014	June 2015	March 2016
Term agreement (years)	3	3	2	2	3
Researchers IIT FT	18	-	1	-	-
Researchers IIT PT	-	2 technicians and 24 researchers	1	2	2,5
Corporations resources	12 (years/person)	5 PT + 2 FT	2 FT + 1 PT	2 PT	2 or 3
Total value of agreement			554.000 €	518.000 €	3.900.000 €
Cash firm contribution	7,500,000 €	75.000 + 50.000* €			
In kind firm contribution	na	3.000.000 €	290.000 €	260.000 €	2.040.000 €
IIT Contribution	People and instruments	250.000 € + part time scientific staff + facilities	Staff and structures for an amount of 264.000 €	Staff and structures for an amount of 258.000 €	Staff and structures for an amount of 1.860.000 €
I.P. management	<ul style="list-style-type: none"> <li>Ownership of contributed IP remains with each partner</li> <li>Jointly developed IP assigned pro quota to partners (with reference to each party's contribution in people, technology, funding)</li> </ul>				
Results	2 patents filing; start up in pipeline	Licensing option on patents and new research contracts for € 250.000)	1 patent filing; application for 2 POR	Long term cooperation agreement for industrialization; 1 start up in pipeline	

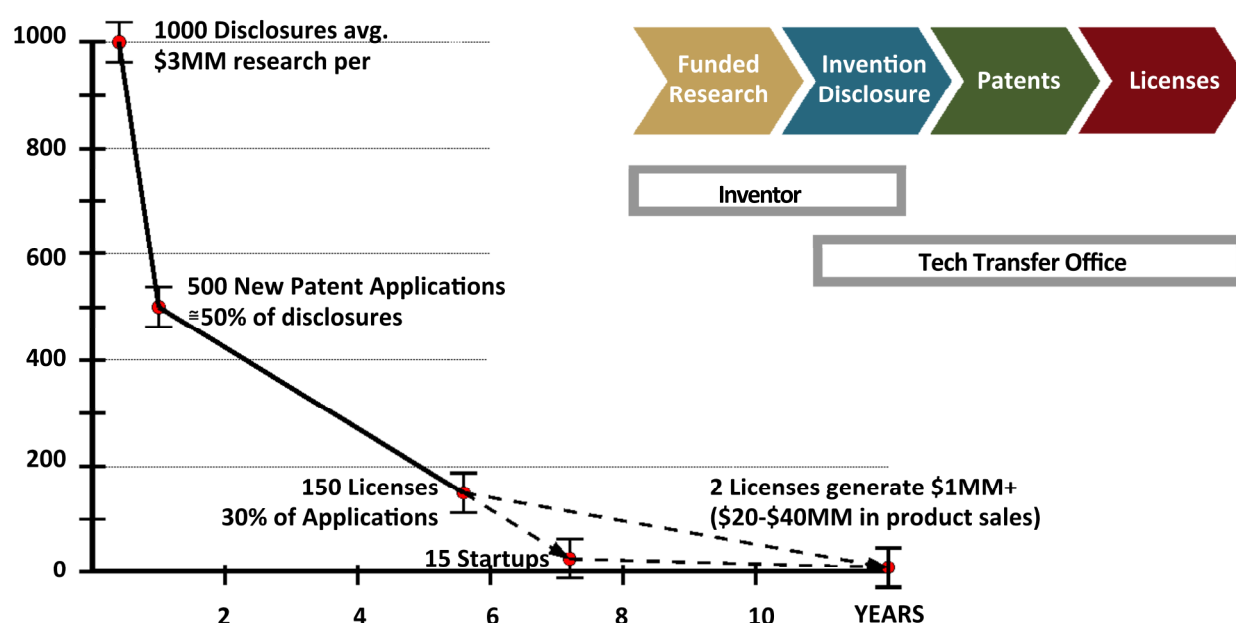
\*50.000 € from the Chamber of Commerce of Genoa intended to NIC and they represents financial resources acquired by IIT in relation to the creation of joints lab

Source: IIT

As of today the commercial value of the innovation that IIT may generate is not broadly visible to corporations, yet. The wide broadcasting of the IIT capabilities and scientific production in large events and venues is not sufficient to reach the target partners. The limited interest and propensity of Italian companies for R&D invalidate the effectiveness of the general messages. Also, these companies usually have a negative bias on universities and research centers since their time to market is on average 2-3 years while the effects of scientific research may take much longer to become marketable (8 to 10 years) (Ex. 20).

## Exhibit 20

### TIME TO MARKET OF OUTPUT FROM SCIENTIFIC RESEARCH



In such a landscape the only way to establish a wider and deeper relationships with corporations is through a surgical action of targeting and reach to corporations (starting from those who are represented in the Board) with bespoke solutions. A number of interviews performed by the EC with corporations in different industries (pharma, energy, high tech, aerospace, eyewear) confirms that the direct application of the technical and scientific expertise of IIT to a clear cut situation gives valuable answers to a specific problem and transform the relationship into an industrial partnership. (Appendix F). The interviews have also highlighted that while IIT contribution is prominent in the pre-industrial phase (development of tech concept, feasibility study, production of samples, lab testing), the support offered in understanding the scalability at industrial level, assessing the economic viability, engaging manufacturing partners and other industrial contributions is very limited. The suggestion of these partners is *to complement the team of super qualified technicians of IIT with commercial and business profiles*. The strengthening of the action of IIT Technology Transfer with industrial partners can be achieved through the constitution of a special unit within the Tech

Transfer Office supporting the researchers in promoting their innovative ideas with identified potential partners and in managing the business side of the relationship with them.

**R26. Dedicate a new team in TTO to the direct promotion of the output of IIT research to corporations with potential interest, working jointly with the researchers in the generation of leads and in the management of the industrial partnership.**

**R27. Expand the program for the execution of long term partnerships with innovative corporations (joint labs, research cooperation agreements) laying the groundwork for the realization of a technology park to be self financed with a mix of private and public contributions and where IIT can be the convener of a network of key players (academics, Government, start ups, corporations, experienced entrepreneurs, industry experts, banks, VC and PE investors, private investors, regulators).** The recent involvement of IIT in designing the new Human Technopole can represent an opportunity (also from a logistic point of view) to launch a project for the development of a technology park where several key players can be attracted for an effective Tech Transfer .

- ¶ To support the start ups IIT should facilitate the access to proper financing for its researchers. So far, the process for funding new initiatives of IIT researchers has been managed internally, with very little contamination of external competencies. In particular, industry and financial experts – venture capitalists, business angels, bankers – have been involved only sporadically. Best international practices show that a more stable relation with external experts with a direct interest in the investments can improve the outcome and lead to success stories. Having some examples of success is important to galvanize the researchers and to stimulate new initiatives. As said, IIT has already implemented a program for pre seed financing of ideas who have not gone yet through the de-risking phase and need a 'proof of concept' or 'proof of market'. The investment tickets for each project in this phase are relatively limited, rarely beyond €500K and therefore within the boundaries of resources availability at IIT. When the ideas get out successfully from this phase the financial needs for their spin off and transition to a commercial venture go to a level that requires professional financing (from € 1-3 mio up to tens of millions), out of IIT scope. To support the researchers in this phase IIT should promote an initiative for channelling the interest and resources of professional investors on innovative projects that demonstrate encouraging market potential. The matching of the demand of financial resources by IIT researchers and the supply of professionally managed funds is not immediate, especially in Italy where the number of professional venture capitalists is limited. The IIT sponsored projects compete for VC resources against many other projects owned by highly qualified teams with established competences and track record and , given their close link to scientific research, the assessment of their eligibility for financing might not receive an appropriate rating by generalist VCs. An initiative sponsored by IIT (as suggested by the previous Evaluation Committee), possibly

in partnership with professional players (ie owning the required skills of VC investment management) will give the right visibility to the projects and will facilitate the assessment of their eligibility for financing. The direct participation of IIT to the start up with equity investments must be considered with care for the implied risks (execution risk, portfolio risk). IIT does not have the skills for an appropriate risk assessment nor it is advisable to invest resources into the acquisition of capabilities (like VC investment management) that are not core for the achievement of its mission. The mechanism of designating an external evaluation committee for the assessment of each project recommended by the recent DL 3/2105 is not common practice and leaves the final decision on risk taking to the IIT organization, not equipped with the right capabilities.

**R28. Sponsor the launch of a program for the financing of ventures of researchers from IIT and other Italian universities by partnering with professional, independent investment companies with a proven track record and performance.** In research driven start ups financing IIT can be the champion of a new initiative that will cover an important gap in the national landscape by raising the attention of institutional investors on the Tech Transfer from academy and research centers. This is common practice for primary research institutions worldwide (Imperial Innovation sponsored by the Imperial College in London, Yeda Fund by the Weizman Institute in Israel, DDC Ventures by the Max Planck in Germany, CTI Invest by the EPFL in Switzerland). In the planning of this initiative is important that IIT does not play a role on single investment decisions and leaves the task to a professional team. It is important to explore the possibility of a partnership with the initiatives sponsored by Cassa Depositi e Prestiti which is already VC financing and can leverage on existing projects and funding. The initiative must remain opened to investors and ventures in order to diversify the risk and build up an opportunity that represents a game changer in the stifled space of Italian venture capital (Appendix G).

- ¶ The step up of Tech Transfer at IIT as outlined by these recommendations is a formidable challenge that requires a rise of priority in IIT agenda, additional planning quality and a leadership contribution in line with the level of ambition of IIT. Impact on economic development is one of the 3 components of IIT mission (along with scientific research and contribution to high level education) and at this point of its development Tech Transfer requires a direct commitment by IIT leadership in the execution.

**R29. Devise a solution for a more extensive, full time involvement of an ExCo member in Tech Transfer and for ensuring continuity of representative leadership in this area not only in the decision making but also in the execution of the enhancement program, supplementing the role played by the organization.**

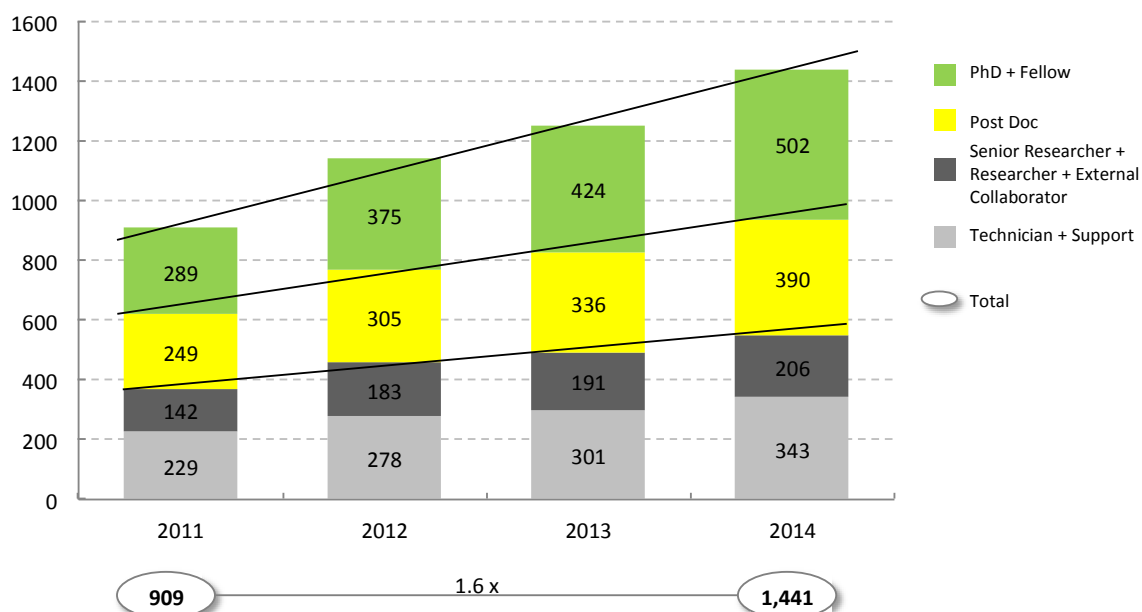


## 8. HUMAN CAPITAL MANAGEMENT (M5)

¶ The staff of IIT during the 2012-2014 registered a rate of increase of both employees and PhD students equivalent to the previous years indicating a pace of steady growth of IIT size during the full decade (*Ex. 21*).

### Exhibit 21

#### GROWTH OF IIT STAFF

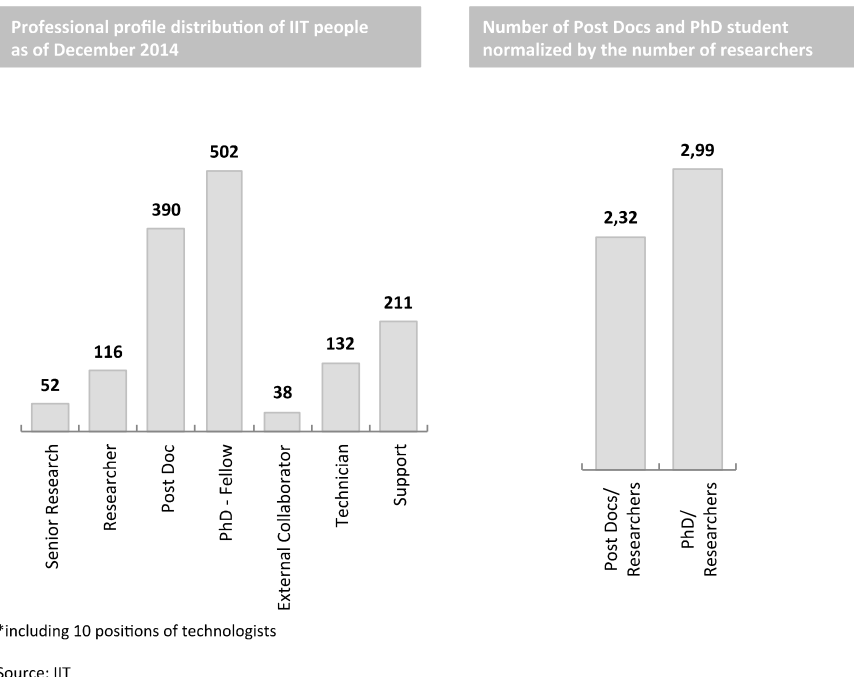


Source: IIT

As of December 2014 the total staff of IIT was 1440 (502 PhD students, 390 Post Docs, 337 Researchers, 211 Administratives) within a young, dynamic, international scientific environment (an average age less than 34 years with a dominant component of under 40s, a significant 45% fraction of foreign scientists and “returned scientists”, a light 14,6% weight of the support staff) that can compete with the most important research centers worldwide in the fight for the attraction of scientific talents. (*Ex. 22*)

## Exhibit 22

### DISTRIBUTION OF PROFESSIONAL PROFILES AT DECEMBER 31, 2014



IIT is far ahead in the comparison with the Italian universities (where average age of professors and researcher is higher than 51 and less than 0,1% of the budget is devoted to positions for foreign professors), not only because IIT is an “adolescent” organization but because it has adopted a managerial infrastructure (systems, procedures, instruments, rulebooks) in line with international standards and above all its research environment (structure of research programs, available facilities, a highly cooperative climate, ample degrees of freedom in research) is attractive for young, capable scientific talents (*Ex. 23, Ex. 24*).

## Exhibit 23

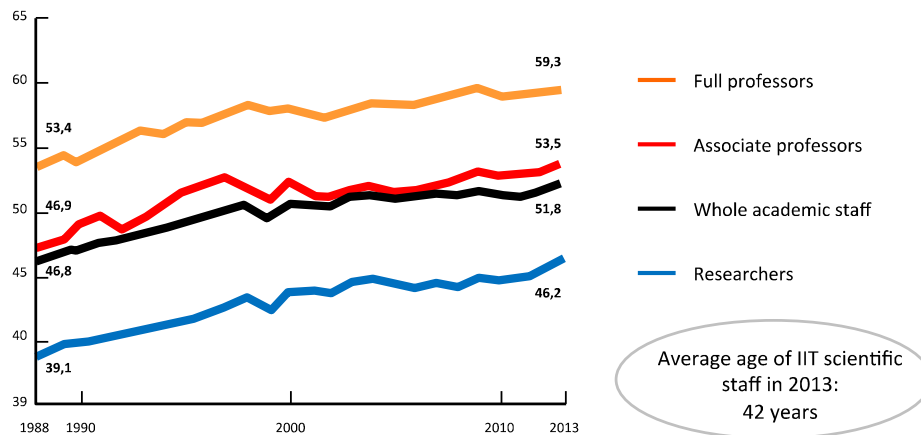
### RESEARCHERS POOL AT IIT & CNR

	IIT				CNR			
	2012		2014		2012		2014	
	#	aver. age	#	aver. age	#	aver. age	#	aver. age
Senior Researcher	40	50.02	52	47.63	1107	54.41	1034	55.46
Junior Researcher	83	39.24	106	39.65	3145	43.94	3346	44.98
Technologist			10	43.30	635	46.13	720	46.72
<b>Total</b>	<b>123</b>	<b>42.75</b>	<b>168</b>	<b>42.34</b>	<b>4887</b>	<b>46.6</b>	<b>5100</b>	<b>47.35</b>

Source: CNR

## Exhibit 24

### EVOLUTION OF AVERAGE AGE IN ITALIAN UNIVERSITIES



Source: MIUR

Now considering that IIT is reaching a level of maturity and the staffing of research may not continue to grow at the same pace of last decade ( unless a major strategy change materializes), more focus will be required on the issue of a balanced growth and quality of staff. The future expansion of IIT staff depends on a number of different parameters and constrains (e.g. the scientific strategy including the role IIT could play in the Human Technopole project, the availability of financial resources, the availability of space, the level of desired quality standards, ecc.). In the planning of future growth, the association with a selected number of italian universities into joint research centers introduce the need for IIT to interface highly qualified partners who share the same scientific vision. In this context the set up of growth aspirations with an indication of the quality goals and the suitable resources at the different level of the organization is becoming a complex exercise for IIT

**R30. In defining the guidelines for the next strategy plan a specific effort is required on the growth of the scientific activity and resources in the next decade with the implications for staff size (in the different functional categories and roles) in order to understand what actions shall be taken for preserving a proper age and tenure balance as well as target quality at all level in the organization.**

- ¶ An important innovation introduced by IIT in the period (following a recommendation of the previous Evaluation Committee) is the Tenure Track program, a recruitment system based on international standard that offers to young researchers the opportunity of competing for permanent positions. This program is key for finding a proper balance between the flexibility offered by the high turnover of the research staff (65% every 4 years) and the need to retain the best among the young researchers. The researchers selected within

the program are offered to enter into a tenuring process splitted in 2 stages (stage TT1 and TT2 of five years each, with a stage gate for the advancement) or a tenured position (nearly equivalent to a university full professor). IIT has performed two selections, the first in 2013-2014 for internal candidates (149 candidates considered eligible, selection of 10 tenured positions, 14 in TT2, 6 in TT1, 10 positions under evaluation as of December 2014), the second in 2015 open at international level (call for 10 positions, 375 applications mostly from non italian candidates, 7 TT positions offered and 4 accepted ). The progress done by IIT in this field in the last 3-4 years is quite remarkable (the orchestration role played by two experienced practitioners like prof. G.Margaritondo, EPFL and Prof. J. Assad, Harvard, introduction of Search Committees including IIT scientists for the pre-selection, the engagement of a qualified network of international referees for the final selection, the adoption of fair and reliable selection procedures) and the program today is in line with the best practices of international universities and research centers. The departure of prof. J. Assad who went back to Harvard has raised an urgent leadership issue. Assad will continue to support IIT in remote on the TT program but given the size and complexity reached by IIT activities this will not be sufficient.

**R31. Identify a full-time senior IIT scientist, member of the enlarged direction, who will be responsible for the overall supervision of the TT program and the forthcoming TT calls for the next selections.**

- ¶ The aspiration for the future is that in IIT all PIs should be into the Tenure Track system. It will imply to assign at least 10 tenure track or tenured positions every years for the next decade. In the achievement of this aspiration it will be key to keep a right balance of internal and external candidates. Every year about 150 researchers complete their Post Doc period at IIT and only a fraction of them will have the opportunity to get a TT position and continue to stay at IIT. Most of them will apply for a position to other institutions or companies (only a minority of them is considering a private company as a “choice” for their future carreer). In informal discussions, the young IIT scientists conveyed a common feeling that “the window of opportunity for internal candidates is now closed and will remain closed in the near future”. Of course this is true for the senior scientist who where not successfull in the first selection but cannot be true for a young post doc at the beginning of his/her career. There is also a point of attention on external candidates, whose recruitment in TT positions will be important (for a number of reasons). The experience of the second TT cycle suggests that their acceptance rate must be improved. The candidates declining the TT position offered by IIT had received a counter-offer from their universities of origin or decide to refuse for difficulties in managing the mobility of their families. All these issues require counter actions and an appropriate planning.

**R32. Clarify and communicate to IIT researchers that future selections will continue to include new internal candidates and scientific excellence will continue to be the most important key selection criterium.**

**R33. Activate an appropriate mentoring system for the coaching of outstanding IIT young researchers (Post Docs) in preparation for their future application to Tenure Track (having in mind not only IIT as destination).**

**R34. Reconsider with high priority the economic package and benefits (family, relocation, immigration support ecc.) with the goal to increase the attractiveness of a tenure track position at IIT for top qualified young scientists that shall transfer from current national or international locations.**

**R35. Start a suitable program to put in contact the Post Docs at the end of their period in IIT every year with qualified industrial companies interested in hiring scientific talents.**

- ¶ The attractiveness of IIT for scientific talents is helpful to contrast the “brain drain” in Italy. In general young talents shall be encouraged to enlarge their horizon and have an educational and professional experience abroad. In Italy this principle has become a one-way movements representing a pure loss for the national research system. IIT can be one of the few champions that stimulate a bidirectional process, with a benefit not only for the staffing of its projects but also for the italian system as a whole.

**R36. Continue the program for an intense international recruiting at all level and explore the possibility of competing for the financial resources recently allocated by the Government to re-attract back top italian scientists living abroad.**

- ¶ A high turnover of young researchers is key for the organizational health of IIT since it is a guarantee for the renewal of ideas and energy and gives a stable connection with the world of research. At the same time a number of tenured position must be offered to top level researchers (PIs) that can shape the scientific strategy of IIT. This is what IIT is achieving with the implementation of the Tenure Track program. A balanced evolution of the organization requires a renewal at all levels, even though with different pace. It is important that tenuring and tenured PIs are stimulated in continuity to contribute to the scientific excellence of IIT and to the growth of the next generation of researchers. Also, the relevance of their contributions shall become a determinant for the continuity in tenure and in case of repeated underperformance they should be advised to transfer out. It must be acknowledged that not all the researchers admitted at TT1 or TT2 will be able to get a positive evaluation at the end of their TT period and surpass the program stage gate. A moderate turnover, also at level of tenured PI, is a guarantee for the long term health of the IIT organization. Today IIT is not equipped with a system for managing these important passages and each situation is handled with ad hoc solutions.

**R37. Implement a performance based “grow or go” policy to avoid the ‘freezing’ of the organization with Tenure Track researchers that over time move onto an underperforming trajectory.**

**R38. Activate a Personal Progress system for the regular monitoring of the progression of Tenure Track researchers across their stages, with the goal to detect possible development issues and suggest corrective actions.**

**R39. Start a “transfer out” program to optimize the relocation of those researchers who do not surpass the Tenure Track stage gates or demonstrate a performance which is consistently disjoined from expectations in their roles.**

- ¶ IIT introduced the role of technologist in 2013, in parallel with the launch of the first TT recruitment call. The technologist is a researcher in a permanent position with a technological attitude and a preference for the development and transfer of technologies rather than pure scientific research. The choice to open career opportunities for technologist is coherent with IIT mission. Similar positions can be found in other research centers both in Italy and abroad (a limit case is CERN in Geneva where technologists represents nearly 40% of the staff with a key role in the design, construction and operations of complex machines for high energy physics experiments). At the end of 2014 in IIT there were 10 technologists (6% of the researchers pool), a small number if compared, for example, with the presence of technologists in CNR (720 equivalent to 14% of the researchers pool). Looking forward it is important that IIT keeps high admission standards for this role and ensures a continuous professional development of its technologists. The risk to avoid is that this role is considered as an *ad personam* solution for researchers who failed to move to Tenure Track. In fact this practice should be forbidden or restricted to truly exceptional and rare cases. A strong scientific background shall be mandatory and the performance evaluation shall take into account not only patents and technology transfer records but also the quality and intensity of scientific publications.

**R40. Specify rigorous and restrictive selection criteria for the position of technologist and design and implement an ad hoc program for their professional development. The information on this role should have a wider dissemination inside and outside IIT and new calls for technologists must be planned with opening to both internal and external candidates.**

- ¶ IIT gender statistics seem much better of many other public and private organization in Italy (41% of the overall staff is female, 25% in the pool of scientific researchers). It is difficult to define an ideal target of gender without incurring into the risk of discrimination (in one or the other direction). The argument that for achieving equivalent scientific results female scientists must work much harder than the male colleagues might not be fully applicable in the scientific world and the so called “quotas” may not be a workable solution for all situations. To confirm the commendable results achieved in this area without slipping back again to the level of less advanced organization IIT should continue to keep a special focus on it.

**R41. Extend and further improve the on going program and actions to support the professional growth of young female scientists, in particular those with families.**

- ¶ IIT has more than 200 people that are not strictly classified as researchers or technicians who provide an essential activity to support the organization and allow the researchers to concentrate on their core activities. Given the size and the importance of role of the administrative functions, it might help a planning where requests for additional personnel is included in a broad evaluation of future needs and coverage solutions.

**R42. Develop a regular process of personnel planning for all the administrative positions, both for roles within Departments and Centers and for more general administrative functions that serve the whole Institute.**

- ¶ A situation that deserves a special attention is the position of the *12 dirigenti amministrativi*. Unlike the senior scientist who are in a permanente position, the *dirigenti amministrativi* have temporary contracts (3 and 5 years lenght) that are subject to repeated renewals. This situation is favourable for the flexibility it ensures in the management of headcounts but, at the same time, presents a vulnerability for IIT. In fact most of the *dirigenti* have been renewed in their role at least one time and shall be considered important members of the organisation. Nevertheless their working relationship with IIT could be interpreted at any time, also for reasons independent from IIT, leaving a gap in the coverage of very important functions. While this situation was suitable in the early stage of IIT, a change is required today in the direction of a higher stability of the *dirigenti amministrativi* in their role, particularly for those who can be acknowledged of a high performance record.

**R43. Develop a program for transforming the role of *dirigente amministrativo* into permanent position, subject to a filter of perfomance evaluation over a period of time.** A solution could be to introduce a tenure track-like program implying thei hiring in temporary position and one or more stage gates: after a multi year period (5 to 6 years) for the passage to permanent position subject to performance assessment (based on established criteria).

## 9. FINANCIAL SUSTAINABILITY AND GOVERNANCE (M6)

- ¶ After more than a decade of activity, the high boost of the last period and a strong record of achievements IIT has reached its maturity and both the Financial Sustainability and the Governance need to be tested for consistency against the requirements of today's and future IIT aspirations. The next 10 years will be different from the past. Even without considering the likely implication of Human Technopole, the strategy of IIT shall move *from Growth to Quality*, simply because the available public financial resources are at their full utilization (see below). A project for the review of the Governance was completed in 2015 with the support of a professional advisor under the supervision of a working group designated by the *Presidente* and, following their recommendations, a number of innovations are being introduced. The view of the EC is that Financial Sustainability and Governance of IIT shall continue to be reviewed since a number of issues are still open and some of them are key for the future of IIT. This evaluation is offering a contribution in highlighting some of these issues but their solution will require a new specific project aimed at a comprehensive remodeling of the Governance and the implementation of structural reforms – including a renewal of the By-Law, if needed, according to the new governance requirements - that ensure an alignment with the IIT strategy for the next 10 years (not only short term fixes).

**R44. Launch a project for the strategic review of its Financial Sustainability and Governance driven by a preliminary definition of the aspirations for the next 10 years and open to an innovation of the existing By-Law and internal rules**

- ¶ In the first 8 years of activity the budget of IIT generated a yearly surplus which has been cumulated into a liquidity reserve of around € 350mio (sum of yearly surplus), complemented by €100 mio of additional resources, for a total liquidity of € 450 mio (deposited in the *Tesoreria Unica*, managed by the Bank of Italy) (*Ex. 25*).



## Exhibit 25

### IIT YEARLY BUDGET

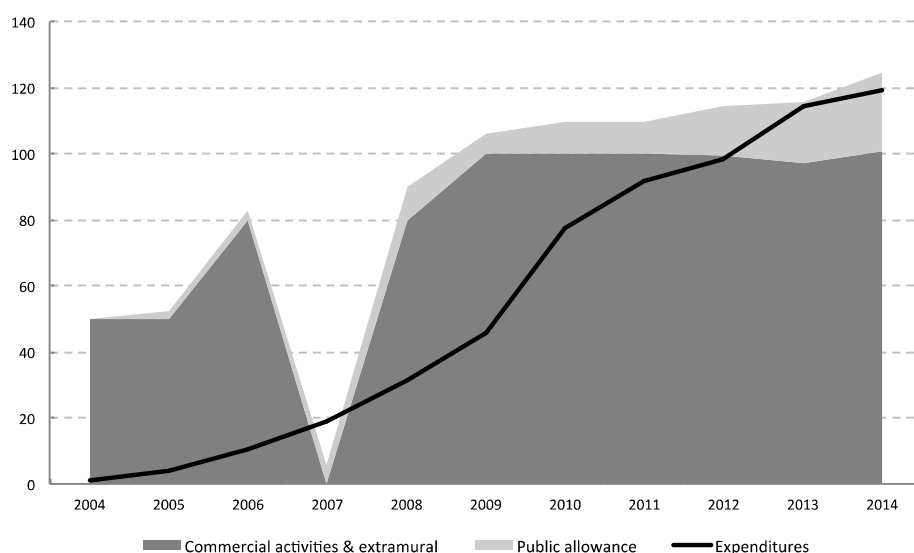
Year	A Public allowances	B Commercial activities & extramural	C=A+B Total	D Expenditures	E=C-D Surplus	Cumulative
2004	50,0	0,1	50,1	1,0	49,1	49,1
2005	50,0	2,4	52,4	3,8	48,6	97,7
2006	80,0	2,9	82,9	10,6	72,3	170,1
2007	-	5,4	5,4	18,7	-13,2	156,8
2008	80,0	10,0	90,0	31,3	58,7	215,5
2009	100,0	6,0	106,0	45,4	60,5	276,1
2010	100,0	9,8	109,8	77,3	32,5	308,6
2011	100,0	9,4	109,4	91,6	17,7	326,3
2012	99,2	15,1	114,3	98,5	15,8	342,1
2013	96,8	18,7	115,5	114,2	1,3	343,4
2014	100,9	23,4	124,3	119,4	4,9	348,3
<b>Totali</b>	<b>856,9</b>	<b>103,2</b>	<b>960,1</b>	<b>611,8</b>	<b>348,3</b>	

Source: IIT

These funds are the outcome of an effective and sound use of the available resources and are today available for funding future needs of IIT budget and new research projects, within IIT and, if required, in the national research system. In 2012 the yearly public funds matched exactly the expenditures of IIT while in the following years the difference became negative and IIT budget was balanced though the revenues generated from commercial activities and grants. This is common to most research institutions in the world who usually manage their economics with a mix of public allocation and self generated funds, yet with a structural ceiling for the latter (in US, the most advanced nation in commercial dissemination of research the public financing does not go below 65% of the total funds collected by research institutions). The quite simple reason is that these institutions' mission is to do scientific research of technological relevance and the commercial activity is one of the by products but not their core mission (*Ex. 26*).

## Exhibit 26

### EVOLUTION OF IIT ECONOMICS



Source: IIT

Two considerations can be drawn by the financials of IIT: *i)* the yearly planning of activities and economic budget become more and more important for IIT since no room is left in the budget for unexpected events; *ii)* a change of paradigm shall occur at IIT since the future strategy of the research will be dependent not so much on growth but on the quality of goals, activities and people with limited room for further growth.

**R45. The next cycle of strategy planning of IIT shall include a stress test on financial sustainability and on the flexibility required for the mitigation of potential vulnerabilities as well as an explicit presentation of a review of the research programs and related allocation of funds that ensures the best possible use of available resources.**

- ¶ According to the current By-Law, the IIT governance is based on steering and monitoring functions (Board, President, Strategy Auditors) and management and execution functions (Executive Committee, Scientific Director). It was designed with the purpose to facilitate the role of strategic guidance and control and is unchanged from the startup (subject only to a number of improvements of rulebook, delegation of power, functional chart that anyhow induced no structural change to the initial design). It has worked well in driving IIT in the past decade to a successful positioning in the national and international landscape of scientific research. With the increasing size and complexity of IIT activities the governance deserves a review for an alignment to the new challenges. A first point is that at the moment, by choice, the SD is

the only figure with a full time employment among the constitutional roles.. Board, President and ExCo roles are played by senior managers and scientists who are committing their time to IIT in addition to assignments they have in their own organizations. This is particularly relevant for the President and ExCo that according to the By-law have a key role in the design and execution of the IIT strategy. While formally the responsibility remains with the different governing bodies, de facto there is a concentration of tasks and responsibilities on the figure of the SD, compatible with a small and simple organization, but not with an increasing growth of IIT in size, budget and complexity.

**R46. Consider to commission more time availability to the executive leadership and to invite to the ExCo senior members of the staff (eg Deputies of the SD, DG, Senior Scientists) that have permanent responsibilities on key matters (eg Scientific Research, Human Capital, Tech Transfer, Finance) in order to ensure continuity to the ExCo action.** ExCo could be organized in subcommittees dedicated to each specific matter (an alternative solution would be the assignment of individual, direct responsibility on the key levers of IIT strategy to the ExCo members that should be selected according to the relevant skill requirements).

- ¶ The recent review of the leadership of the scientific team with the appointment of a Deputy SD, 2 Deputy Directors and the formation of 3 Scientific Advisory Teams under the supervision of 3 Deputy Directors is an important enlargement of the top structure of Research, in line with the recommendation of the last EC. More specifically the introduction of the Scientific Advisory Teams represents a key step in the completion of the vertical dimension of the matrix “Programs - Research Groups”. These appointments concur to the coverage of some key organisational gaps (e.g. the supervision of the PhD program by the new Deputy SD), an action that should be completed by designating the supervisors of other key tasks, always in the area of Human Capital (e.g. the Tenure Track , Post Docs). The suggested approach is to replicate the principle followed so far i.e. designating experienced senior researchers (instead of administrative managers) as supervisors of Human Capital systems since they have the closest interaction with the research staff and, presumably, the highest sensitivity on the managerial issues of this pool. PhD students, Post Docs., Tenure Track researchers are the primary assets of a research organisation like IIT and should be the primary concern of the IIT leadership (of course the designated supervisor shall be supported in the execution of their duties by the IIT offices).

**R47. Complete the new leadership for the Human Capital management function with the designation of Deputy Directors for the coverage of remaining gaps in key organisational roles (i.e. Tenure Track program, Post Docs Mentoring).**

- ¶ Another element of Governance that deserves attention is the composition of the Board of Trustee. Today the Board is made by 15 members of which only 3 belongs to the scientific community (5 come from the service industry and the economists community while the remaining 7 come from corporations). This

composition does not fit well with the responsibilities of the Board and the mission of IIT as a Research Organization. According to the By-law (art. 7) the Board is responsible for *highlighting the strategic and operational guidelines, approving the multiyear activity planning, decide the internal operating rules and monitoring the performance*. The effective accomplishment of these tasks within a research institution require the contribution of a wide group of high level, experienced representatives of the national and international scientific community. Also, corporate leaders who are in the Board should be the primary sponsor of an intimate cooperation in scientific research between IIT and corporations, an area where IIT shall do a quantum leap.

**R48. Review the Board composition and increase the weight of high level representatives from the international scientific community**

**R49. The members of the Board from corporations shall be powerfully encouraged to promote cooperation agreements in research projects between IIT and the corporations they represent in areas of joint interest** (of course within the established policies on conflict of interest)

¶ Given the nature of IIT and the main source of its funding, the control on a purposefull and appropriate use of the available resouces is everyday concern of the leadership. While there are a number of internal and external entities who are continuously engaged on the monitoring (Internal Audit, Compliance, Statutory Auditors, Organismo di Vigilanza 231, a representative of Corte dei Conti, monitoring Ministries), there is no entity with the responsibility to periodically develop an holistic and comprehensive view of the different outcomes from the monitoring processes. In the world of corporations, particularly in listed companies, this role is usually played by a risk and control committee of the board (it is one of the 3 subcommittees that consitute part of the backbone of corporate governance worldwide). According to the By-law (art.7) the Board of IIT can establish a subcommittee including also external members, if required.

**R50. Establish a support to the Board for a regular, periodic reporting on risk management and internal control systems resulting from the integration of the outcomes of the monitoring processes executed by the designated entities.** This recommendation will be in line also with the suggestions of Corte dei Conti outlined in the 2012 and 2013 yearly reports.

¶ While the above recommandations outline improvements that could be *implemented* within the perimeter of the existing organization, the governance of IIT may require more structural reforms for the future, including a remodeling of the By-Law. One example has to do with the role of Scientific Director. The size and complexity reached by IIT suggest to execute a comprehensive review of this role. According to the By-law (art.10) the SD is responsible for *“the execution of strategies and resolutions of the Exco, coordination and management of scientific, administrative and support functions as well as the execution of the scientific programs of the Foundation”*. It is an assignment more suitable to the role of a chief executive leader than to a

Scientific Director. While such a high concentration of tasks on the figure of the SD was compatible with a small and simple organization of IIT in its early stage, it looks increasingly challenging with the growth of the size and complexity of activities and organization. As a matter of fact there is no evidence of a similar design in comparable research institutions worldwide (as highlighted by the benchmarking on Governance produced by the advisor engaged in 2015). Going forward the success of IIT will be more and more dependent on 3 key levers ie *i)* the distinctiveness of the Scientific Research, *ii)* the effectiveness of Technology Transfer, *iii)* the pre eminence of Human Capital (as the key enabler for every achievement). The management of each of these levers today requires the stewardship of an ExCo level type of profile. In fact the Scientific Research has the challenge to extend the successes achieved in the established areas into new scientific domains (with a scientific staff of over 1000 researchers, 50 PIs, 11 interdisciplinary programs that could more than double with HT 2040), the Technology Transfer shall receive an additional boost to its development (cultivation of corporates, sponsorship of dedicated VC financing, creation of an innovation park ecc.) with an increasing attention to potential conflicts of interest (on use of IIT intellectual property), the Human Capital management shall devote growing attention to 3 large pools of resources (ie the PhD students, the Post-doc, the Tenure Track candidates), each with increasing and diversified needs (including the management of the relationship with a wide network of Italian and international universities in the field of post graduate education). It is hard to imagine that the coverage of these responsibilities can be effectively concentrated in one figure as in today's organization.

**R51. Consider to introduce a role of Executive Vice President (reporting to the President and ExCo) with the responsibility for the execution of the IIT strategy and the oversight of all activities in team with 4 Directors ie a Scientific Director (the Provost), a Director of Technology Transfer, a Director of Human Resources, a Director of Administration and Finance (all experienced, senior researchers and executives who devote one part of their agenda to their research projects and another relevant part to the management of these key drivers of performance).** The introduction of new roles with their assignment to candidates of high level profile is a recommendation that wants to highlight the need of a structural reform for IIT. It is not necessarily consistent with the previous recommendations of this chapter and to be confirmed will require an holistic review of the overall governance of IIT, an exercise that at this point is strongly recommended.

## 10. SUMMARY OF RECOMMENDATIONS (**MUST DO IN BOLD**)

This chapter summarizes all the recommendations suggested throughout the report. According to the EC, those with a bold character are a “must do” for IIT, meaning that they should have the highest priority in implementation.

### **Research and Scientific Production (M2)**

**R1. Expand and organize the database (that should include bibliometric and non bibliometric indicators like invitation to flagship conferences, organization of seminars and meetings, prizes and awards, patents and licences, participation to spin offs ecc.) that is used for the monitoring of the quality of the research in continuity and not only at the moment of the periodic assessments.**

**R2. Accentuate the monitoring of the technological relevance of the output of each PI (in addition to the scientific relevance) by introducing “smart” indicators of the economic impact of research and give more visibility to the cases of excellent performance.**

**R3. The research strategy must be continuously reviewed as to aspiration and vision both in the established areas of excellence as well as in the other areas . In particular, evolution, vision and strategy of Life Science area must be followed with utmost commitment.**

R4. Ensure that the evolution of D3 and NBT, induced by the recent changes implemented in the two departments (aimed at promoting new ideas and innovation with the introduction of new lines of research) and new scientific leaders are aligned with the vision of IIT in Life Science and generates multiple, interdisciplinary contributions with other research teams.

R5. Ensure that the 3 Centers under assessment (CGS and CNI and CLNS) are reviewed within mid 2017 for a confirmation as permanent units within IIT or for their exit from IIT perimeter.

R6. Clarify the expected contribution and role of the “light centers” in Harvard and MIT within the research strategy of IIT and specify a commitment of resources for them which is appropriate with their expected contribution.

R7. Review the situation of the presence with two centers in the same city (Pisa and Milan) and verify whether there are compelling reasons for the duplication or it is possible to unify them in the same city without jeopardizing the relationship with the involved universities.

R8. Develop the design at the end state of the new matrix organization and its operational structure and specify the key milestones of implementation to plan a regular monitoring.

**R9. Clarify the role of Departments and Centers within the new matrix organization and plan their step by step transformation for the next years.**

**R10. Increase the visibility of decision making criteria for research portfolio management and for project management and review the effectiveness,**

**accountability, sustainability of the procedures for budget allocation as well as their consistency with the future IIT needs.**

### **Impact on High Level Education (M3)**

**R11. Review the policies and criteria for selection of PhD candidates, their performance evaluation during the doctorate, the pre-qualification and admission to the final dissertation (in consultation with partner universities) and ensure appropriate quality filters.**

**R12. Align all the signed PhD cooperation agreements to the standard IIT frame, verify if it is possible to implement it with equivalent impact to universities with and without a joint research pole and stop the cooperation with the Universities that do not want to accept it.**

R13. Introduce an explicit Quality Criterium in the selection of the universities eligible for the joint PhD program and for cooperation with IIT in research.

**R14. Continue the program for the formal accreditation as an institution authorized to release PhD degree with the goal to complement the cooperation with universities with the entitlement to authonomy in PhD education.**

R15. Test the possibility to establish a joint PhD program with foreign universities, starting from those with a joint research center with IIT (i.e. Harvard, MIT).

R16. Ensure that the overall compensation package offered by IIT to a PhD student (i.e. PhD grant and value of additional benefits) is in line with the standards of european and international competitors.

**R17. Introduce the planning of PhD students enrollment in the process IIT strategic plan and adopt appropriate instruments as a support.**

R18. Review the approach to PhD tutorship ensuring that the supervision of the academic progress (usually under the university responsibility) and the supervision of the research progress (usually under the IIT responsibility) get unified into one comprehensive performance review (and include this into the standard cooperation agreement with universities).

R19. Ensure a wider participation of IIT researchers in the PhD tutorship and adopt a more balanced distribution of assignments and load among them.

**R20. Designate a Director of PhD Activities that will be responsible of all issues related to PhD students from hiring to graduation, including the activation and administration of all the joint PhD programs with universities.**

**R21. Implement a plan for the enrichment of the PhD education at IIT with the complementary skills required for a successfull career in research within the industrial world and specify the plan for promoting the PhDs with corporations interested to a doctorate education in science and technology.**

## **Results of Techonology Transfer (M4)**

**R22. Develop a blueprint that reiterates the IIT mission to promote technological innovation and researchers entrepreneurship, specify the actions for the execution of this mission and stimulate a discussion among the researchers lead by a few “evangelists” (researchers with a personal attitude for technology transfer and comercialization of IP and with the capability to entertain their peers on the subject).**

R23. Increase the weight of the results in Tech. Transfer in the performance evaluation of the researchers (giving a weight at least comparable to the results in research) and in the decisions for their professional advancement.

**R24. Design and implement a project for the development for a Tech Transfer ecosystem around IIT including at least 3 elements ie 1) an educational program on entrepreneurship (possibly in partnership with a qualified university with a specialization on the theme), 2) one or more incubators for facilitating the researchers at the very first steps of their industrial journey, 3) an organized mentorship program with the participation of managers with experience in advanced tech transfer and start up who commit their time as coaches of the researchers.**

R25. Transform the program for access to preseed financing into a yearly competition open to all scientists and researchers of IIT to give more visibility to the opportunity and stimulate a wider interest of the researchers in Tech Transfer.

R26. Dedicate a new team in TTO to the direct promotion of the output of IIT research to corporations with potential interest, working jointly with the researchers in the generation of leads and in the management of the industrial partnership.

**R27. Expand the program for the execution of long term partnerships with innovative corporations (joint labs, research cooperation agreements) laying the groundwork for the realization of a technology park to be self financed with a mix of private and public contributions and where IIT can be the convener of a network of key players (academics, Government, start ups, corporations, experienced entrepreneurs, industry experts, banks, VC and PE investors, private investors, regulators).**

R28. Sponsor the launch of a program for the financing of ventures of researchers from IIT and other italian universities by partnering with professional, independent investment companies with a proven track record and performance.

**R29. Devise a solution for a more extensive, full time involvement of an ExCo member in Tech Transfer and for ensuring continuity of representative leadership in this area not only in the decision making but also in the execution of the enhancement program, supplementing the excellent role played by the organization.**

## **Human Capital Management (M5)**



**R30. In defining the guidelines for the next strategy plan a specific effort is required on the growth of the scientific activity and resources in the next decade with the implications for staff size (in the different functional categories and roles) in order to understand what actions shall be taken for preserving a proper age and tenure balance as well as target quality at all level in the organization.**

**R31. Identify a full-time senior IIT scientist, member of the enlarged direction, who will be responsible for the overall supervision of the TT program and the forthcoming TT calls for the next selections.**

R32. Clarify and communicate to IIT researchers that future selections will continue to include new internal candidates and scientific excellence will continue to be the most important key selection criterium.

R33. Activate an appropriate mentoring system for the coaching of outstanding IIT young researchers (Post Docs) in preparation for their future application to Tenure Track (having in mind not only IIT as destination).

**R34. Reconsider with high priority the economic package and benefits (family, relocation, immigration support ecc.) with the goal to increase the attractiveness of a tenure track position at IIT for top qualified young scientists that shall transfer from current national or international locations.**

R35. Start a suitable program to put in contact the Post Docs at the end of their period in IIT every year with qualified industrial companies interested in hiring scientific talents.

R36. Continue the program for an intense international recruiting at all level and explore the possibility of competing for the financial resources recently allocated by the Government to re-attract back top italian scientists living abroad.

**R37. Implement a performance based “grow or go” policy to avoid the ‘freezing’ of the organization with Tenure Track researchers that over time move onto an underperforming trajectory.**

R38. Activate a Personal Progress system for the regular monitoring of the progression of Tenure Track reseachers across their stages, with the goal to detect possible development issues and suggest corrective actions.

R39. Start a “transfer out” program to optimize the relocation of those researchers who do not surpass the Tenure Track stage gates or demonstrate a performance which is consistently disjoined from expectations in their roles.

R40. Specify rigorous and restrictive selection criteria for the position of technologist and design and implement an ad hoc program for their professional development. The information on this role should have a wider dissemination inside and outside IIT and new calls for technologists must be planned with opening to both internal and external candidates.

R41. Extend and further improve the on going program and actions to support the professional growth of young female scientists, in particular those with families.

**R42. Develop a regular process of personnel planning for all the administrative positions, both for roles within Departments and Centers and for more general administrative functions that serve the whole Institute.**

R43. Develop a program for transforming the role of *dirigente amministrativo* into permanent position, subject to a filter of performance evaluation over a period of time.

### **Financial Sustainability and Governance (M6)**

**R44. Launch a project for the strategic review of its Financial Sustainability and Governance driven by a preliminary definition of the aspirations for the next 10 years and open to an innovation of the existing By-Law and internal rules.**

R45. The next cycle of strategy planning of IIT shall include a stress test on financial sustainability and on the flexibility required for the mitigation of potential vulnerabilities as well as an explicit presentation of a review of the research programs and related allocation of funds that ensures the best possible use of available resources.

**R46. Consider to commission more time availability to the executive leadership and to invite to the ExCo senior members of the staff (eg Deputies of the SD, DG, Senior Scientists) that have permanent responsibilities on key matters (eg Scientific Research, Human Capital, Tech Transfer, Finance) in order to ensure continuity to the ExCo action.**

**R47. Complete the new leadership for the Human Capital management function with the designation of Deputy Directors for the coverage of remaining gaps in key organisational roles (i.e. Tenure Track program, Post Docs Mentoring).**

R48. Review the Board composition and increase the weight of high level representatives from the international scientific community.

R49. The members of the Board from corporations shall be powerfully encouraged to promote cooperation agreements in research projects between IIT and the corporations they represent in areas of joint interest.

**R50. Establish a support to the Board for a regular, periodic reporting on risk management and internal control systems resulting from the integration of the outcomes of the monitoring processes executed by the designated entities.**

**R51. Consider to introduce a role of Executive Vice President (reporting to the President and ExCo) with the responsibility for the execution of the IIT strategy and the oversights of all activities in team with 4 Directors ie a Scientific Director (the Provost), a Director of Technology Transfer, a Director of Human Resources, a Director of Administration and Finance (all experienced, senior researchers who devote one part of their agenda to their research projects and another relevant part to the management of these key**

**drivers of performance).**

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## PART THREE

## APPENDIXES



## APPENDIX A: EVALUATION TEAMS

Committee Members	1. Mission	2. Scientific production and research	3. Training & impact on HLE	4. TT & impact on economy	5. Human Capital management	6. Governance & Administration
• Bassi	X		X		X (Speaker)	X
• De Poli	X			X		X
• Ghislanzoni	X		X		X	X
• Grifoni	X	X			X	X
• Lugli	X	X (Speaker)	X			X
• Montanino	X			X (Speaker)		X
• Profumo*	X		X (Speaker)			X
• Zuccato	X	X				X
• Terzi*	X (Speaker)			X		X (Speaker)

\* Councilors

## APPENDIX B: DOCUMENTS AND POLICIES FOR THE EVALUATION

Modulo	Base documentale
1. Mission	<ul style="list-style-type: none"> <li>• Legge istituzionale</li> <li>• Statuto</li> <li>• Regolamenti di funzionamento generale</li> <li>• Piano strategico 2012-2014 e 2015-2017</li> <li>• Rapporto di valutazione ANVUR 2013</li> </ul>
2. Ricerca e produzione scientifica	<ul style="list-style-type: none"> <li>• Piano scientifico ed analisi risultati</li> <li>• Rapporto del CTS su piano scientifico</li> <li>• Misurazioni bibliometriche</li> <li>• Audit a CTS</li> </ul>
3. Formazione e impatto su HLE	<ul style="list-style-type: none"> <li>• Programma di cooperazione su PhD con MI, To</li> </ul>
4. TT e impatto su economia	<ul style="list-style-type: none"> <li>• Linee guida del TT</li> <li>• Regolamento su proprietà Intellettuale</li> <li>• Linee guida su investimenti nel TT</li> <li>• Policy per gli spin-off e start-up</li> <li>• Classificazione di accordi, progetti, joint venture</li> <li>• Verbali Commissione spin-off</li> </ul>
5. Gestione del capitale umano	<ul style="list-style-type: none"> <li>• Policy su sistema di tenure track</li> <li>• Linee guida di gestione risorse umane</li> <li>• Analisi di gestione risorse umane 2012-2014 (Hay Group)</li> <li>• Sintesi di valutazioni annuali MBO 2012-2014</li> <li>• Autovalutazione del DS</li> <li>• Policy e sistema di recruiting internazionale</li> </ul>
6. Governance e Amministrazione risorse	<ul style="list-style-type: none"> <li>• Regolamento di funzionamento generale</li> <li>• Organigramma e funzionigramma</li> <li>• Policies di gestione</li> <li>• Bilanci e relazioni di gestione</li> <li>• Analisi di processi amministrativi (Studio KPMG 2011)</li> <li>• Risk Assessment (Studio Deloitte 2012)</li> <li>• Audit Report per il periodo 2011-2014</li> </ul>

## **APPENDIX C: ACTIVITIES**

### **M2:**

11.06.2015 Interview with G. Cannata (Uni Genova-Robotics) and E. Yoshida (Uni Tokyo-Robotics) performed by Paolo Lugli

09.07.2015 Site visit at CNST@POLIMI and interview with G. Lanzani and M. Caironi performed by Paolo Lugli

30.09.2015 Site visit at CGS@SEMM and interview with B. Amati, H. Muller, L. Riva, M. Pelizzola, F. Nicassio and S. Campaner performed by Chiara Zuccato

08.10.2015. Site visit in Morego and interview with T. Pellegrino and T. Bandiera (D3) and L. Cancedda, T. Fellin, A. Barberis, R. Tonini and F. Benfenati (NBT) performed by Chiara Zuccato

29.10.2015 Site visit at ETH Zurich and interview with G. Blatter, W. Wegscheider e S. Lilly performed by Milena Grifoni

16.11.2015 Interview with S. Hirche and G. Chen (TUM-Robotics) performed by Paolo Lugli

27.11.2015 Milano CNST@POLIMI Scientific Meeting with the IIT Directors

18.01.2016 Site visit to Swiss Robotic Center (EPFL) performed by Paolo Lugli

18.01.2016 Site visit and interview with G. Margaritondo (EPFL) performed by Paolo Lugli

19.01.2016 Site visit to Innovation Park (EPFL) performed by Paolo Lugli

21.01.2016 Site visit and interview with M. De Vittorio (CBN@UNILE) performed by Chiara Zuccato

21.01.2016 Site visit and interview with M. De Vittorio and F. Della Sala (CBN@UNILE) performed by Paolo Lugli



## M4:

<b>Analysis</b>	<ul style="list-style-type: none"> <li>• Analysis of methods and bibliometric sources</li> <li>• Productivity of Centers and Departments</li> <li>• Determination of non bibliometric parameters for scientific areas</li> <li>• Comparison between national and international scientific production</li> <li>• Comparison with comparable Centers according to AUTM, NETVAL, ASTP</li> <li>• Regulations, policies, internal reports</li> <li>• Review of HR processes (recruiting, development, performance management, outplacement)</li> <li>• Survey on Alumni group</li> </ul>
<b>IIT internal interviews</b>	<ul style="list-style-type: none"> <li>• Chairman (Grilli)</li> <li>• Chairman CE (Galateri)</li> <li>• Chairman CTS (Margaritondo)</li> <li>• IIT functional managers (Administration, HR, ROO)</li> <li>• PI Life Science area</li> <li>• TTO manager</li> <li>• F. Pasinelli (Spin-off commission)</li> <li>• Berdondini, Rocchia (Start up founders)</li> <li>• Graduate students, post doc, researchers on tenure track (IIT GE, IIT/poliMI)</li> <li>• Prof. Assad (Tenure Track)</li> <li>• Directors of Centers and Departments</li> </ul>
<b>IIT external interviews</b>	<ul style="list-style-type: none"> <li>• Prof. S. Lilly (Dir. Dep. of Physics ETH Zurigo)</li> <li>• Prof. Cheng (Resp. Inst. Robotics &amp; Bioengineering TUM)</li> <li>• Prof. Calderini (MIUR)</li> <li>• Prof. Corboud Fumagalli (VP TTO, EPFL)</li> <li>• Cappellini, Tommasini (FII, start up fund)</li> </ul>
<b>Visits</b>	<ul style="list-style-type: none"> <li>• Life Science Area (GE, MI, Rome)</li> <li>• MIT Boston (J. Turner, TTO Leader)</li> <li>• North Western Chicago (Bortolotto, Tiemeier, TTO)</li> <li>• University of Chicago (Kuemmerle, Okabe, TTO)</li> <li>• ETH Zurigo (Blatter, Wegscheider)</li> </ul>

## M5:

<b>Analisi</b>	<p>Discussione delle pratiche e delle performance dell'IIT nei principali processi relativi alla gestione dei Ricercatori</p> <ul style="list-style-type: none"> <li>- Strategia generale</li> <li>- Recruiting</li> <li>- Professional Development</li> <li>- Performance Management</li> <li>- Retention</li> <li>- Outplacement</li> </ul>
<b>Interviste interne</b>	<p>Incontri con dottorandi, post-doc e ricercatori in tenure track presso:</p> <ul style="list-style-type: none"> <li>• Milano, Centro IIT/PoliMI</li> <li>• Genova (sede centrale IIT)</li> </ul> <p>Incontro su tenure track con prof. Assad e prof. Margaritondo a Genova (db)</p>
<b>Interviste esterne</b>	<p>Impostata dal GdL una survey appena erogata da IIT agli alumni, relativa a:</p> <ul style="list-style-type: none"> <li>• Soddisfazione relativa all'esperienza in IIT (Professionale, Personale, Complessiva) e impatto sulla carriera</li> <li>• Motivazioni e criteri delle scelte professionali pre e post esperienza IIT</li> </ul>
<b>Visite</b>	<p>Giornata di lavoro a Genova con Dottoressa Cagnoni e Dottor Monga</p>

## APPENDIX D: AGENDAS OF EVALUATION COMMITTEE MEETINGS

### Genoa, March 31-April 1, 2015



**Ore 18:30** Riunione introduttiva del Comitato di Valutazione

**Ore 20:30** Cena di benvenuto



**Ore 8:30 – 10:00** Visione Generale sull'IIT – Benvenuto del Direttore Scientifico IIT

**Ore 10:00 – 11:00** Produzione scientifica dell'IIT – Chairman del Comitato Tecnico Scientifico

**Ore 11:00 – 12:00** Risultati raggiunti in materia di Trasferimento tecnologico – Direttore Scientifico IIT e Responsabile TT

**Ore 12:00 – 12:30** Politiche di gestione del personale – Direttore Scientifico IIT e Capo del Personale

**Ore 12:30 – 13:00** Politiche Tenure Track – Deputy Director Tenure Track

**Ore 13:00 – 14:00** Lunch – Ristorante IIT

**Ore 14:00 – 15:00** Riunione del Comitato di Valutazione

**Ore 15:00 – 17:00** Visita dei Laboratori IIT come segue:

- Materiali sostenibili, plastiche biodegradabili
- Nikon Centre
- Grafene
- Presentazione del robot umanoide iCub, del robot compliant CoMan e del robot quadrupede HyQ

**Ore 17:10** Saluti e ringraziamenti

## Milan, July 9-10, 2015



<b>Ore 08:30 – 09:00</b>	Apertura dei lavori (Vittorio Terzi)
<b>Ore 09:00 – 10:30</b>	Discussione Modulo M2 (Ricerca e Produzione Scientifica – Paolo Lugli)
<b>Ore 10:30 – 10:45</b>	Break
<b>Ore 10:45 – 12:15</b>	Discussione Modulo M3 (Formazione e Impatto su H.L.E. – Francesco Profumo/Giancarlo Ghislanzoni)
<b>Ore 12:15 – 13:30</b>	Presentazione del Centro IIT (Prof. Lanzani, Responsabile Centro IIT Poli Mi/Prof. Roberto Cingolani, Direttore Scientifico)
<b>Ore 13:30 – 14:15</b>	Pausa pranzo
<b>Ore 14:15 – 15:30</b>	Rapporto tra il Centro IIT e la Fondazione IIT (Attività di ricerca, Technology Transfer, Attività di High Level Education)
<b>Ore 15:30 – 17:15</b>	Visita al Centro IIT e interviste con le “figure chiave”
<b>Ore 17:15 – 18:15</b>	Rapporto tra il Centro IIT e il Politecnico di Milano
<b>Ore 20:30</b>	Cena



<b>Ore 08:30 – 10:15</b>	Discussione Modulo M4 (TT e Impatto su Economia – Andrea Montanino/Vittorio Terzi)
<b>Ore 10:30 – 12:00</b>	Discussione Modulo M5 (Gestione del Capitale Umano – Davide Bassi/Giancarlo Ghislanzoni)
<b>Ore 12:00 – 13:00</b>	Avvio discussione Modulo M1 (Mission dell'Istituto – tutti)
<b>Ore 13:00 – 14:00</b>	Pausa pranzo (presso Centro IIT)
<b>Ore 14:00 – 15:50</b>	Riunione del Comitato di Valutazione per wrap up e prossimi passi (tutti)
<b>Ore 16:00</b>	Fine dei lavori e rientro alle rispettive destinazioni

## Rome, October 15-16, 2015



<b>09:00 – 09:30</b>	Apertura dei lavori (Vittorio Terzi)
<b>Ore 09:30 – 11:00</b>	Discussione Modulo M2 (Ricerca e Produzione Scientifica – Paolo Lugli) e condivisione prima bozza report
<b>Ore 11:00 – 11:30</b>	<b>Break</b>
<b>Ore 11:30 – 13:00</b>	Discussione Modulo M3 (Formazione e Impatto su H.L.E. – Francesco Profumo/Giancarlo Ghislanzoni) e condivisione prima bozza report
<b>Ore 13:00 – 13:45</b>	Presentazione del Centro IIT (Prof. Ruocco, Responsabile Centro IIT @La Sapienza/Prof. Roberto Cingolani, Direttore Scientifico)
<b>Ore 13:45 – 14:30</b>	<b>Pausa pranzo</b>
<b>Ore 14:30 – 15:30</b>	Rapporto tra il Centro IIT e La Sapienza (Prof. Alberto Boffi)
<b>Ore 15:30 – 17:30</b>	Visita al Centro IIT e interviste con le “figure chiave”
<b>Ore 17:30 – 18:30</b>	Avvio discussione Modulo M6 (Governance)
<b>Ore 20:30</b>	<b>Cena</b>



<b>Ore 08:30 – 10:00</b>	Discussione Modulo M4 (TT e Impatto su Economia – Andrea Montanino/Vittorio Terzi) e condivisione prima bozza report
<b>Ore 10:00 – 10:30</b>	<b>Break</b>
<b>Ore 10:30 – 12:00</b>	Discussione Modulo M5 (Gestione del Capitale Umano – Davide Bassi/Giancarlo Ghislanzoni) e condivisione prima bozza report
<b>Ore 12:00 – 13:00</b>	Riunione del Comitato di Valutazione per wrap-up e prossimi passi (tutti)
<b>Ore 13:00 – 14:00</b>	<b>Pranzo</b> (presso il Centro IIT)
<b>Ore 14:00</b>	Fine dei lavori e rientro alle rispettive destinazioni

## Lecce, January 21-22, 2016



<b>08:30 – 09:00</b>	Apertura dei lavori (Vittorio Terzi)
<b>Ore 09:00 – 10:30</b>	Condivisione prima bozza report e discussione collettiva sul capitolo Ricerca e Produzione Scientifica (Lugli, Grifoni, Zuccato)
<b>Ore 10:30 – 10:45</b>	<b>Break</b>
<b>Ore 10:45 – 12:15</b>	Condivisione prima bozza report e discussione collettiva sul capitolo Formazione e Impatto su H.L.E. (Profumo, Ghislanzoni, Bassi, Lugli)
<b>Ore 12:15 – 13:45</b>	Condivisione prima bozza report e discussione collettiva sul capitolo TT e Impatto su Economia (Montanino, Terzi, De Poli)
<b>Ore 13:45 – 15:00</b>	<b>Pausa pranzo</b>
<b>Ore 15:00 – 16:00</b>	Presentazione del Centro IIT a cura del responsabile del Centro, Prof. Massimo De Vittorio
<b>Ore 16:00 – 17:00</b>	Visita del Centro IIT
<b>Ore 17:00 – 18:00</b>	Intervista con le figure “chiave”
<b>Ore 18:00 – 18:30</b>	Prime conclusioni su lavoro di valutazione
<b>Ore 20:30</b>	<b>Cena</b>



<b>Ore 08:30 – 10:00</b>	Condivisione prima bozza report e discussione collettiva sul capitolo Gestione del Capitale Umano (Bassi, Ghislanzoni, Grifoni, Zuccato)
<b>Ore 10:00 – 10:30</b>	<b>Break</b>
<b>Ore 10:30 – 12:00</b>	Discussione collettiva sul capitolo Governance
<b>Ore 12:00 – 13:00</b>	Conclusioni e condivisione piano di lavoro a chiusura della valutazione
<b>Ore 13:00 – 14:00</b>	<b>Pranzo</b>
<b>Ore 14:00</b>	Fine dei lavori e rientro alle rispettive destinazioni

## APPENDIX E: COOPERATION AGREEMENTS WITH UNIVERSITIES

University	Academic year	Signed agreements	Assigned agreements		Scholarship (average value)	IIT staff interaction in the selection	Prsence of IIT members among faculty members	Educational definition	Educational supply by IIT
Università degli Studi di Genova	21 (2005/2006)	10	10	10	11.177,35	Yes, students apply themes proposed by IIT staff in the notice; IIT takes part in the definition of shortlist	Yes	Yes	Yes
	22 (2006/2007)	25	22	22	11.147,44				
	23 (2007/2008)	50	26	23	12.500,00				
	24 (2008/2009)	50	27	26	16.500,00				
	25 (2009/2010)	63	53	50	16.500,00				
	26 (2010/2011)	80	60	59	16.500,00				
	27 (2011/2012)	90	62	51	16.500,00				
	28 (2012/2013)	87	63	57	16.500,00				
	29 (2006/2007)	70	59	55	16.500,00				
	30 (2014/2015)	67	53	51	16.500,00				
	31 (2015/2016)	67	0	65	16.500,00				
Politecnico di Milano (Dept. of Physics, Chemistry, Mathematics, Engineering Electronics, Energy)	20 (2004/2005)	4	4	4	1.561,55	Mainly in the hands of Politecnico. In practice the CNST organizes internships to bring potential candidates to the activities of the center	The coordinator of the center thanks to his part time role at Politecnico	Mainly in the hands of Politecnico.	A course by the coordinator of the center as professor of Politecnico
	21 (2005/2006)	4	4	4	10.561,55				
	25 (2009/2010)	1	1	1	13.638,47				
	26 (2010/2011)	6	6	6	16.724,00				
	27 (2011/2012)	19	17	16	16.898,08				
	28 (2012/2013)	4	4	4	16.598,31				
	29 (2006/2007)	10	8	7	16.661,27				
	30 (2014/2015)	14	10	10	16.326,31				
Università del Salento	31 (2015/2016)	10	0	8	16.718,61				
	25 (2009/2010)	15	17	15	13.638,47	Low presence of IIT; under improvement following the change of the coordinator of the center tin his part-time role in UniSalento	The coordinator of the center thanks to his part time role at UniSalento	Mainly in the hands of Unisalento.	A course by the coordinator of the center as professor of UniSalento
	26 (2010/2011)	8	5	3	13.638,47				
	27 (2011/2012)	8	5	5	13.638,47				
	28 (2012/2013)	5	5	5	13.638,47				
	29 (2006/2007)	9	9	9	13.638,47				
	30 (2014/2015)	8	8	8	13.638,47				
	31 (2015/2016)	8	0	8	13.638,47				
Scuola Superiore Sant'Anna (Robotics & Drug Research)	20 (2004/2005)	5	5	4	10.742,00	Yes, one permanent IIT member	The coordinator of the center	The coordinator of the center is approached as professor of the School to fix the framework of the courses	A course by the coordinator of the center as professor of the School
	25 (2009/2010)	10	10	10	22.000,00				
	26 (2010/2011)	6	6	6	22.000,00				
	27 (2011/2012)	6	5	4	22.000,00				
	28 (2012/2013)	8	7	7	22.000,00				
	29 (2006/2007)	8	6	6	22.000,00				
	30 (2014/2015)	8	7	4	22.000,00				
	31 (2015/2016)	4	0	4	25.000,00				

University	Academic year	Signed agreements	Assigned agreements		Scholarship (average value)	IIT staff interaction in the selection	Prsence of IIT members among faculty members	Educational definition	Educational supply by IIT
Politecnico di Torino	25 (2009/2010)	11	10	8	13.638,47	Yes, several members	The coordinator of the center thanks to his part time role at Politecnico	IIT tutor can direct the doctoral student choices among the different courses	/
	26 (2010/2011)	5	5	5	13.638,47				
	27 (2011/2012)	8	8	8	13.638,47				
	28 (2012/2013)	8	6	5	13.638,47				
	29 (2006/2007)	6	5	5	13.638,47				
	30 (2014/2015)	6	6	6	13.638,47				
	31 (2015/2016)	6	0	4	13.638,47				
Scuola Normale Superiore	20 (2004/2005)	8	7	4	12.500,00	/	/	/	/
	23 (2007/2008)	5	5	4	12.500,00				
	25 (2009/2010)	4	4	3	12.500,00				
	26 (2010/2011)	4	4	3	12.500,00				
	27 (2011/2012)	2	2	2	14.347,00				
	29 (2006/2007)	3	3	3	15.800,00				
	30 (2014/2015)	7	7	7	16.000,00				
Università di Roma 1	31 (2015/2016)	5	0		16.000,00				
	27 (2011/2012)	2	2	2	13.638,47	Mainly in the hands of UniSapienza	The coordinator of the center thanks to his part time role at UniSapienza	The coordinator of the center is approached as teacher of the school to fix the framework of the courses	A course by the coordinator of the center as a professor of UniSapienza
	28 (2012/2013)	15	15	15	13.638,47				
	29 (2006/2007)	7	7	7	13.638,47				
	30 (2014/2015)	8	8	8	13.638,47				
	31 (2015/2016)	10	10	10	13.638,47				
Università degli Studi di Napoli	25 (2009/2010)	2	2	2	13.638,47	Yes, one permanent IIT member	The coordinator of the center thanks to his part time role at UniNa	To obtain his doctorate, the student must collect 180 credits; 120 from the thesis, 24 from lectures agreed with IIT tutor, all the rest from laboratory activities, conferences attendance and summerschool. There is a conversion table from hours to credits fixed by the faculty board	Laboratory activities
	26 (2010/2011)	5	5	5	13.638,47				
	27 (2011/2012)	4	4	3	13.638,47				
	28 (2012/2013)	5	5	5	13.638,47				
	29 (2006/2007)	6	6	5	13.638,47				
	30 (2014/2015)	5	5	5	13.638,47				
	31 (2015/2016)	5	0	5	13.638,47				
Università degli Studi di Milano	28 (2012/2013)	13	10	7	15.702,81	/	/	/	/
	29 (2006/2007)	6	7	5	15.702,81				
	30 (2014/2015)	2	2	2	15.702,81				
	31 (2015/2016)	1	0	1	15.702,81				

University	Academic year	Signed agreements	Assigned agreements		Scholarship (average value)	IIT staff interaction in the selection	Prsence of IIT members among faculty members	Educational definition	Educational supply by IIT
Università degli Studi di Pisa	25 (2009/2010)	2	2	2	13.638,47	/	/	/	/
	26 (2010/2011)	2	2	1	13.638,47				
	27 (2011/2012)	2	2	2	13.638,47				
	28 (2012/2013)	4	4	4	13.638,47				
	29 (2006/2007)	2	2	1	13.638,47				
	30 (2014/2015)	2	2	2	13.638,47				
	31 (2015/2016)	3	0	3	13.638,47				
Università degli Studi di Trento	26 (2010/2011)	3	2	2	13.638,47	Yes, one IIT member	Not at the moment; a cooperation agreement with UniTn is under definition for an increased participation of IIT in the faculty board and teaching	Not at the moment; a cooperation agreement with UniTn is under definition for an increased participation of IIT in the faculty board and teaching	as before
	27 (2011/2012)	3	1	1	13.638,47				
	28 (2012/2013)	5	1	1	13.638,47				
	29 (2006/2007)	3	3	3	13.638,47				
	30 (2014/2015)	3	3	3	13.638,47				
	31 (2015/2016)	4	0	0	13.638,47				
Alma Mater - Università di Bologna	29 (2013/2014)	3	3	3	13.638,47	Yes, one IIT member	Yes, one IIT member	Yes, one IIT member	Yes, one IIT member
	30 (2014/2015)	3	3	3	13.638,47				
	31 (2015/2016)	3	0	3	13.638,47				
Università degli Studi di Siena	27 (2011/2012)	2	2	2	13.638,47				
	28 (2012/2013)	1	1	1	13.638,47				
	29 (2006/2007)	1	1	1	13.638,47				
	30 (2014/2015)	1	1	1	13.638,47				
	31 (2015/2016)	1	0	1	13.638,47				
Università degli Studi di Padova	27 (2011/2012)	1	1	1	13.638,47	/	/	/	/
Università degli Studi di Parma	29 (2013/2014)	1	0	0	13.638,47	/	/	/	/

Source: IIT



## APPENDIX F: INTERVIEWS TO CORPORATIONS ON TECH TRANSFER

### Angelini Pharma - IIT Collaboration

**Collaboration starting date:** IIT researchers and R&D Angelini started meeting more than five years ago. The most significant collaboration dates back to the signing of the research agreement on July 1, 2013.

**Description of industrial topics of cooperation:** Angelini and Italian Institute of Technology (IIT) have signed 18 months research contract which have created a Joint Lab for the development of new drugs for the central nervous system. The objective was to validate and characterize NCE as potential drugs that can radically change the course of serious diseases such as bipolar disorder and neurodegenerative diseases on inflammatory basis such as multiple sclerosis. The prospective horizon of this collaboration is aimed at developing an integrated package of preclinical studies adequate to support the initiation of studies necessary to complete a registration dossier. The project started from the design and synthesis of original molecules from internal research programs of R&D Angelini group directed by Dr. Serena Tongiani, for which the company has maintained the intellectual property. It was developed with the support of skills and drugs' validation technologies of IIT group directed by Professor Daniele Piomelli. At the end of the articulated research program, IIT's involvement and contribution to the Joint Lab allowed it to exercise the license option, with the right to sub-license, with regard to the molecules selected and to the indications present in the field. With this goal, IIT and Angelini agreed to sign a single contract in December 2015, which governs the granting of the Licence and the implementation of further research program, currently underway.

**IIT strengths** emerging from its activities: expertise and availability of its own technologies and experimental models for the research program execution. Experience and knowledge for the identification and validation of innovative mechanisms in therapeutic areas of great need such as chronic pain, inflammation, and neurodegenerative diseases.

Skills and technologies required to advance a project from initial identification and validation of molecular target until the selection of the potential candidate for development.

Openness to dialogue and coherent exchange of scientific and technical information.

**Points of IIT's potential development:** handling and researching for any initiatives to encourage and help people to understand the specific role of IIT as a research and development partner in the multi-annual programs.

**Any plans to continue/renew collaboration:** the currently ongoing contract governs the granting of the license to selected molecules as GSK3beta inhibitors and of the execution of a further research program. Over the past two years Angelini and IIT also signed contracts for the performance of activities aimed at the characterization of molecules or experimental models.

The experiences of recent years foster the interest to consider and extend possible interactions and synergies between Angelini and IIT also on other specialized fields.

Recently there was a meeting for the presentation of innovative technologies and description of skills and competences for the identification and validation of new materials for the production of pharmaceutical formulations and medical devices.

## **Edison – IIT collaboration**

**Collaboration period dates:** 15 April 2014 -31 August 2015

**Description of industrial topics of cooperation:** Development of innovative materials for the removal of hydrocarbons at sea.

**IIT strengths emerging from activities:** Expertise in the field of smart and nano materials and availability of advanced techniques for their preparation and characterization.

**Points of IIT's potential development:** As part of the collaboration with IIT, Edison offered its expertise regarding the application of the material to be developed.

On the other hand the collaboration has suffered from the lack of a manufacturing partner, complementary to Edison, with specific skills for the development of a solution.

In these cases, it would be desirable IIT put to good use his network of partnerships to establish a relationship with a manufacturing partner that can help them address the research and develop new materials for the intended application, taking into account not only the expected performance but also of their industrial applicability and economic viability.

**Any plans to continue / renew collaboration:** The activity was completed but its continuation has not been provided since the identified innovative materials, while exhibiting interesting performances, resulted too 'sophisticated' for the intended application. Edison continues to maintain relations with IIT to evaluate new initiatives in the energy sector.

## **Technoprobe – IIT collaboration**

**Collaboration period dates:** Collaboration with IIT began in March 2015 with a total contract value of about €370,000. In January 2016 the contract got an economic integration of €70,000 as IIT has represented that the requirements were more challenging than expected. The current contract ends in March 2016. Technoprobe provided IIT with some free-loan equipment to carry out the project. (Note: IIT is quite expensive, more than German and American technology institutes – please keep it in mind).

### **Description of industrial topics of cooperation:**

Development of technology to make miniaturized electronic circuits with very high complexity. The approach is completely new as it uses lasers for writing the various layers alternating them with the deposition of metal and dielectric materials with PLD and sputtering techniques.

**IIT strengths emerging from activities** we found very competent staff both on the part of the laser micromachining and on the materials deposition. We also found the laboratories adequately equipped (big and pleasant surprise being in Italy) although in spaces too small and cramped. IIT has also shown the ability to offer an innovative problem solving approach in considering technological challenges from several points of view.

**Points of IIT's potential development:** Culture on the Pre-industrialization have to move ahead to technology transfer. It would be very important to go beyond the pure feasibility study. Getting a good sample is not enough...industry needs to go further. In order to demonstrate that the developed process is feasible to go to real industry and to move to a true technological transfer, it is necessary to have a significant number of samples through a process equipped with specifications.

Reporting has to be more precise about the work done for the company (man/hours and machine/hour monthly mislead what agreed by contract)

A little more flexibility would be appreciated in accommodating on-going requests of changes. At the moment of contract signing, it can happen that there is not a clear view of all aspects of the project and it might change upon step by step results.

Together with super qualified technicians, IIT should introduce some commercial profiles for customer management and to increase its business.

### **Any plans to continue/renew collaboration:**

Technoprobe is willing to continue the collaboration, not only because both parts are Italian but also because they are happy with results of last year.

There are further development activities in progress that Technoprobe would like to illustrate to IIT in order to investigate if there is any opportunities to broaden their cooperation. They could also think to have a dedicated line of researchers to their projects, once they get new spaces.

However, Technoprobe didn't understand if IIT is interested in continue the collaboration, as it seems that Technoprobe's operational field is out of IIT strategic sectors. Technoprobe would like to get a feedback on this to better understand next steps.

## **Luxottica – IIT collaboration**

**Collaboration starting date:** May 2015

### **Description of industrial topics of cooperation:**

Study of graphene based compounds to increase characteristics of polymers used in eyewear.

Development of production processes for the production of graphene based coatings to increase the mechanical characteristics in compliance of the optical properties.

### **IIT strengths emerging from activities**

Proactivity in the description and solution of industrial problems.

Technical and scientific expertise on the specific matter.

Scalability of the results obtained in the laboratory

### **Points of IIT's potential development:**

Extension of services offered, realizing graphene-based composites.

### **Any plans to continue / renew collaboration**

In light of the results of this collaboration, Luxottica is absolutely willing to continue the cooperation,

## **GE Avio Aero – IIT collaboration**

**Collaboration starting date:** The collaboration with IIT was initiated in 2013 and engages AvioAero for about €770,000.

### **Description of industrial topics of cooperation**

The definition of an automated visual inspection system of mechanical transmissions assembled (mature technology stage: MRL 5, the project is expected to end Q1 2017);  
The definition of a robotic system for the identification and removal of chips from ducts integrated into the housings of the mechanical transmissions (mature technology stage: MRL 2 project expected to end Q1 2018);  
The definition of a robot system for assembling mechanical transmissions (mature technology stage: MRL 3, project expected to end Q2 2017).

### **IIT strengths emerging from activities**

The IIT is for Manufacturing Product Strategy Team and P & E AvioAero a great potential partner to develop technologies with low current level of manufacturing readiness. Periodic development audits confirmed that IIT team is able to develop interdisciplinary industrial solutions. The most obvious strengths are as follows:

Ability to think of solutions that require the combination of a more technological disciplines (especially robotics), relying on the important basin of researchers who operate

Strong project management skills.

Ability to understand the customer's needs and attitude to seek industrial applicability (in this regard a meeting of "brainstorming" on further areas of collaboration was also organized and saw involving both Avio's manufacturing product strategy team and Avio's engineering team.

### **Points of IIT's potential development**

The potential development areas are related to the ability to engage other industries in the development. In fact IIT does not industrialize the solution, but develops the concept and manufactures a sample, leaving industrial plant construction to other subjects. It would be interesting a joint effort supported by heavy industry to create a network for the industrialization of small / medium-sized firms. From this perspective, this could go together with the other already ongoing initiative, that creates industrial clusters for the production of components no longer considered as core to AvioAero

### **Any plans to continue / renew collaboration:**

AvioAero is willing to continue.

## APPENDIX G: INTERNATIONAL EXAMPLES OF RESEARCH VC FUNDING

Di seguito sono illustrati alcuni esempi di strutture finanziarie avviate e/o partecipate da centri di ricerca/università e dedicati a supportare il lancio di start-up innovative derivanti dalla ricerca di questi centri/università.

### University of Manchester – UIMP Premier Fund (UK)

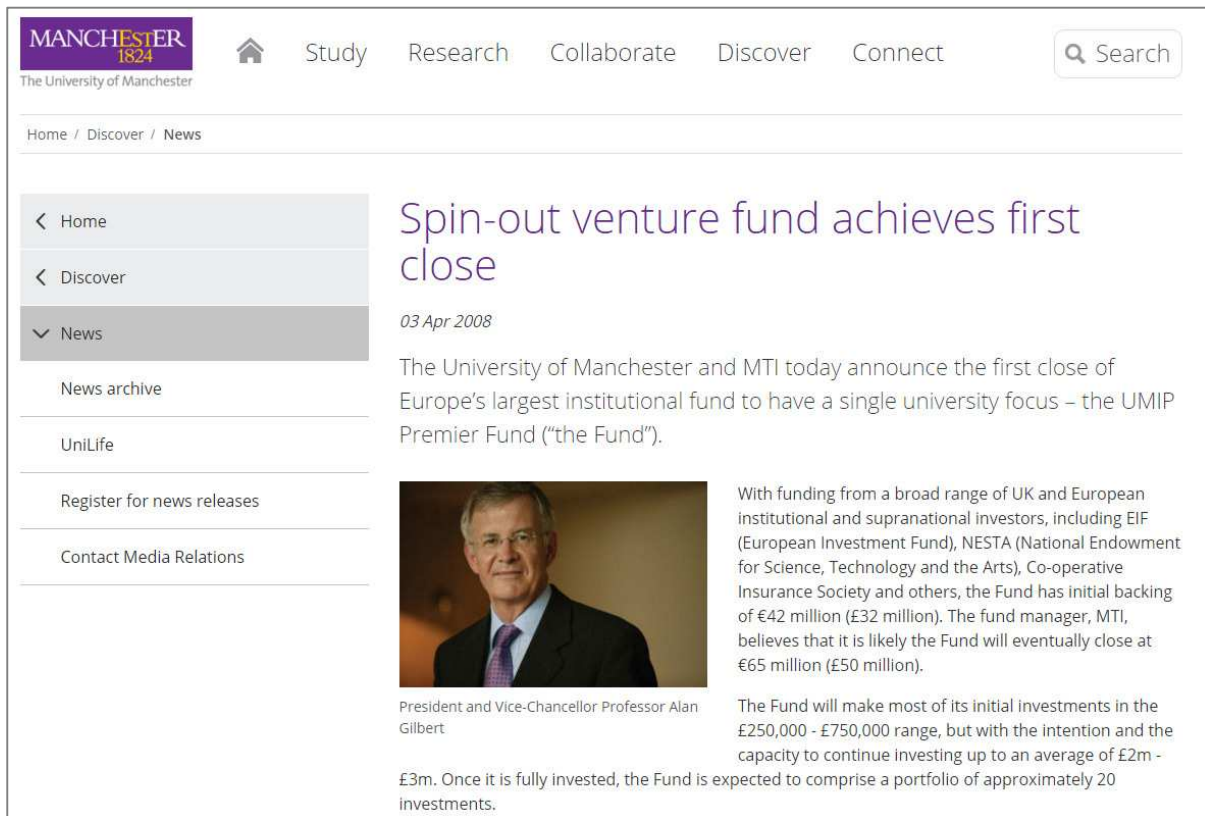


Fig. 5

L'Università di Manchester ha avviato sin dal 2008 la raccolta di un fondo d'investimento dedicato ad investire in iniziative derivanti dalla ricerca sviluppata presso la stessa Università (University Focus). Il Fondo, denominato UIMP Premier Fund, è stato creato in partnership con un affermato operatore finanziario, MTI Ventures (<http://www.theupf.com/>) ed ha un focus su early stage e growth, con l'obiettivo di traghettare idee di impresa sin dalla fase di *proof of concept* (a cui è allocato il 10% delle risorse), supportandole con finanziamenti che possono arrivare a £3,0M (€4,1M).

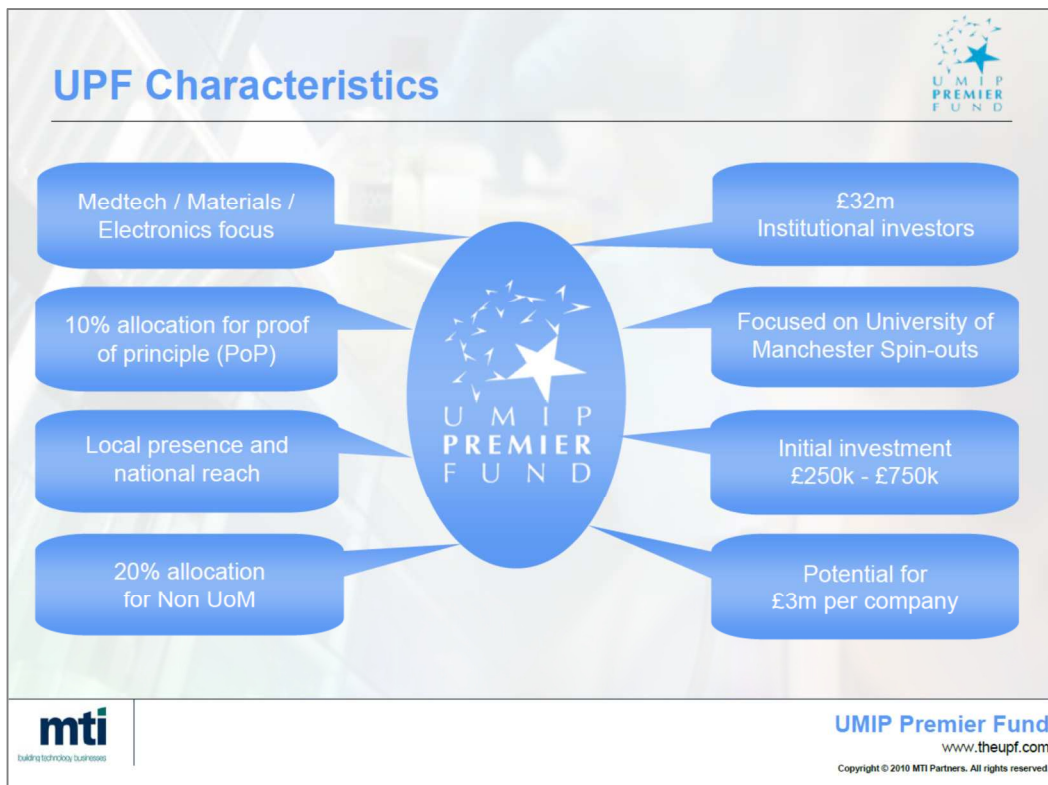


Fig. 6

L'istituzione si è dunque trovata ad agire sia come aggregatore di capitale che come principale attore che alimenta la pipeline degli investimenti.

Il modello prevede che l'università conceda al fondo un accesso prioritario alle tecnologie sviluppate, garantendo per contro ai propri ricercatori un immediato confronto con investitori ed esperti del settore, oltreché una fonte di finanziamento sin dalle fasi iniziali (Proof of Principle), capace di supportare finanziariamente il progetto nelle fasi di crescita.

Sull'esperienza del fondo raccolto per iniziativa dell'Università di Manchester, il partner finanziario ha avviato una seconda raccolta di capitali nel 2012, costituendo un nuovo fondo con un partnership allargata a tre università: University of Manchester, University of Edinburgh e University College London.

Il fondo ha inoltre investito in spin-off della ricerca universitaria proveniente anche da Oxford, Manchester e Southampton, generando pertanto un effetto volano sul trasferimento tecnologico del comparto della ricerca.

Elementi chiave per il successo dell'iniziativa sono

- il posizionamento di eccellenza scientifica e tecnologica dell'università di Manchester nel settore della ricerca (*The University of Manchester is the UK's largest university, with more than 34,000 students, 5700 academic and research staff and the alma mater of 23 Nobel Prize winners*);
- la presenza di staff dedicato al trasferimento tecnologico. L'università di Manchester ha infatti costituito una società, posseduta al 100%, dedicata alla



valorizzazione della Proprietà Intellettuale prodotta dalla ricerca scientifica, che si configura come interlocutore del fondo nella proposta di iniziative d'investimento;

- la partecipazione di un soggetto professionale e indipendente al processo di raccolta e gestione degli investimenti.

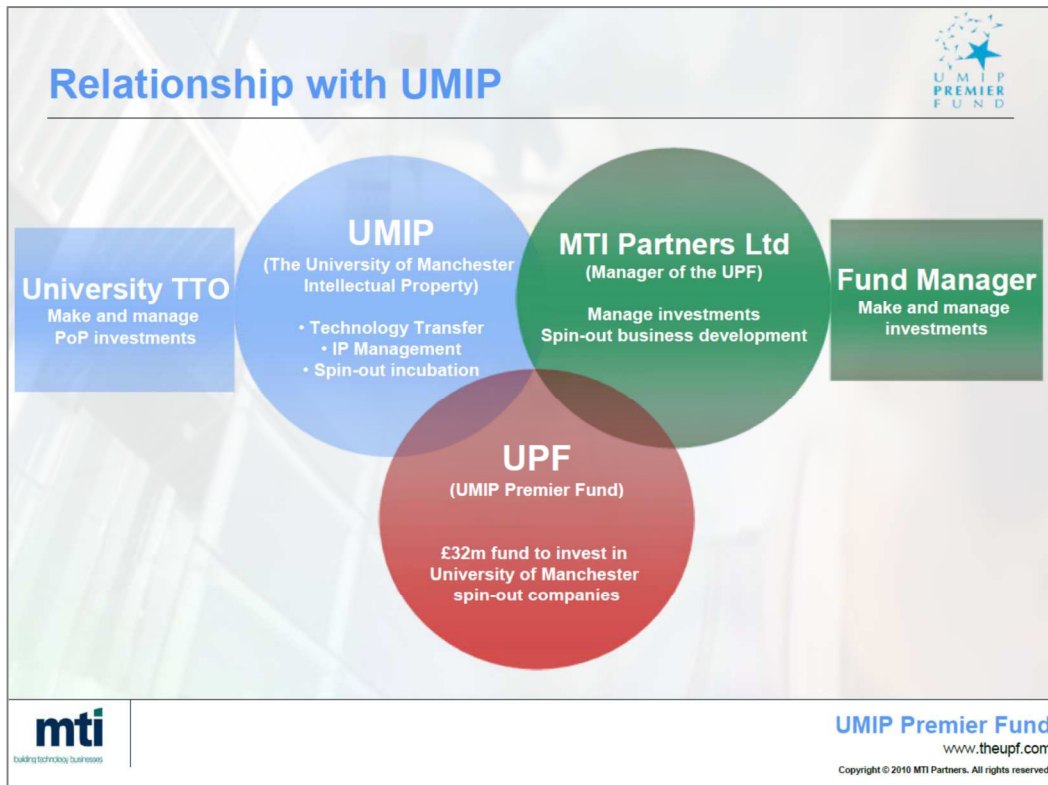


Fig. 7

Gli investimenti sono selezionati e decisi da un team di professionisti indipendenti, assicurando così il massimo rendimento per l'intero sistema. La strategia d'investimento è sintetizzata in fig. 8, e fa riferimento ad un mercato dei capitali a grande mobilità, che include anche tra le possibilità per l'uscita del fondo dal capitale delle spin-off anche l'offerta pubblica.

## Max-Planck Innovation – DDC Ventures (Germany)

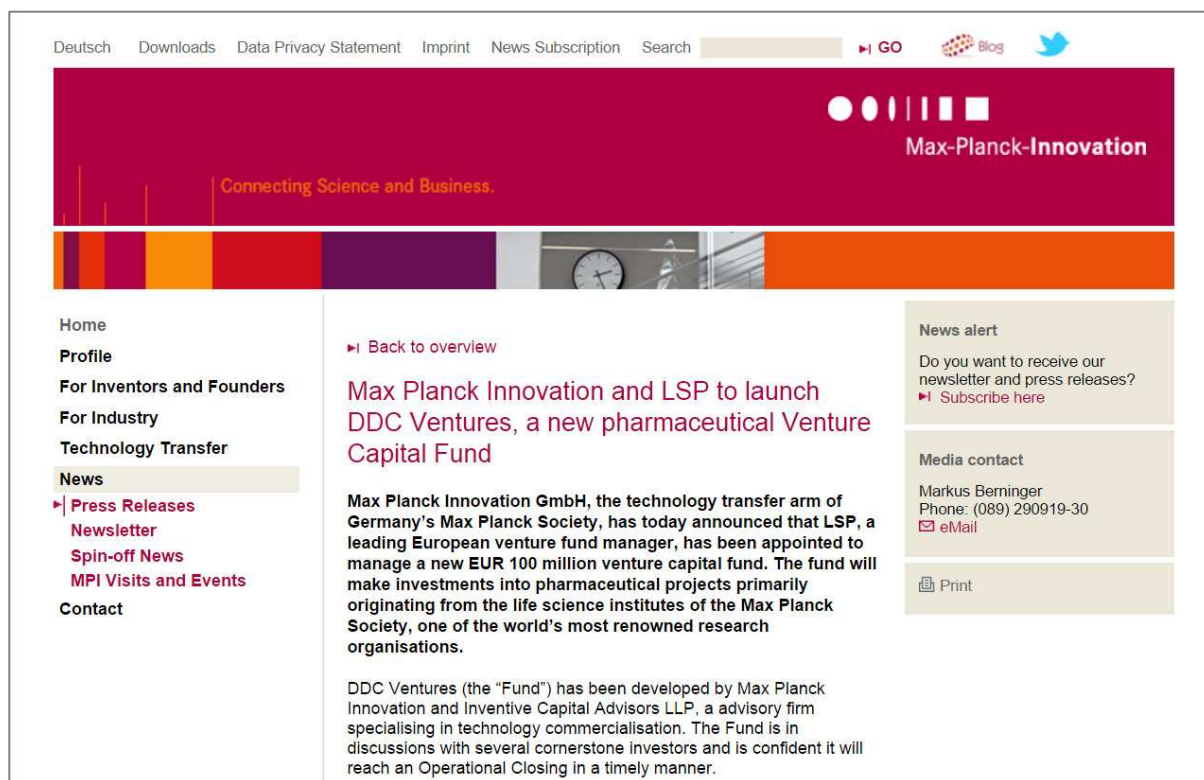


Fig. 8

Nel 2008, il Max-Planck Innovation, la divisione dedicata al trasferimento tecnologico del noto istituto tedesco Max-Planck Society, ha adottato una politica di investimento diretto in tecnologie delle scienze della vita sviluppate al Max-Planck.

In particolare è stato creato il Lead Discovery Center, una società finanziata dal Ministero della Ricerca tedesco per €20,0 milioni, e destinata a sviluppare la fase preclinica del farmaco fino alla *lead discovery*.

La disponibilità di tecnologie promettenti, e parzialmente sviluppate, ha quindi dato lo spunto per il lancio di un nuovo fondo d'investimento in capitale di rischio, denominato DDC Ventures – Drug Development Center Ventures, che è stato affidato alla gestione professionale di affermati operatori del settore del venture capital, ossia Inventive Capital Advisors LLP e Life Science Partners. Il fondo è stato lanciato nel 2009 con l'obiettivo di raccogliere €100 milioni per investire in iniziative originate dalla ricerca del Max-Planck.

Anche in questo caso quindi gli elementi abilitanti sono

- Eccellenza scientifica e tecnologica dell'istituzione di ricerca;
- Presenza di una divisione dedicata al trasferimento tecnologico;
- Partecipazione di un operatore qualificato del settore nella raccolta e gestione dei fondi.

Esistono altre forme di associazione/partnership tra Max-Planck e il sistema finanziario, come ad esempio:

- il fondo High-Tech Gründerfonds ([www.htgf.de](http://www.htgf.de)), costituito nel 2005 con una raccolta di €272,0 milioni per superare la crisi del sistema di finanziamento alle iniziative high-tech early-stage. Il fondo ha l'obiettivo di fornire finanziamenti di tipo *seed* per importi fino ad €500.000. Le richieste di finanziamento sono prese in esame solo se accompagnate da un "coach accreditato", come il Max-Planck Innovation. HTGF ha pertanto l'obiettivo di accompagnare i progetti ad una crescita tecnologica e manageriale, preparando l'azienda alla fase di crescita
- il fondo EXIST Forschungstransfer ([www.exist.de/exist-forschungstransfer/](http://www.exist.de/exist-forschungstransfer/)), soggetto terzo che finanzia attività pre-seed da validare presso il Max-Planck Institute. In particolare, il fondo è attivato dal Ministero Federale dell'Economia e della Tecnologia, e ha l'obiettivo di investire in start-up high-tech nella fase di early-stage. Il meccanismo prevede una fase di pre-seed, che copre costi di sviluppo fino a 18 mesi presso il Max-Planck Institute. In aggiunta, è prevista la possibilità di un finanziamento ulteriore alla costituzione della società per i test di mercato e l'avvio della fase operativa.

## Isis Innovation – University of Oxford (UK)

L'università di Oxford ha costituito la società di scopo Isis Innovation, interamente controllata, con lo scopo di accelerare il trasferimento delle tecnologie al mercato. Tra gli strumenti di Isis Innovation, che comprendono, tra gli altri, programmi di formazione e incubazione d'impresa, vi sono una serie di fondi dedicati al trasferimento tecnologico:

FUNDS MANAGED BY ISIS	FUNDS MANAGED BY THE UNIVERSITY	OTHER SOURCES OF TRANSLATIONAL FUNDING – AWARDING BODIES
<ul style="list-style-type: none"> <li>• OIF +</li> <li>• UCSF +</li> <li>• UOIF +</li> </ul>	<ul style="list-style-type: none"> <li>• EPSRC Impact Acceleration Account (IAA) +</li> <li>• John Fell +</li> <li>• NERC Impact Acceleration Account +</li> </ul>	<ul style="list-style-type: none"> <li>• BBSRC +</li> <li>• EPSRC +</li> <li>• NERC +</li> <li>• STFC +</li> <li>• Medical Research Council +</li> <li>• Wellcome Trust +</li> <li>• Cancer Research Technology/Cancer Research UK +</li> <li>• Innovate UK (formerly Technology Strategy Board) +</li> <li>• Royal Society +</li> <li>• The Sir Jules Thorn Charitable Trust +</li> <li>• Arthritis Research UK +</li> <li>• National Science Foundation +</li> <li>• National Institutes of Health +</li> <li>• Horizon 2020 +</li> <li>• GSK +</li> <li>• Holmes Hines Memorial Fund +</li> <li>• NHS England +</li> </ul>

Fig. 9

Questi fondi prevedono anche il contributo diretto dell'università in termini finanziari, e un sistema di gestione composto da membri dell'Isis Innovation e membri esterni. Ognuno di essi ha regole e meccanismi specifici, che nel loro insieme supportano iniziative scientifiche ad affrontare il percorso che le porta dal laboratorio al sistema produttivo.

Ad esempio, il fondo University Challenge Seed Fund (UCSF - <http://isis-innovation.com/award-details/university-challenge-seed-fund-ucsf/>). Si tratta di un fondo universitario, dedicato alle iniziative scientifiche originate da Oxford che necessitano di un periodo di accelerazione tramite capitale di rischio.

Istituito nel 1999 con una dotazione iniziale di £4,0 milioni, il fondo è stato lanciato con il contributo del Governo (£1,4m), delle fondazioni benefiche Wellcome Trust e Gatsby Charitable Foundation (£1,6m), e dell'università di Oxford (£1,0m).

Ogni iniziativa può attingere a finanziamenti compresi tra £2.500 e £250.000, per accedere ai quali deve mostrare reali potenzialità di mercato e cedere una parte del

capitale al fondo, che si configura quindi come un fondo VC early stage. I proventi del fondo vengono messi a disposizione per nuovi investimenti, così da costituire una riserva che alimenta una fase critica del trasferimento tecnologico. A dieci anni dalla sua costituzione, il fondo aveva finanziato 102 progetti, generando 31 spin-off, di cui 3 quotate sul mercato AIM di Londra. Gli investimenti liquidati hanno generato £2,7 milioni e il suo valore complessivo (incluse le partecipazioni, ossia total asset value) risultava pari a £6,0 milioni, di cui £1,0 milione di cassa.

Il meccanismo pertanto ha prodotto un volano che ha reinvestito i proventi delle dismissioni per alimentare il meccanismo di trasferimento tecnologico, colmando il vuoto finanziario tipico della prima fase di vita delle tecnologie.

## Weitzmann Institute (Israele) - YEDA Research and Development Co. Ltd.

YEDA Research and Development Co. è la società dedicata alla commercializzazione della proprietà intellettuale del Weitzman Institute. Nel 1997, YEDA ha avviato una partnership con il fondo d'investimento PAMOT, focalizzato sulle fasi di early stage, concedendogli un diritto di prelazione per investire nelle spin-off del Weitzman.

Nel tempo la società ha sviluppato una serie di collegamenti con il sistema finanziario fino ad avere propri strumenti d'investimento. In particolare si distinguono

- **Yeda CEO Fund:** un contributo compreso tra €10k e €40k per progetti *pre-seed*;
- **Nofar Fund:** un contributo lo sviluppo pre-industriale di idee scientifiche ad alto potenziale, compreso tra €110k e €140k, da erogare in abbinamento al contributo di un partner industriale;
- **Kamin Fund:** un contributo per lo sviluppo pre-industriale di idee scientifiche ad alto potenziale, fino ad un massimo di €200k, da erogare in abbinamento al contributo di Yeda.

ידע חברה למחקר ופיתוח בע"מ  
מסחור טכנולוגיות של מכון ויצמן למדע  
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**Funding Your Research**

**Funding Your Research:**  
If your research has commercial potential, Yeda has several sources of funding to offer. Yeda's goal is to help you turn your initial findings and ideas into an attractive project which, when licensed to Industry, could become a successful product for the benefit of society.

The available funding sources, all offering one/two years grants of up to \$20,000 to \$100,000 (depending on the grant), are:

**Yeda CEO Fund:** An internal Yeda fund.

**Nofar Fund:** A Ministry of Industry & Trade fund, with financial support of an industry partner. Yeda can assist you in finding the required industrial partner.

**Kamin Fund:** A Ministry of Industry & Trade fund, with financial support of Yeda.

Please don't hesitate to contact us with any question or comment.

**Yeda - always at your service.**

Fig. 10



## Consiglio Nazionale delle Ricerche (Italia) – Principia Sgr (già Quantica Sgr)

Nel panorama nazionale un caso per molti aspetti simile a quello oggetto della presente relazione vede il Consiglio Nazionale delle Ricerche (CNR) partecipare al Fondo Principia.

Il progetto nasce nei primi anni 2000 su iniziativa di autorevoli esponenti del mondo scientifico, industriale e finanziario, tra cui il CNR, con l'obiettivo di investire in imprese ad alto contenuto tecnologico provenienti dal mondo della ricerca scientifica. Principia acquisisce partecipazioni sia di maggioranza che di minoranza qualificata in imprese sia in fase di start up/early stage che in aziende di piccole e medie dimensioni ("PMI"). Dei tre fondi Principia, ad oggi due risultano interamente investiti e un terzo ha una dotazione una pari a €185 milioni

**Consiglio Nazionale delle Ricerche**

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- Innovazione
  - Partecipazioni societarie
  - Elenco partecipazioni

**PRINCIPIA SGR**

- Valorizzazione della Ricerca
- Dati e Statistiche

**PRINCIPIA SOCIETA' DI GESTIONE DEL RISPARMIO S.P.A.**

**Sigla:** PRINCIPIA SGR

**Natura giuridica:** S.P.A.

**Oggetto:**

Quantica SGR è autorizzata all'esercizio del servizio di gestione collettiva del risparmio per la gestione esclusiva di fondi chiusi di investimento riservato per attività di venture capital dedicata esclusivamente alla gestione di fondi chiusi d'investimento riservati per attività di venture capital rivolto ad imprese ad alto contenuto tecnologico e gestisce i fondi "Principia I" e "Principia II"

**Dipartimento:**

**Sede legale:** Via Quintino Sella 3 - 20121 - Milano (MI)

**Fondo consortile:** € 1.000.000,00 (partecipazione CNR: 36.00 %)

**Iscriz. Registro delle Imprese di N.**

**Partita IVA:** 03629920962

**Note:**

**Note statuto:**

**Elenco Consorziati:**

- Andrea Di Camillo
- Andrea Gerosa
- CNR
- Fondazione BNC
- Michele Costabile
- Stefano Silenti

**Rappresentanti CNR negli organi Gestionale e Scientifico:**

Nominativo	Tipologia	Note
Archetti Francesco	Consiglio di Amministrazione	durata mandato: scadenza dicembre 2012
Di Porto Andrea	Consiglio di Amministrazione	
Pezzi Luciana	Consiglio di Amministrazione	

**Allegati:**

Titolo	Tipo allegato
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Fig. 11