International education as a way to survive

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1. Introduction

The world of Higher Education is facing strong changes: the growing international mobility of students; the rise of importance of Asian universities; the evolution of Massive Online Open Course and Online Distance Learning.

The new environment is creating threats to "traditional universities", especially in countries, like Italy, that are experiencing slow economic growth and are in general perceived as "declining"; however, we do believe that it is also offering European universities growing opportunities to improve the quality of education, provided that they are able to change their strategy, and to adapt to the new context.

This paper describes the strategic change that Politecnico di Milano, an Italian Technical University established in 1863, started at the end of 2011, with the aim of moving from being the place where the largest number of Italian architects and engineers graduate to being "an International University with strong roots in the Italian culture". The paper is articulated in 6 main sections, concerning:

- the starting point, i.e. the key figures of Politecnico di Milano before the strategic change (section 2);
- the main issues the university had to face due to the evolution of the environment (section 3);
- the expected impact of these issues on the university (section 4);
- the content of the strategic decision (section 5);
- the strategy process (section 6);
- the preliminary results of the strategic change (section 7).

2. The starting point

Established in 1863, Politecnico di Milano is the largest technical university in Italy. With about 40.000 students and 1350 professors, it graduates about one engineer out of six in the whole country, one architect out of five and more than 50% of Italian designers.

In table 1, you can see the key figures of the university at the end of 2010, in terms of students, staff, financials and international rankings.

The number of foreign students was limited, but high if compared to other Italian universities. As a matter of fact, Politecnico di Milano started to open to International students in 2003, when the university created the first tracks in English. In most cases we opened tracks within Master of Science already in place

and these tracks were performed in the campuses outside the city of Milan. This choice allowed to experiment "international tracks" in local and more flexible campuses, and at the same time allowed to maintain a dual channel for the same Master of Science (International Track and Italian Track), so that Italian students could choose between a National (in Milan) and an International class (outside Milan). From 2003 and 2010 the number of International tracks increased and so did the number of foreign students , mostly due to this "dual-channel-system". Only three Masters of Science (urban planning, materials engineering and product service system design) out of 34 were entirely taught in English.

Yet the dual channel system led to a peculiar situation: 88% of Italian students were enrolled in Italian classes, while International classes were mainly made up by foreign students. However, in the three Masters of Science taught only in English, we did not experience any decrease in the enrollment of Italian students and the mix of Italian and foreign students did not create any problem.

Table 1 – Key figures in 2011

Students	40375
- Of which, graduate students	12201
- Of which, international students	3475
Faculty	1386
Funding (millions €)	345
- Of which, National funds for universities	200
- Of which, third party	85
- Of which, students' fees	60
International rankings (engineering&technology)	
- QS	48
- ARWU	Not ranked
- NTU	103
- THES	Not ranked

3. The evolution of the context

In 2010, the context of Higher education was facing a few important issues, some of them leading to incremental changes, while others potentially leading to disruptive ones. Below, we will discuss such issues, analyzing their potential impact - in terms of opportunities and threats – on a university like Politecnico di Milano (table 2).

Table 2 – Potential impacts on Politecnico di Milano of main change drivers

Driver	Opportunities	Threats
Globalization	Attracting smart foreign students	Losing the "captive market" of smart Italian students R&D moving eastward
MOOCs and ODL	Complement traditional education	Losing "low income" students
Education environment	Students are more able to find information	Need of providing new skills and capabilities

3.1 Globalization

Over the last 10 years the number of students enrolled outside their country of residence doubled (figure 1). It is a global dynamics, but even more relevant in Europe. As a matter of fact, while Europe represents about 11% of World population, 23,1% among those who decide to study abroad are European (figure 2). The growing share of European students going abroad can be a threat for a university like Politecnico di Milano, considering that in the past Italian students represented a sort of "captive market" for the university. Moreover, those who decide to study abroad are usually among the best students. Hence, globalization would not only reduce the number of people enrolled in Politecnico di Milano, but also their average quality. On the other hand, students' mobility can also create the opportunity to attract bright students from abroad. In 2010 (see figure 3), OECD figures show that while Europe as a whole is an attractive destination for foreign students, Italian universities are not. They account only for 1,7% of total destinations of foreign students, a share similar to smaller countries like Austria or the Netherlands. OECD itself underlined that "this is due to the lack of higher education courses in English".

For a technical university, globalization is also connected with R&D expenses. In order to do qualified research and innovation in engineering and technology, we need large investments in laboratories, infrastructures and corporate connections. Due to globalization, R&D expenses are moving eastwards, to follow the new centers of economic activities (see table 3), while the share of European countries decreased, in 15 years, from 25% to 21,7 and in the Americas from 36,3% to 33,9%. Hence, it is not surprising that Asian universities are moving upwards in university rankings in engineering and technologies. Over the last four years in the top 50 universities in QS World Engineering and Technology ranking their presence increased from 24% to 34%.

Table 3 – Evolution of global R&D expenses (sources: NSF.gov; Battelle, R&D Magazine)

	2009	2014
Americas	36,3%	33,9%
Europe	25,0%	21,7%
Asia	34,5%	39,1%
Rest of the World	4,2%	5,3%
Total	100,0%	100,0%

Globalization of companies and students are somehow reinforcing. If a university does not have strong corporate relationships, it cannot be considered as a source of potential job opportunities and it is more difficult to attract third party funds for R&D. This is very risky for European countries that are experiencing a reduction in public support to research, like Italy or Spain; as a consequence, third party funding is compulsory for carrying out research. At the same time, global companies choose the location of their R&D activities according to different drivers, an important one being the "quality of human capital and universities"; hence, if a university is unable to attract good students, this will impact on its capacity to attract global R&D.

3.2 Massive Open Online Courses (MOOCs) and Open and Distance Learning (ODL)

A second important trend concerns the rise of MOOCs and ODL. It was once considered as "low quality education", provided often by unknown institutions and with limited quality control (UK Open University being an exception); now EDX and Coursera platforms group elite universities providing contents and media of top quality.

While globalization affects the "high income" students, that can afford to study abroad, choosing the best university, digitalization can impact on "low income students", as now they can find opportunities to learn at (almost) no cost, without moving abroad.

Producing MOOCs is expensive and the business model is at present not clear; for universities with few financial resources it is difficult to follow a proactive strategy, but, at the same time, they risk to lose market in their home country. However, again, this can be turned into an opportunity, as universities can use MOOCs produced by other universities as a "complement" to more traditional education.

3.3 Education environment

The issue of MOOCs is strictly linked to that of learning behavior. Universities were designed in a world of "limited information", where people had the opportunity to use the time they spend in universities to try to get as much information as possible. Now, digital natives are educated in a world of "excessive information". This has consequences also on higher education: if we still train them as we were trained in the last decades, we will not provide them with what they need.

More specifically, in the past people learned almost automatically how to model a problem and how to focus their attention to that problem till they would have solved it. It was natural: you were forced to take your time to understand the objective, the key issues to reach it, and where you could then find the information you needed. Today, people insert a word in Wikipedia and find a lot of information. However, they are less trained to model a problem, to compare different information in order to understand if there are trustable, to systemize information in a way that is useful to solve the problem, and even to focus on the solution and to remain concentrated for a long time.

Figure 1: Growth in the number studying abroad (Source: OECD, Education at a glance)
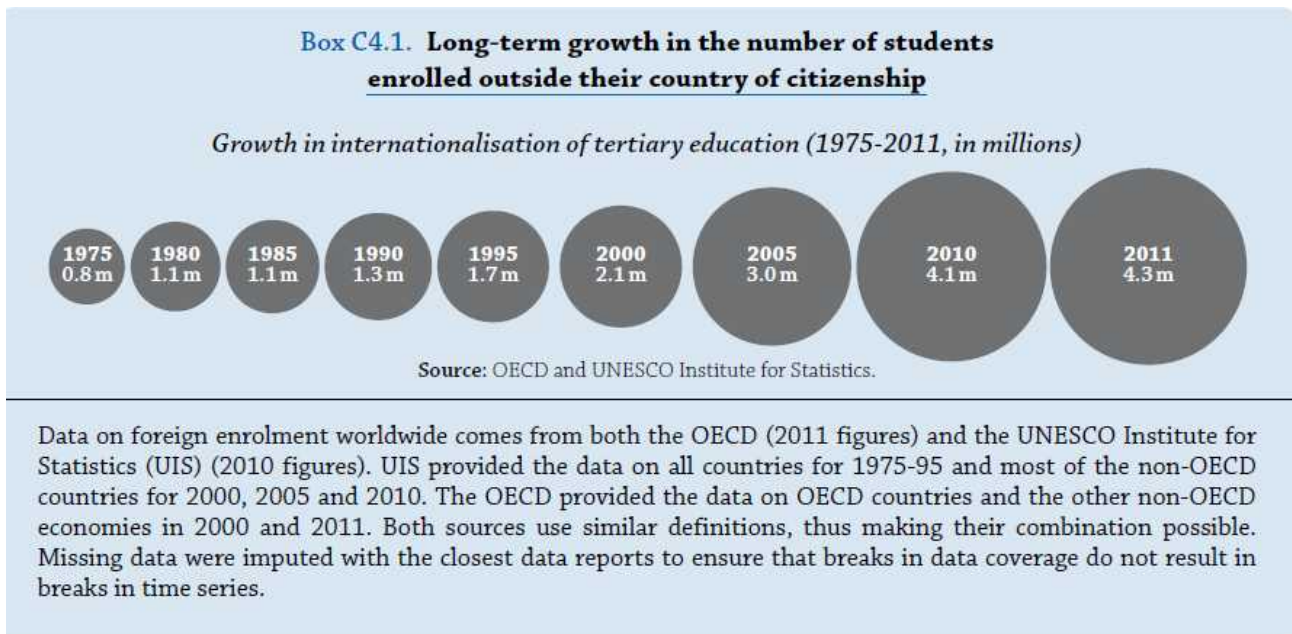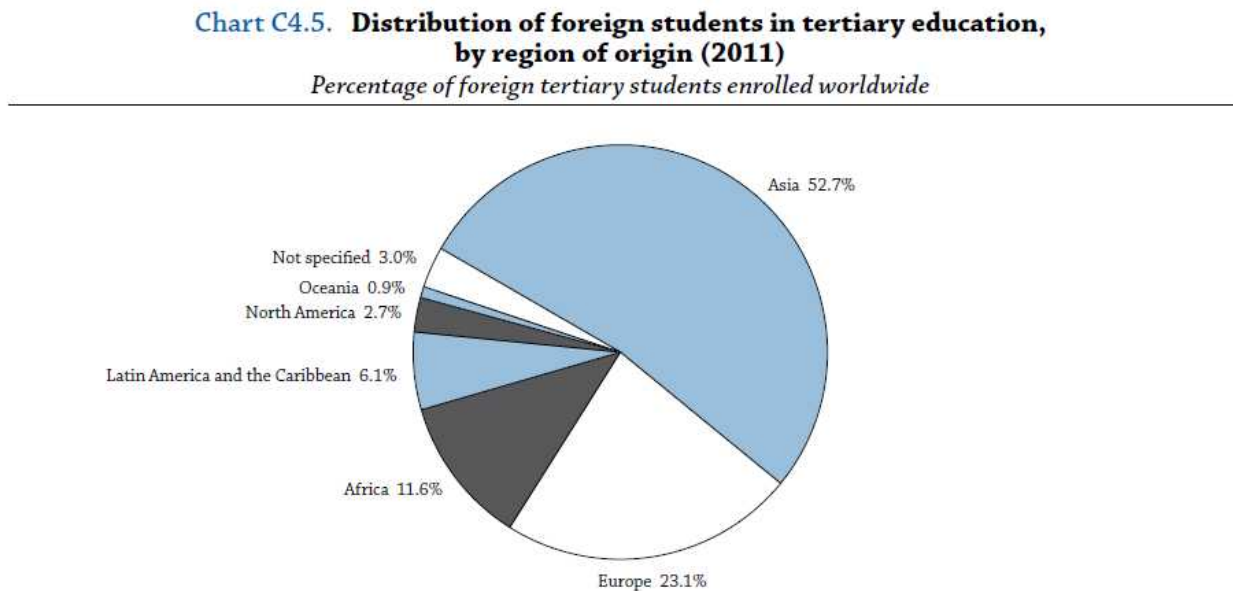

Box C4.1. Long-term growth in the number of students enrolled outside their country of citizenship

Growth in internationalisation of tertiary education (1975-2011, in millions)

| 1975 0.8 m | 1980 1.1 m | 1985 1.1 m | 1990 1.3 m | 1995 1.7 m | 2000 2.1 m | 2005 3.0 m | 2010 4.1 m | 2011 4.3 m |

Source: OECD and UNESCO Institute for Statistics.

Data on foreign enrolment worldwide comes from both the OECD (2011 figures) and the UNESCO Institute for Statistics (UIS) (2010 figures). UIS provided the data on all countries for 1975-95 and most of the non-OECD countries for 2000, 2005 and 2010. The OECD provided the data on OECD countries and the other non-OECD economies in 2000 and 2011. Both sources use similar definitions, thus making their combination possible. Missing data were imputed with the closest data reports to ensure that breaks in data coverage do not result in breaks in time series.

Figure 2 – Distribution of foreign students in tertiary education, by region of origin (Source: OECD, Education at a glance)

Chart C4.5. Distribution of foreign students in tertiary education, by region of origin (2011)

Percentage of foreign tertiary students enrolled worldwide

Asia 52.7%
Not specified 3.0%
Oceania 0.9%
North America 2.7%
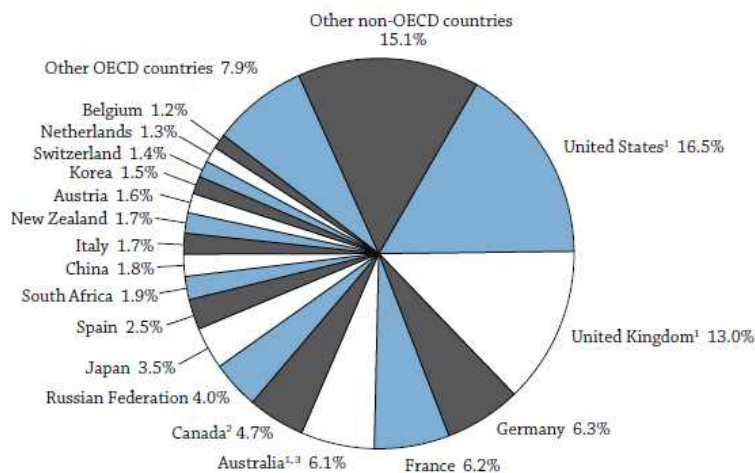Latin America and the Caribbean 6.1%
Africa 11.6%
Europe 23.1%

Note: Year of reference of data for countries other than OECD and G20 is 2010.
Source: OECD and UNESCO Institute for Statistics for most data on non-OECD destinations. Table C4.3.
See Annex 3 for notes (*www.oecd.org/edu/eag.htm*).
StatLink http://dx.doi.org/10.1787/888932847621

Figure 3: Distribution of foreign students in tertiary education, by country of destination (Source: OECD, Education at a glance)

Chart C4.2. **Distribution of foreign students in tertiary education, by country of destination (2011)**

Percentage of foreign tertiary students reported to the OECD who are enrolled in each country of destination

Note: Year of reference of data for countries other than OECD and G20 is 2010.
1. Data relate to international students defined on the basis of their country of residence.
2. Year of reference 2010.
3. Student stocks are derived from different sources and therefore results are indicative only.
Source: OECD and UNESCO Institute for Statistics for most data on non-OECD destinations. Table C4.4 and Table C4.7, available on line. See Annex 3 for notes (*www.oecd.org/edu/eag.htm*).
StatLink ᵃ⁷ᵖᵛ http://dx.doi.org/10.1787/888932847564

Again, threats and opportunities. If Universities are only concerned by the "contents" of education, they risk to be displaced either by elite universities (that can afford to recruit best known professors) or by MOOCs (that are less expensive and adopt a medium that is very natural for digital natives). However, if traditional universities change their educational process to be able to provide other skills, more consistent with the educational skills of digital natives, they can provide an interesting offer, using new technology to support more traditional forms of education.

4. The risk of a vicious circle

We understood, at the end of 2010, that the set of change drivers we discussed above, if not properly managed, would have risked to create a *vicious circle* that we would be unable to revert (see figure 4). The joint action of globalization and digitalization could lead Politecnico di Milano to lose its captive market of smart Italian students. As a result, the interest of national and international companies towards the university would decrease; since we are the largest technical university in the most competitive Italian ecosystem – centered in Milan -, this could reduce the general attractiveness of the whole area, and the number of companies located in the region. As a result, our graduates would have less job opportunities and this could further reduce our attractiveness for prospective Italian students.

In the end, the strategic change we decided to implement at that time, was aimed (figure 5) to transform the vicious cycle in a virtuous cycle, modifying our educational strategy to take advantage of potential opportunities. Thanks to the increase in the globalization of students, we believed that if we would have created an international environment in Milano we would have not only retained the best Italian students,

but also attracted bright students from all over the world. In turn, this would have increased the attention of companies; as a matter of fact, most competitive Italian companies are interested in having both Italian students trained in an international environment and foreign students that have spent two years in Italy and that can be a vehicle to access more easily international markets, especially in countries like Brazil, China, India or Russia. Hence, Politecnico di Milano would support the general competitiveness of the ecosystem, which would in the end result in more job opportunities for its students.

Figure 4 – The vicious circle
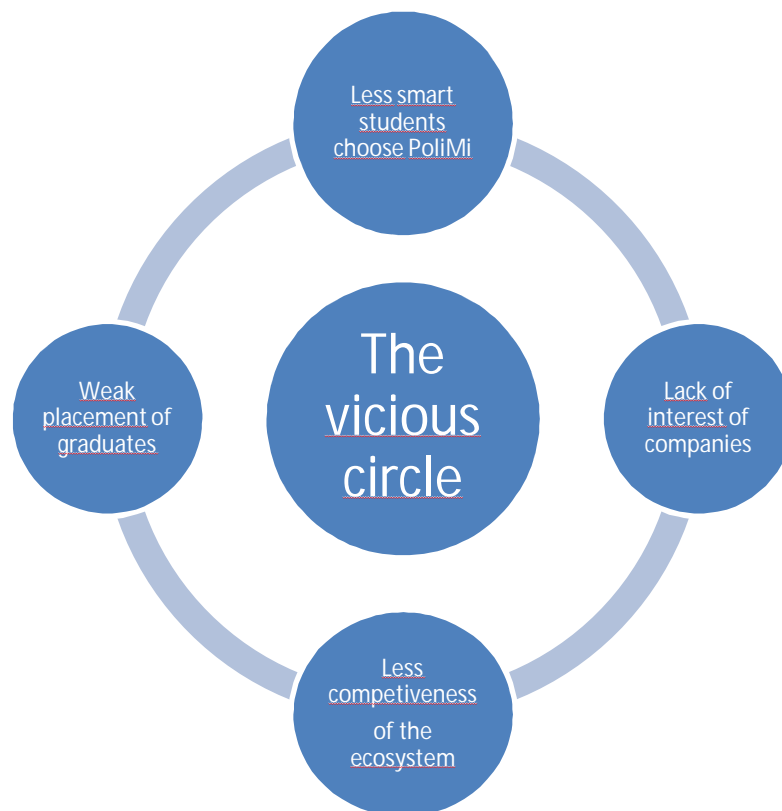
5. Strategy

The new educational strategy is outlined in figure 6. The key vision is that we believe that to be attractive in the new educational environment, we should be able to:

1) Take advantage of the points of strength of our university and of our location: the reputation of our graduates is very strong, especially in terms of technical skills; Milan is a "city of fashion" and quality of life in Italy is known to be good("food and culture");
2) Try to remove or at least balance the points of weakness: focusing on competences that complement the technical background of engineers to improve their employability and, at the same time, creating strategic relations with companies, to improve the real employability of our students.

Figure 5 – The virtous circle
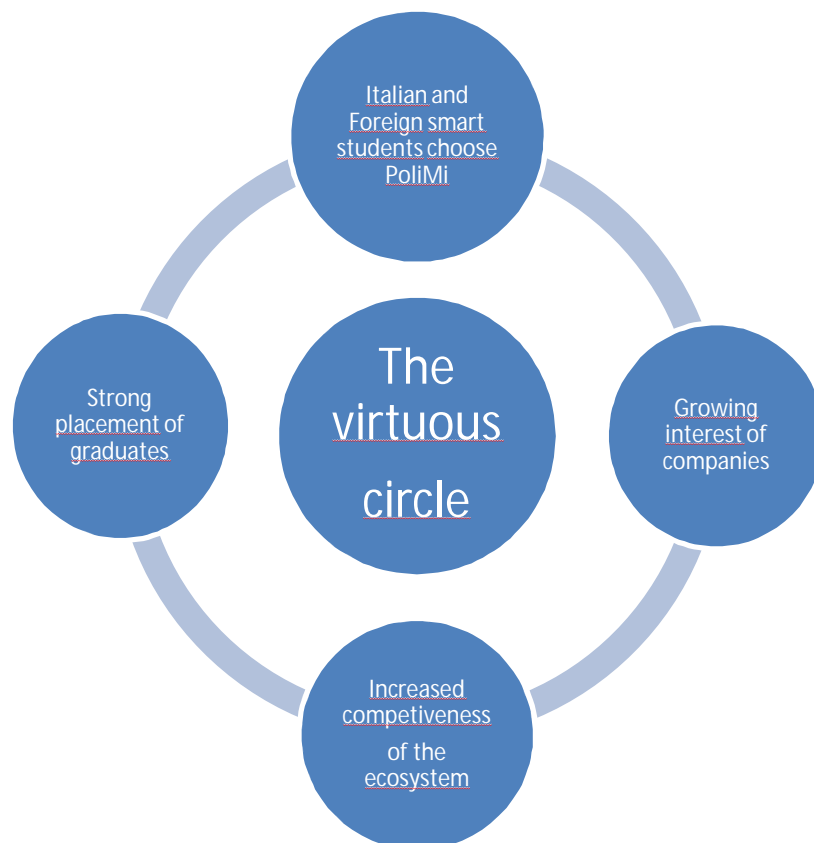
To reach this result, we first decided to change the focus of our educational model, with the objective of graduating people with four main competences:

- *Technical skills*, our traditional point of strength, that is still something engineers and architects must have but it is considered by companies as something "given";
- *Cross-disciplinarity and innovation*, as now people are required to change and innovate "fast", and most innovations require that we are able to link different technologies and competences;
- *Cross-cultural sensitivity*, as people must be able to work in a global environment, both if they work for a foreign company and if they find a job in Italy, seeing that companies that are flourishing during the economic crisis have most of their customers and suppliers abroad.
- *Social responsibility*, as we are a public university that has the mission to improve the world/global quality of life, and we want that our engineers, architects and designers understand the social consequences of their projects.

I am sure that nobody could question the importance of these four competences. The real problem is managing the tradeoff among them.

A first issue is that students can use no more than 24 hours a day, and they should also sleep and eat. The time they use to improve soft skills cannot be employed to reinforce their technical skills. We decided to work on a dual system: define a basic level of skills, that must be available to all students, and then a portfolio of additional opportunities, collected in a portal called POLI4U. Each student will choose the specific soft skills he or she wants to enhance more , according to their desired career: to become an entrepreneur, a manager, a designer, a researcher.....

A second issue concerns the tradeoff between different learning environments: the most critical issue concerns technical skills, one the one hand, and cross-cultural sensitivity and cross-disciplinary innovation, on the other. To enhance the latter, we need to have heterogeneous classes, with people with different backgrounds and nationalities, speaking in a common language. To increase in an efficient way technical skills, on the contrary, we should have homogeneous classes, with a similar background, so that we do not need to spend time to be sure that all people understand everything.

To solve this latter tradeoff, we decided to shift to a T-Shape model (figure 6). In the new approach, bachelor of sciences are taught in Italian to Italian students and are focused on technical skills. In this way, with students using their mother tongue and coming from high schools where they learnt similar things, the efficiency of the educational process is maximized.
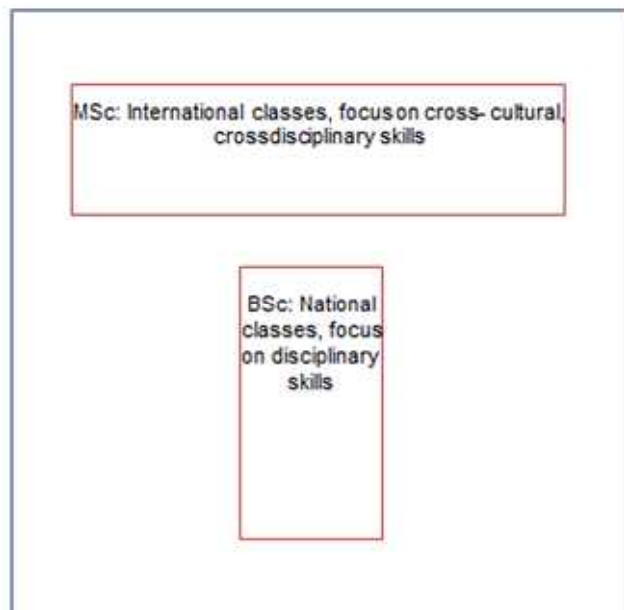
Masters of Science are, on the other hand, aimed at improving technical skills but also, , at "adding" soft skills. For this reason, we decided to move away from the dual channel system and have classes taught entirely in English, with national and international students together. The choice of English was compulsory, as 92% of the applications of International students were for English tracks, confirming what OECD suggested when they indicated the lack of English classes as a main explanation of the limited number of foreign students in Italy. Having international classes at MSc allowed us to better select foreign students, taking into account both the quality of their CVs and the quality of the universities that awarded them a BSc (while it would have been impossible for us to take into account also the quality of international high schools).

This distinction was also consistent with the situation of our country and the mission of our status of public university educating a large share of Italian Architects and Engineers. In fact, at present not all Italian students, at the end of high schools, would know English well enough to attend university lectures in English. This would be especially critical for low income families. Having decided to use English at the Master level, we could provide all students the opportunity to improve their English skills during the BSc, free of charge.

To further reduce the problems deriving from heterogeneity, we decided to make use of MOOCs as a complementary tool for education, with the specific aim of "filling the gaps". Specifically, we are creating a few MOOCs – basically one for each Master of Science – that can be used by people that plan to enroll in our classes, so that they would understand in advance what our expectations are in terms of knowledge and competences to be acquired before they enter Politecnico di Milano. These MOOCs, in English, are also suggested to our students, so that they can become familiar with English terms used in their field of study.

To increase employability, we also decided to strengthen strategic partnership with a set of companies, so that they could be perfectly aware of the new skills of our graduates.

Figure 6 – The T-Shape Education Model

MSc: International classes, focus on cross- cultural, crossdisciplinary skills

BSc: National classes, focus on disciplinary skills

6. The strategic process

The strategic process we followed deserves a few additional comments. We decided in 2011 that the new model would be implemented starting from 2014. In this way:

- the first class of people to be involved in the new MSc in English would have had three years to be prepared (and, moreover, people could enroll in a different university if they decided not to share the new educational model);
- we had the possibility to have intensive courses of English for faculty, focusing on oral skills . We considered three years a reasonable time span for professors that were already used to speaking and writing in English while doing research, considering the fact that they would have to speak in their own discipline (moreover, professors that did not want to do that, could still teach in Italian at the BSc). We also planned courses for non-academic staff that were involved in front office activities.
- we could start the recruitment of young international researchers (postdocs) and visiting professors, to start creating a more international faculty (when most tracks where in Italian, it was almost impossible to recruit foreign professors).

The new strategy was approved with a large majority by the Senatus Accademicus, the board grouping the Deans of Departments and Schools. Among academic staff, a single aspect aroused strong debate, i.e. the decision to have MSc only in English (the only way, as we clarified above, to be sure that all students, and especially all Italian students, would be enrolled in international classes); and such a debate was echoed in national newspapers, with the Minister for Education and the corporate world strongly supporting the decision of the university, while the Association of professors of Italian language claimed that this would

have led to the death of the Italian language and culture. One hundred professors of Politecnico di Milano (out of 1350 faculty members) decided to act against our decision and sued us in court, specifically the Regional Administrative Court (Tribunale Amministrativo Regionale), claiming that such shift could not be decided by the governing body of the University, but it should be agreed by the council of professors teaching at each single curriculum level. As a result, we had to modify our process of change, adopting a bottom-up approach and discussing again the reasons and advantages of the shift; in the end, most professors agreed with the proposal.

In table 4, you can see that more than 60% of our Master of Sciences in academic year 2014/15 are taught only in English, and another 20% is both in Italian and in English, with a strong growth with respect to the past. We expect a further increase next year, as four more Master of Science are expected to be held only in English. Table 5 shows the corresponding evolution in the number of foreign researchers and visiting professors (with teaching load).

Table 4 – The evolution of the Language of Instruction in Masters of Science

	Academic Year 2013/2014	Academic Year 2014/2015
Only in English	18%	61%
Both in English and in Italian	27%	27%
Only in Italian	55%	12%

Table 5: The evolution in the number of foreign researchers and visiting professors

	2011	2014	% increase
Postdocs	36	84	+ 133%
Visiting professors (with teaching load)	27	80	+ 196%

7. A few preliminary results

It is too early to understand if the change in the educational model would lead to a greater long term employability of our students. However, some preliminary results could be drawn, mainly concerning:

- *the capacity of the new educational model to attract Italian students at the bachelor level,* professors that were against the strategic change claimed that Italian students would not enroll in Politecnico di Milano, as they would not be interested in having their BSc in a university where, due to their unsatisfactory knowledge of English, they would have been unable to enroll later in a MSc;
- *the attraction of foreign students at MSc* (as the new educational model is based on the assumption that our offer is attractive for foreign students, provided that courses are held in English);
- *the interaction with companies* (as our idea was to be able to intensify the partnership with companies, so that they are really aware of new skills of people graduated at Politecnico di Milano;
- *the International reputation of the University.*

7.1 Attraction of Italian students

In 2014, over 17000 students applied to enter the Bachelor of Sciences at Politecnico di Milano, about 26% more than in 2010, more than two times the number of available places (about 7500). The increase in the interest of Italian students towards Politecnico di Milano is further testified if we compare our trend in the number of freshmen in Architecture and Engineering with the rest of Italian universities (table 6).

Table 6 – Evolution in the enrollment of freshmen at BSc in Italian universities (2010-2013)

	Politecnico di Milano	*Other Italian universities*
Architecture and Design	-5%	-23%
Engineering	+21%	-6%

7.2 Attraction of foreign students

Table 7 compares the evolution key data concerning foreign students in Master of Sciences, in terms of number of applications, number of freshmen, and share of foreign students enrolled in Master of Sciences (both including and excluding incoming students). All key data improved after the strategic change, as it was expected. In general, the share of foreign students is now large enough to guarantee a really international composition of the classes. As a consequence, the share of Italian students enrolled in international classes increased by 12% (in 2010/2011) to 62%, still far from the targeted 100%, but proving a meaningful growth.

Table 7 – Foreign students in Masters of Science at Politecnico di Milano

	2011	2014	% Increase
Applications of foreign students	2144	3797	+ 77%
Foreign freshmen	716	963	+34%
Share of foreign students (excluding incoming)	16%	22%	
Share of foreign students (including incoming)	25%	35%	

7.3 Partnership with companies

The strategic change had a positive impact also on the relationships between Politecnico di Milano and its corporate partners. During this period, 17 joint research centres between Politecnico and companies were established; third party funds grew by 16%, in spite of the strong crisis of Italian economy.

7.4 International reputation of the university

All five major rankings (THES, QS, ARWU, NTU and USNews) now place Politecnico di Milano within the top 100 universities in engineering and technology (table 8), as it is the case for only 11 universities in Europe (5 UK, Oxford, Cambridge, Imperial college, Manchester and UCL, 2 Swiss, ETH and EPFL, KU Leuven, TU Eindhoven, KTH and TU Munich).

Table 8 – University Ranking 2014 (Engineering & Technology): Rank of Politecnico di Milano

Ranking	World rank	European rank
ARWU	89	18
NTU	95	15
THES	86	27
QS	31	8
US News	46	11

8. Conclusion and lessons learnt

The case of Politecnico di Milano can appear somehow strange; it is a story of a university that tried to identify its way through a new competitive environment, conscious that even if nobody can be sure that the this is the right answer to environmental changes, we are sure that if no actions are taken, decline would be unavoidable.

Some lessons learnt:

- The issue of language in universities is a very sensitive one in European countries, especially in large countries: other universities in Germany and France are moving along our same lines and are facing the same opposition from conservative politicians and scholars in humanities, while the corporate world and the students are strongly in favour of such a change;
- However, even if there is some fierce opposition against the change, no other strategy was proposed to respond to the the globalization of universities; hence, the fight is not between different strategic changes, but between change and inaction;
- The use of English as a medium of instruction is just one part, and not even the most critical one, in implementing this strategic change. Becoming an international university also requires a change in the attitude of non-academic staff towards students and in all operational procedures.