The University of the future

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Towards a new knowledge ecosystem

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UNIVERSITÀ
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Sommario

#0

The University of the future: Towards a new knowledge ecosystem

The Authors

The product of fantasy, like that of creativity and invention, arises from relationships that thought creates with what it knows.
It is evident that [the individual] cannot create relationships between things he does not know, nor between what he knows and what he does not know.
Imagination will therefore be more or less vigorous when the individual has a greater or lesser possibility of making relationships. An individual with very limited culture cannot have a great imagination, he will always have to use the means he has, what he knows, and if he knows only a few things, the most he can imagine is a sheep covered with leaves instead of wool.

Bruno Munari (1999), *Fantasia*, Laterza, Roma-Bari, p. 29.

The post-pandemic world needs creative thinkers in all disciplines, mainly in project planning and design; people able to face complex challenges and develop innovative solutions.
The post-pandemic world will be increasingly characterised by proximity: from a measurable spatial sense to a physical and immaterial relational one, qualities required for a social and territorial organisation, individual and community rights which are created not only through physical proximity, but increasingly strengthened and integrated by flows of data, information and knowledge.

Big Data, the semantic web, digital twinning and multidimensional models, micro- and macro- simulations and systems for the collection, management and interpretation of data, information and knowledge not only point towards new modalities of scientific and professional work for creative design, but they can also open a scenario for universities of new educational ecosystems.

In this sense, given the responsibility of universities in the process

of training the designers, professionals and researchers of tomorrow, it is necessary to ask ourselves what new educational and knowledge environments are already available

today where teachers, researchers, experts and students will be able to perform their activities, an environment in which students can have the opportunity to experience the university as an open system rich in relationships, full of experience and charged with knowledge.

For the area of artistic and design creativity, this goal is also a challenge to build a structured educational and training environment of its own. It is a common belief that creative people have a natural gift, but research and experience have shown that creativity is a skill that can be taught, practised and developed. We as teachers/researchers of architecture, design and urban planning have always placed at the centre of education the processes of transmission of knowledge, skills and abilities characterised by the master/apprentice relationship inherited from the tradition of the Academy of Fine Arts, of which we were part, and from the long tradition of learning through doing, typical of architects until the end of the nineteenth century, which we have combined with the most recent engineering and scientific traditions.

In our design courses students are encouraged to develop multiple ideas, to demand verification and criticism, to create an approximate prototype, to discuss it with other students, to analyze it and defend it against criticism, test it and perfect it through a series of iterative explorations, a recursive process of "trial and error", until reaching a solution that is considered, provisionally, satisfactory, "satisficing" as Herbert Simon would have it.

In short, if we want to work towards offering students a creative environment, an innovation-oriented ecosystem to support university students and alumni in their search to explore, imagine and plan the future of the world, if we want to stimulate and enhance the innovative power of individuals, of young architects, designers, landscape architects and urban planners, we need to imagine, design and build a new physical, digital, scientific/experimental and emotional ecosystem, cooperative and competitive, full of experiences and stimuli, supported by social norms, spaces and services, tools and platforms, teachers, experts and tutors that galvanise and animate the most intense collaboration and interaction between peers.

We believe that higher education for creativity and design, and beyond, needs both a culture and a methodology oriented towards knowledge and design skills, and also an open environment in which connection and collaboration, sharing different visions, knowledge and skills are the fundamental traits. The current experience, of apparent distance, has shown us that it is possible to bring people closer together through digital tools, with which, by integrating face-to-face tools with those of distance education, we can better build and manage the university as a fluid community able to bring together the right mix of diversity of people, knowledge, cultures, with shared intentions and similar values, so that we will be able to train creative, innovative and effective designers necessary for future societies.

Professional competition will reside in the ability to innovate, on creativity based on rigorous methods, on "reflective and responsible creativity", on the ability to operate on both the material and digital dimensions of design and production processes. We must

work to create an environment of open learning, a creative environment capable of helping students to acquire ways of thinking, the cognitive strategies and the skills needed to face ambiguous issues, understand multiple points of view, collaborate between disciplines, and imagine and create new solutions.

A cognitive environment capable of nurturing connections, of bringing together students of different backgrounds, of different cultures around design problems of different scales and different domains; a blended research, training and operational environment of experimentation, capable of nourishing itself and enhancing all useful tools, from direct master/apprentice interaction to all digital tools, to distance learning platforms, to the semantic web, to procreative and cooperative design and augmented reality .

#1

In search of
the Renaissance

Federico Cinquepalmi

A man with a slightly unsteady step advances from the porch of the church towards the parvis, with some effort he lifts a heavy monstrance and in the pouring rain raises the Blessed Sacrament to the leaden sky, in the ancient gesture of Christian blessing. This sacramental sign of protection, forgiveness and reconciliation performed by the Catholic Pontiff on a day in April 2020, was for many an

unequivocal sign of the solemnity of the moment that Europe and all humanity was facing,

a sign that directly connects the COVID-19 pandemic with that long succession of epidemics and pestilence that have in numerous cycles marked the history of humanity.

The history of these epidemics, when analysed and revisited, presents so many and such similarities with today's situation that the 21st century "superman" with his unwavering faith in science was convinced he had regressed to the medieval chronicles. Deserted cities, quarantine at home, masks that hide the face and above all hundreds of thousands of deaths all over the world, with scenes of separation from one's nearest and dearest and excruciating despair.

In the widespread attempt by governments and supranational systems to contain the spread of the virus on the one hand and the economic and social damage of this pandemic on the other, one of the most serious categories of potential collateral damage is without doubt that of education systems as a whole. Students of all levels, from kindergarten to doctorate studies, found themselves locked in their home in the space of 48 hours, having to deal with distance learning where possible, but above all with a forced se-

clusion from their friends and companions, all the more difficult to tolerate for children and young people who are at the age of growth and character building, naturally used to living in groups and finding strength and comfort from being close to their friends. But if on the one hand the long-term effect of this epidemic on children and young people will be a subject of study for pedagogists, psychologists and sociologists, on the other a new factor emerges that we do not find in the chronicles of historical plagues. The isolation of us all is mitigated in its harshness by virtual windows, which allow us to keep in touch, or maintain connection with the rest of the world.

Digital learning, even if viewed with suspicion by the more severe intellectuals, today becomes almost the only tool of mutual contact for adults, and of precious closeness for learning for children and teenagers, albeit with all the limits that must be underlined.

Preschoolers, children with disabilities, those who find themselves growing up in families with serious economic and social hardship certainly cannot benefit from these technological tools, the ineffectiveness or total absence of which only intensify the hiatus, the inequality that these categories already suffer naturally compared to the rest of society.

If on the one hand there are about 10 million Italian students who, not by choice but by obligation, have found themselves since the beginning of March 2020 with the bright screen of a phone or personal computer as the only point of contact with the scholastic and academic reality to which they belong, on the other hand there are hundreds of thousands of teachers, professors and educators, who in turn are connected to the same digital devices, often with a much less developed ability to understand and use these tools than their students and learners.

This community of teachers and academics, sometimes no longer in their early youth, finds themselves chained to a "digital cliff" no less frightening for some than the monsters of ancient mythology, and themselves transformed into mythological creatures, half man and half keyboard, who, like Sisyphus, daily push their stone up an endless slope, with all the difficulty of not fully understanding if their students located somewhere in the void of cyberspace, in addition to the mere transfer of information and notions, also receive some "nuances" of human teaching. That human communication, composed of language and meta-language, which constitutes an essential element to form the critical awareness of the citizens of tomorrow.

In this singular historical moment of ours, the forced separation in our ordinary life produces some positive results, however, and we must take this into account. The exhausting daily efforts of performing remote activities using digital tools will find their place in our life, that perhaps before were only marginal, once the emergency is over.

How many international meetings, European Councils, and direct bilateral negotiations could perhaps be conducted remotely, thus drastically reducing the need for face-to-face meetings, the essentiality of which until yesterday was practically an untouchable taboo.

The savings that will derive from this new approach in terms of travel costs, time and the reduction of pollution in the atmosphere still has to be calculated and will represent new capital in which to invest.

The same applies to the effects on daily employee Smart Working, with perhaps greater serenity and quality of life for them, and a reduction in the impact deriving from physical mobility in our cities, strangled until yesterday by traffic and suffocating in exhaust fumes and fine particulate pollution.

By the same token, we must not throw away the experience gained from distance learning; perhaps even from this experience, slightly brutal due to its sudden implementation, it is possible to derive something good to hold dear for that future in which we will once again be exposed to the happy noise of youngsters, while our schools and universities now remain silent.

Perhaps it is necessary to imagine a future in teaching that is mixed, or better to say blended, developing a model for schools and universities in which the possibility of online education at the institutes of learning is maintained, while respecting agreed parameters of face-to-face classes, in order to guarantee, on the one hand, the essential educational relationship with the teachers and above all between the students, but on the other hand, at least partially limiting the physical load of daily movement to and from the places of study, as well as reducing overcrowded classrooms and buildings dedicated to teaching and study.

Perhaps international academic mobility itself will have to in some way take into account this new digital approach to teaching, especially in relation to student mobility, which up until yesterday consisted of almost 100,000 international students each year coming to our country, and about 74,000 Italian students going abroad. For the immediate future, initial online learning sessions should be considered acceptable, hopefully to be integrated as soon as possible by physical mobility, not forgetting once again that the benefits deriving from mobility, as the European Erasmus program demonstrates so well, are not reduced to simple formal learning, but also harbour a fundamental component in the student's immersion in the social and cultural context of the host country.

To fully accomplish all this, an advanced redesign of the seats of learning, their tangible technological, domotic and digital infrastructures, will be needed to ensure that every physical space, in schools and universities, but also in the conservatories and academies of fine arts, in museums and libraries, become a digital environment, with connections available at all times for those students who, for some reason, are "remote", that is, working students or those unable to attend for various physical and social reasons. This infrastructure, which must be both digital and cultural, progressively extended from institutions of knowledge to the entire urban context, has nothing to do with what has so far been defined as the "intelligence" of the physical structures of human experience and habitation.

There is nothing intelligent or Smart in all of this, other than **the very intelligence of man, for whom digitalisation must serve as a tool to help and for improvement, certainly not as an ultimate goal.**

Even the approach to the management of megadata that today is inappropriately called Artificial Intelligence must in this logic be nothing other than a tool to make quick and efficient use of the huge flows of information that will be generated by these renewed digital infrastructures.

A real IT revolution in the education sector must begin now, without losing sight of the fundamental human relationship between teacher and student and that of students between themselves. IT devices must be of use in providing further generations with new work tools, which reduce both physical and social distance, tools that are not ends in themselves and therefore are potentially the cause of social "autism" and emotional and functional illiteracy in people, especially when applied to the younger community.

The evolutionary leaps of human societies have always sprung from more or less serious crises, which have called into question the previous development models and created new ones.

The fall of Constantinople in 1453, and with it the eclipse of the last traces of Roman times, saw the arrival in the West of a whole generation of Byzantine scholars (a perfect example is Cardinal Bessarione) who brought entire libraries of ancient classic volumes principally to Italy. These refugees, who fled with their books, were the motor of Humanism; we can only hope that the current crisis, combined with a more considered reflection on digital communication, will serve to mark humanity's path in the search for a new Renaissance.

#2

The distance that has shortened distances

Saverio Mecca

"In consideration of the exams taken, in consideration of the special exam passed with a grade score of 110 with honours, in the name of the Italian Republic, I declare you the holder of a Master's degree in Architecture." Another graduation session for hundreds of students is ending, the commissions have met and I have just proclaimed the usual formula. But it is everything else that has disappeared.

In just a few days a prejudice that seemed deep-rooted seems to have dissolved, although many will still make complaints about lost quality, the golden age substituted by the age of silicon.

In just a few days, and forced by dramatic events, we have learned that distance learning is not a second-class solution for Universities

and that it is today one of the ways in which to generate and transmit knowledge, potentially more rigorous than traditional lessons, and we have learned that perhaps it is worthwhile to reconsider the current system which almost seems to set traditional universities against telematic universities.

We have learned that distance learning can be effective and is certainly viewed favourably by most students, as it allows them to manage their study time more flexibly and less rigidly, it increases their attendance, at least in this quarantine phase, and active participation in digital classrooms, and can promote greater awareness and the ability to manage their time and activities.

We have learned that distance learning increases the approachability for working students to study; helps students who are not up to date with their studies and reduces their feeling of being left behind; helps students who commute

by wasting less time in taking public transport; helps all those who cannot enter the classroom due to illness or temporary unavailability. We have learned that we will be able to enrol students from all over the world more easily, who will be able to come closer to our culture, will be able to study and make friends with Italian students, and that maybe we will attract a larger number. We have learned that in this way we will be able to internationalise Italian universities, opening them to the world and thereby spreading knowledge of our language.

We have learned that from an environmental point of view, distance learning reduces the non-essential mobility necessary to attend classroom courses; reduces the need for transport, the consumption of energy and fuel; reduces study costs without penalising the need for quality education, thereby becoming more sustainable for society as a whole.

We have learned that it is possible to change the work of the teaching staff, who can also prepare lessons in advance and record them and have them ready for subsequent courses and progressively build an archive of communicable knowledge, whereby they can balance the reduced work represented by the digital content already prepared, dedicating themselves to face-to-face work with the students and making it more effective.

We have learned that many new young teachers will be nee-

ded immediately who will be supplementary contract teachers, perhaps with qualifying professional experience for the courses; we will need tutors who can follow small groups of students to better care for and support learning processes; and we will have to create virtual, as well as real laboratories, where teachers, students, PhD students, young researchers in training and tutors work together on innovative research projects.

We have learned that, in the same way as for schools, universities we also will need more attractive environments, which deserve the greater cost and time spent in the classroom, rather than attending virtual classrooms; that we will need less formal, single-function classrooms, and more multifunctional environments for the direct relationship between the teacher and the student, for the independent work of groups of students, for teaching and research laboratories, enhanced services and infrastructure.

And those of us who work in schools of architecture, design, urban planning, landscaping, restoration and construction management have also learned something more: because the teaching of creative projects has always been based on a master/apprentice relationship, on working in close proximity in exploring, choosing and developing solutions to open problems that are structured in an intensive dialogue. So, we have learned that

platforms different from the ones we are all using now will be needed: the platforms created for business are not suitable for distance learning in the creative project field.

We have also learned that platforms should be owned by universities, at the very least Italian or European, because the platforms that Google and Microsoft provide to universities, notwithstanding the fact we currently use them, produce a huge and continuous amount of data, the famous so-called big data, which is their real profit. Data that we are giving them more or less wittingly and of which we will no longer be the owners... when something is free on the web, we become the product!

But we have also learned that platforms can not only extract our profiles, but worse, they could take away our expertise, learning from us and from our interactions through artificial intelligence tools; we have learned that we have to immediately create

our own European, or even Italian, open source platform, designed specifically for teaching which allows us not only to create better virtual environments, but also to maintain control and management of big data

and manipulate the knowledge that is generated and enriched by all the direct interactions between teachers and students, and of course by students between themselves.

We have learned that in areas such as design and creativity, this knowledge is our intangible heritage, our culture, fruit of our home territory and we cannot risk it being stolen, squeezed out, collected, processed and systematised, and thereafter reproduced for the benefit of other economic systems.

We have learned that we have to reflect on this unexpected quarantine experience as if it were a laboratory experiment, and that among the strategic actions for the post-COVID-19 period we must immediately invest in our own platform.

We have learned that today distance has shortened distances.

The University sector will not be able to escape its duty to interpret the new global scenarios that are rapidly changing social relations, production techniques and transport solutions; educational innovation will play a central role in production processes and the dissemination of knowledge, and will find support and stimulus in new digital environments
for the processes of change that will enable the university system to offer increasingly effective responses to the need for knowledge in society.

#3

The Italian university system: From challenges to opportunities

Saverio Mecca

The post COVID-19 epidemic scenario for the Italian university system

The COVID-19 pandemic and its impact on the Italian system and on Italian universities, wider and deeper than we thought possible even a month ago, require a profound collective reflection not only with respect to the current emergency situation, but above all on the most effective strategy to kickstart the country, in the face of an economic crisis that will be without equal, except for the one at the end of the Second World War. There is the perception, and perhaps for many the desire, that a long phase that began in 1945 will close, that the whole construct of globalisation and limitless development is revealing its fragility due to the COVID-19 pandemic, and that a profound rethink of values and priorities is needed, as soon as Italy and Europe are able to get safely back into step.

One of the most important effects of this pandemic, which will have to be pondered over, both politically and scientifically, is the proof that without secure, credible, global, widespread and shared knowledge it is now impossible to plan the future of Homo sapiens; the complexity of the interaction between human communities and nature is greater than previously perceived; and the health and well-being of people and all forms of life overwhelmingly become in the most profound sense the reason for sustainability.

The silence of all those who spread anti-scientific theories in all fields highlights how much

investment in research and higher education and in continuous and widespread training is essential to ensure the well-being of

communities and the future of a complex and global society like the one we currently live in and, in different ways, in the one in the upcoming years.

Over seven billion people persevere on our planet, and only responsible, programmatic, systemic and transparent science will make our survival possible together with the survival of life in all its diversity. "The current and incontrovertible globalisation, associated with a human population of over seven billion people, of which over 50% live in crowded urban areas, will lead evermore in the future towards pandemic danger, due also to the close proximity to animal species that carry viruses whose risks to human health are unknown to date"[1]. Arnaldo Caruso outlines a clear and schematic path: without a relaunch of science, university and research, without a global and systemic project based on research and competent citizenship, the future of human civilisation is nothing less than uncertain.

Universities, or rather university polyclinics, hospital research and care institutes, faculties of medicine and surgery, of nursing science and virology laboratories have ensured and continue to ensure the safety of many of our fellow citizens within the limits of the possibilities and means made available to them. Where doctors fell short, the engineers trained in our engineering faculties intervened, and were able to transform underwater scuba-masks into life-saving respirators, design special adaptors and produce them with 3D printers, while at the same time donating the patent to anyone who wanted to make the same profit-free.

Architects and engineers have redesigned entire hospital wards or contributed to the creation of special new wards, which have saved and continue to save lives across the Country.

What is really needed at this point, beyond all the emergency measures, is the strengthening and reinforcement of the Italian public university system to become the country's global infrastructure, its research and training potential,

universities that are no longer aimed only at educating the ruling class, but more generally at educating an increasingly large section of Italian society.

The internationalisation challenge, a strategic axis for the development and innovation of the Italian university system

The teachers, students and technical and administrative staff of the entire university system, thanks to their ability to innovate and react, were able to ensure, with no noticeable interruption, almost all the services normally provided to students. As of March 20, Italian universities had already transferred 62,000 courses to different distance-learning platforms, equivalent to 94% of university courses. As of March 20, 70,500 official exams have been conducted online and about 26,000 degrees have been awarded.

To date, almost all students follow lessons, interact with the teacher and other students, participate actively in seminars, and take exams or graduate online.

The Italian university system has responded to this extremely serious emergency in a way that universities in other countries have not, revealing a robust and resilient strategic infrastructure in the country which has, in a very limited time, experimented with and implemented innovative solutions which are now an enrichment and a future potential developed by teachers and students, to be enhanced yet further when the emergency is over.

This is one of the solutions for the post-COVID-19 phase that will serve to rebuild the country and relaunch our economy: investing in the knowledge economy, according to new parameters. Significant and long-term investments are necessary, for which we will have to take on more debt, but which will serve to give the new generations the conviction and the opportunity to study and obtain a degree, because everyone has understood that in times of emergency, only those who, having studied seriously in our universities, can find in their scientific and cultural background the ability to respond today to emergencies, and tomorrow to the needs of society.

This implies a cultural change, rediscovering and implementing what was very clear to the Founding Fathers of our Republic, but whose message, well summarised in Art. 33 of the Constitution, has been greatly diluted in the last seventy years of the history of our country, which recognises the university system not as a shopping centre, but as one of the vital infrastructures of the country. But the change of pace towards the knowledge economy implies radical revisions of the Italian university system, which are not exclusively linked to the dramatic lack of public funding, especially over the last ten years.

The Italian post-COVID-19 university system requires first of all that the centralisation of resource management, the reward structure, formal and meticulous ex-ante control of requirements and limitations to design and planning activities all make way for simple and transparent rules and procedures, open development projects, to guarantee the conditions necessary for universities for the highest quality of education and research, but still, on the other hand, guaranteeing ex-post control of the correct use of resources and results obtained, first and foremost the right of Italian citizens to quality education. Public and transparent control, oriented towards measurement and continuous improvement, which foresees the acceptance of direct responsibility by the management bodies of the institutions concerning the results achieved, on the effectiveness of the hiring policy and the resources managed.

The internationalisation of universities, understood as a motor for development, can be the main "driver" of its renewal, by immediately removing all those regulatory provisions that shackle higher education institutions, starting with the rules related to standard funding, and those which unjustifiably complicate public competition procedures.

The time has come for universities and research institutions to, with freedom and responsibility, on the one hand attract the best brains and skills from around the world, and on the other retain the brilliant minds educated in Italy.

The internationalisation process, which was growing, albeit unevenly, in Italian universities, will not consist so much in Erasmus mobility or double or joint degrees, but more in rendering attractive all courses for students who are not resident in Italy, but above all for Master's degrees, for university Masters and doctorates: it might seem an ambitious goal, but today, in the pandemic crisis, it is an objective capable of enhancing the resources of the Italian university system, necessarily following paths that other European university systems have already trodden, even if these foreign systems have enjoyed incomparably higher public funding for research and training than is true for Italy.

Internationalisation can lead to the bolstering of the right to study, i.e. the quality, quantity and accessibility to education.

Innovation and growth in the higher education system

The growth of the educational offer in Italian, English and also in other internationally wide-spread languages and a greater influx of non-Italian students must correspond to an increase in the capacity for training and research, in qualitative and quantitative terms, by removing the many existing rules that are still linked to a "home-grown" vision of the Italian university system, thanks to expansive measures, such as:

- growth of the teaching staff (drastically reduced over the last decade);
- a different structure for contract teaching, more aligned with

internationally recognised criteria, which fully recognises its complementary role to permanent teaching staff;

- the development of innovative tools for distance learning to integrate classroom teaching, with particular reference to the reduction in mobility that will certainly occur in the coming years, both due to the immediate consequences of the current health emergency and to the inevitable downturn of current economic realities which will substantially reduce the income of many families.

The development of innovative digital tools for teaching in higher education was declared a priority by the European Education Ministers meeting in Paris in May 2018[2].

With regard to the simplifications that will have to be assessed to relaunch the attractiveness of Italian higher education in each sector, the following should be considered:

- a drastic rethink of the rules relating to national limited access courses;
- the current limitations to follow PhD courses, where different from international norms;
- the ban of following two study courses (University Masters, 1st cycle degrees (Lauree), 2nd cycle degrees (Lauree Magistrali) and Doctorates), which dates back to the Royal Decree of 1933;
- the rigid precautionary and centralised control of the educational offering, about which the State limits itself to a few general criteria;

- the final decision to choose the Bologna Process model: Bachelor, Master and Doctorate;
- setting aside the ex ante inspectorate control of Miur and Anvur which evolves towards an ex post control and evaluation of results.

While some of the measures indicated require legislative change and/or adequate financing,

digital tools have not only allowed all universities to continue their teaching during the emergency, while already supporting research, but today they are judged by the majority of teachers and students as useful and effective in the perspective of integration with classroom teaching.

Potential offered by distance learning

The data we can reflect on is that the decision taken in the emergency to transfer all the teaching to the available platforms (Moodle, Google Suite, Microsoft Teams, etc.) is proving to be in many ways effective; post-emergency teaching (we do not yet know when it will start) will never be able to go back to the status quo ante, but will have to find an effective balance in integrating the new methods with classroom teaching, enhancing both in different ways in the various study courses.

In the coming years, both as a result of the pandemic and of the

inevitable subsequent economic crisis, we will witness a decrease in enrollments in higher education courses, both for young Italians and for international students, who in recent years had been enrolling in ever greater numbers, especially in courses dedicated to the area of creativity and design.

The inevitable reduction in international mobility will increase international competition, a competition in which Italy has an overall weak position due to the under-financing of the last decade, under-financing which has had a serious impact on both the teaching staff and the overall services offered.

Furthermore, any process of extensive innovation in the economic and administrative systems will require extensive higher education programmes for new generations, as well as continuous training and updating (upskilling and reskilling). There will also be strong focus on the offering of courses that lead to the award of micro-credentials, one of the new educational frontiers receiving most attention internationally, as expressly confirmed in the Paris Communiqué by the forty-eight Ministers of the European Higher Education Area[3].

To sum up, a university system that pursues objectives of internationalisation and of satisfying increasingly strong needs, both for the training of new generations and for lifelong learning, will not only have to recycle and increase its staff, but will have to invest in the development of agile and integrated digital tools and in the experimentation of blended didactic models between e-learning, distance learning and classroom teaching.

The development of innovative technologies and distance learning tools will be the main means of supporting and extending the right to study for Italians, in particular in a crisis that promises to be deep and long-lasting, increasing accessibility to studies thanks to lower costs, less travel and greater inclusion for student workers,

improving global sustainability thanks to less mobility and less need for real estate infrastructure, its construction and management, and supplementing scarce public financial resources with income arriving from the enrollment of students from outside Italy.

Note

1. Extract from recent message from the President of the Società Italiana di Virologia (Italian Virology Association), Professor Arnaldo Mancuso, to the Minister for Universities and Research, Gaetano Manfredi.

2. "Digitalisation plays a role in all areas of society and we recognise its potential to transform how higher education is delivered and how people learn at different stages of their lives. We call on our higher education institutions to prepare their students and support their teachers to act creatively in a digitalised environment. We will enable our education systems to make better use of digital and blended education, with appropriate quality assurance, in order to enhance lifelong and flexible learning, foster digital skills and competences, improve data analysis, educational research and foresight, and remove regulatory obstacles to the provision of open and digital education", in BFUG, Ministerial Communiqué, Paris (2018).

3. "In many of our systems, ECTS-based short cycle qualifications play an increasingly important role in preparing students for employment and further studies as well in improving social cohesion by facilitating access for many who would otherwise not have considered higher education. We are therefore including short-cycle qualifications as a stand-alone qualification within the overarching framework of qualifications of the EHEA (QF-EHEA). Each country can decide whether and how to integrate short cycle qualifications within its own national framework", in BFUG, Ministerial Communiqué, Paris (2018).

#4

A strategy for the area of fine arts and creative design

Elisabetta Cianfanelli
Saverio Mecca

If, as seems highly probable, at the end of the planetary COVID-19 crisis, global competition in the field of education intensifies in relation not only to the resulting economic and financial crisis, but above all to a different paradigm as regards mobility connected to the education field, it is vital for the Italian university system to develop effective and diversified strategies for the various research and study areas.

The area of the arts, architecture and creative design (represented by the AFAM system, by the faculties of architecture, design, territorial planning, landscape, conservation of cultural and architectural heritage, performing arts and art history, by the CNR, by MIBACT and other institutions) constitutes for Italy one of the most potentially competitive areas at the international level, for the overall quality of both training and research

(Italian university research in the overall domain of creative design is one of the most valid worldwide).

The cultural, artistic, architectural and landscape heritage of our country, and the public institutions that operate in its protection and conservation, use, enhancement and production, constitute an additional competitive factor on a global scale, especially if we could coordinate it with the institutions of higher education and research. However, the potential of the education and research area would need to be supported both on a technical, pedagogical and institutional level.

An applicable international growth strategy capable of enhancing the resources of the Italian system could be articulated on two axes:

1. creation of new specialised structures in the area of the arts, architecture and creative design capable of coordinating the various public academic, research and management of cultural heritage institutions for a competitive blended higher education offer, which complements and adds to the current offer;
2. development of a specific web knowledge-based design platform for creative design that is public, owned and managed by Italy, to ensure a platform that is effective and efficient for teaching creativity and creative design, which allows for the control and handling of the data produced according to public criteria and which manages the knowledge produced by the entire teaching and student community.

New poles for higher education in the fine arts and creative design
It would be interesting to start the establishment of innovative structures, which starting from existing structures could better coordinate and integrate human, organisational and physical resources (the skills and competences that are present in the AFAM system, university departments, CNR and other research bodies, in institutions of management and enhancement of cultural heritage, such as museum systems, restoration institutes, etc.). Looking ahead to the next few years, on one side

the area of both artistic and design creativity in their various forms will take on a central role in the processes of creating value and wealth,

while on another, the new information and knowledge management technologies will create the conditions for the re-establishment of a scientific design thinking and creativity domain including all the historically consolidated combinations, in addition to areas of science and information technology engineering and production.

The creation of these new integration and coordination structures could start with trials in some metropolitan areas such as Naples, Florence, Rome, Venice, Turin and Milan where all the academic and cultural territorial resources are present and which could identify and communicate quality in the area of fine arts and creative design.

The pilot structures could be set up, also using the procedures of the National Artistic Poles, supported by consortia between the public institutions under the umbrella of MIUR (Universities and AFAMs), the cultural and heritage management institutions of MIBACT and of the territory, of the Regions and local authorities and could take on the name of "University of Architecture, Design and Fine Arts". They could offer both second and third level degree courses (master's degrees, first and second level masters, doctorates), both autonomous, and supplementary courses and modules, according to a blended model that includes both remote and classroom activities.

The structures ("University of Architecture, Design and Fine Arts") could have a strong international orientation, both in the nature of the various education offers, and in the use of information technology. As was already clear in the years preceding the COVID-19 crisis, AFAM courses and university courses in the area of creative design, architecture, landscape architecture, design, fashion, etc. saw an increasing enrollment of non-European students.

The structures ("University of Architecture, Design and Fine Arts")

in pulling together the world of creative design in all its forms, could be the most suitable institutions for the most important mission: to respond to the needs of the society to come, of the society that we will have to reinterpret starting from what is already in the future and from what, in a short while, we will consider the ruins of the past.

Information technology is performing a process of restructuring of the whole area of creativity, an area that today has a strategic role in designing a more open, fair and innovative society,

capable of interpreting the multiple needs of more complex societies, capable of inventing new sustainable and rounded processes based on individual and collective knowledge and responsibility.

A new Italian platform for education in the area of fine arts and creative design

The pedagogical peculiarity determined by the specific domain of education in fine arts and creative design, in the various disciplines, requires both a wide multidisciplinary didactic experimentation and the development of a platform for distance learning that integrates theoretical and practical classroom study, which is designed to support these educational streams, and is original, innovative and European, or better yet Italian.

In Italy, however, there is a gap with other European countries, which sometimes arises from the inability to remodel the approach to education, especially in the areas of creative design.

We can agree with Jeremy Rifkin when he says that "we need to

study new ways of conduct, study, work, social life, to always keep a safe distance from each other".

The idea of a knowledge-based design and creativity platform for Italian education also stems from the consideration that all the teaching and research activities we are performing at the moment are entrusted to systems promoted by multinationals like Google or Microsoft and to foreign data centres.

This unconditional "trust", perhaps justifiable during the emergency, is still worrying because these platforms, in addition to handling sensitive data, also have the power to determine our choices, thanks to the possession of our data.

Following this reasoning, the quality of Italian distance-learning platforms will not only be an element of innovation and competitiveness for Italian universities on an international

level, but also a specific support for the university education system in the area of creativity and design.

A platform designed for the area of artistic and design creativity will have a superior and different efficient performance vis-à-vis the current ones, with features specific to usage in these sectors; of course, other areas of education will also be able to make use of the tools of a platform capable of supporting complex interactions as is the case under discussion, i.e. the solution of communication problems connected to creative projects at different levels.

The forced experimentation of these tools in these months of emergency can lead us to develop analyses and evaluations with respect to the potential and limits - including social and cultural - of the technologies currently available for teaching and research, with particular regard to the scientific domain of the culture of creative design.

Creativity and design present peculiarities, both in the teaching and research areas, which require innovation, experimentation and, finally, without doubt the development of much more complex platforms than those currently available.

All this also opens up a parenthesis for unprecedented reflections on the new digital skills for teaching and on the role of the teacher, who alongside the role of teacher/trainer also develops a role as an organiser of creative processes.

A blended offer, that is, an appropriate combination between the different teaching methodologies in balance between the various components, is necessary, in the light of the current global framework, to:

- increase access to higher education;

- reduce mobility and the attendant costs and time to the basic minimum;
- reduce and modify the need for physical spaces for teaching activities and the connected evaluation of learning outputs;
- increase the attractiveness component of the Italian higher education system in the areas of the arts and architecture;
- develop pedagogical innovations towards the creation of more complex, fluid learning environments capable of enhancing ICT innovations which are open to society (co-working and co-learning).

It is not a question of the simple technological ICT development of a new platform, but of research, design and multidisciplinary experimentation, mainly connected to the modalities of the education process in the arts and in the organisation of teaching and research in the area of creative design, which are oriented towards:

- the configuration of new learning environments, whether virtual or physical/face-to-face (formal institutional spaces, classrooms, laboratories etc.);
- enhancement of a new interactive and collaborative approach:
- redesign of learning paths, with a new time-based modulation of activities (synchronous and asynchronous);
- new multimedia tools (LMSs, platforms, hubs, apps);
- preparation of knowledge management tools capable of dealing with the knowledge produced in complex pedagogical interaction;
- production of specific quality verification protocols (data and educational material protection, open source);
- protection and control of the production of big data;
- evaluation methodologies for distant learning.

The theme of creating collaborative digital environments with the use of some of the existing collaborative software or platforms

(BIM, Generative Design, etc.) can also be an extremely important tool for both students and researchers that will allow them to measure themselves and immerse themselves in the professional practices already in use.

In fact, a field of experimentation is opened that involves the whole shared design process that can enter the practice of academic work and laboratories in particular, both as student work practice and as an environment of cooperation between teacher and student with the specific needs to interact in creativity education.

Given the present situation and the increasingly strong and manifest tendency towards globalisation and the elimination of territorial boundaries, especially in the educational field – we can see the exponential increase in online and remote courses - it would therefore be also interesting to involve other national and European universities in the project so as to activate a real distance learning network. Keeping creative design disciplines in the forefront, but not limiting the partnership only to these.

It could be a general platform for all disciplines of creativity and design with subsections for each institution and a place where close and faraway institutions can get in touch.

The project therefore becomes part of a European distance learning system, too, also creating new tools or developing existing ones, in relation to Erasmus projects as well.

#5

A strategy for a "blended learning path": an experiment for fashion and design

Elisabetta Cianfanelli
Debora Giorgi
Antonella Trombadore

This pandemic has highlighted many of the contradictions of our lifestyle and will probably also challenge many of the already existing trends, such as, for example, the exponential phenomenon of the urbanisation of the world population, concentrating all the strategic services and infrastructure in major urban centers. In these times of sharp acceleration of changes in social behavior, it is necessary to introduce a broad and systematic reflection to understand how both the patterns of utilisation of teaching environments and the relational dynamics between teacher and learner will change, but, above all, how the rigid articulations of the formative process can be revolutionised, combining

the need to reduce and control the risks of mobility and proximity with an innovative use of digital tools for new-generation distance learning.

Today, in fact, the realm of technology reveals its strategic strength, demonstrating how training and study do not require an obligatory presence in those places with high density, such as poles with high material speed, allowing for a recovery and rehabilitation of those remote places, forgotten villages, perhaps remote, but always connected. As we have seen in this quarantine period, digital infrastructure seems to respond efficiently and effectively to the needs of teaching, allowing us to cope with this emergency phase. At the same time, along with the critical issues, human values also emerge in the relationships between the persons involved both in the education process and in research activities.

A trial for the innovation and competitiveness of the Italian university system

The need to enhance the experience we are living through emerges, transforming it into an opportunity to change the didactic paradigms and trigger a positive metamorphosis also at a social level. A first analysis reveals the need to configure

new education and research scenarios, new skills, new professional profiles,

with new synergies between the public and private spheres, capable of triggering new multi-disciplinary blends and new opportunities for innovation of the country.

To try and find answers to these problems, within the Department of Architecture dida we have started a project called "U-Blended Extra Challenge" (u-be), as a future scenario project in which to operate in the multiple dimensions of the post COVID-19 phase, rendering good innovative teaching practices viral.

The idea is to dissect the challenge in all areas that characterise the complexity of creative design culture, involving, at a university level, both people, professionalism and skills, and places, tools and formative models, promoting the inclusive value of innovation and believing in authentic learning linked to challenges with a significant social impact.

u-be lays claim to be a research platform in continuous growth and evolution. The acronym of University Blended is accompanied by a constant - "e" - that emphasises expectation, expression, experience and the desire for a continuous sharing of information in the specific context of design and exchange.

As part of the preliminary phase of the u-be project, an investigation into the state of the art with respect to existing experience and distance learning tools and a collection of qualitative and quantitative data useful for evaluating the experience of distance learning started during this COVID-19 emergency phase was activated.

The context in which the u-be project will develop a first experiment of blended learning experience is the Made in Italy system, an area in which the Italian creative design culture has always carried out its specific research and formative activity intensely, and in particular, the Master of Science in Fashion System Design and Management course, launched by the University of Florence.

Why this choice? Italy is a manufacturing country known worldwide for the value of Made in Italy, which plays a strategic role not only in economic terms and in terms of the number of workers, but above all as the ambassador for the

identity of Italian savoir faire.

The manufacturing world can acquire Italian brands, transfer part of the supply chain to international contexts, but as an academic institution we have the duty to enhance this cultural, technological and social heritage, above all to safeguard it, including through the use of advanced technologies, by transmitting our knowledge through higher education courses.

Fashion, design and the entire creative and artistic culture manifested in all their forms and values make up an identity matrix on international markets that needs men and women with the appropriate knowledge and skills to correctly understand and manage processes which are currently undergoing a mutation.

Over the years, university education in this sector has seen an expansion of interest from companies, representing a fast-growing economic axis and a strategic driver for the diffusion of Italian culture; but above all it is increasingly becoming a magnet for foreign students from all over the world, who aim for high-level education in Made in Italy sciences, interested in acquiring a learning method based on creative design culture, drawing experience from the tangible and intangible values still present in the Italian territory: genius loci and genius personae.

If we think about the particular moment we are experiencing, all the teaching and research activities we carry out are entrusted to ICT systems managed by multinationals such as Google or Microsoft:

our data is being collected and managed in foreign data centres which, in addition to increasing their big data assets, will also have the power to determine our choices.

Hence the need for an Italian, open source, publicly managed and controlled platform that can guarantee the protection of the data of the players and knowledge of Made in Italy in support of blended project teaching, and give impetus to the creation of a national data management system/database in the context of an Italian Content Management System/Learning Management System and cloud resource.

The quality and protection levels of the distance learning platform

will not only be an element of innovation and competitiveness of the Italian university system on an international level, but also a specific support to the education system in the field of creativity and design.

Possible innovations for a didactic path

The restructuring of an education path integrated with research, as a blended model for higher university education in the areas of Fashion and Design, is not only feasible within the framework of the rules that regulate the education offer, but can also contribute to increase the accessibility of students to university courses, both overcoming the concept of limited availability of places, and offering international courses with the consequent
reduction of costs and travel in line with the new social distance needs required.

Another expected result will be the experimentation of a tool kit shared with the world of production, built specifically on the needs of the Fashion/Made in Italy system, guardia and ambassador of Italian creativity.

In fact, the restructuring of the model provides for a radical rethinking of the training modules which cannot simply be articulated into classroom or remote activities, but will have to respond to a different content structure in learning paths where the learning objectives and teaching methods are combined in immersive educational paths.

In this way, the asymmetry created by the synchronous/asynchronous relationship between teacher and student is overcome, filled by an experiential blended learning mode.

The development and enhancement of the blended tool kit provides for continuous ways of verifying learning and experimentation, so it is necessary to train new professional figures who will

be involved in supporting and managing educational activities: from the development of the challenges for creative design to the management of intensive full immersion training courses on the platform and/or in the classroom.

This model can be implemented by following a road map that will allow its development, implementation and necessary checks in a shared way by all the actors involved, so that in the medium term it can be replicated relating to Degree courses and Master's Degree courses in the creative design area and more generally in the design area, hoping, in the future, for the creation of spaces, periods, experiences and relationships in an Augmented Learning vision.

#6

An ad hoc system for e-learning as a tool to enrich classroom or remote didactics

Massimiliano Condotta

The need for a dedicated e-learning system

When I started my university adventure as a freshman, many of my professors vied to demonise the use of computers in architectural design. My course of study was therefore characterised by switching from the pencil to the mouse, by creating hybrid drawings made with digital tools and with manual illustration techniques.

Five years later my graduation thesis was based on the experimentation of innovative modeling and simulation software to conceive and develop an architectural project.

On the mornings following my graduation day, the first thing I did when I got to the studio was to turn on the computer; while the operating system loaded I made myself a coffee, I exchanged some opinions with my colleagues, then I started designing.

The computer - unlike the predictions of five years earlier - had not disappeared from our offices, on the contrary, it was a daily workmate, whether for writing a report or developing a project. However, it was not the only tool in the room. Behind me, a stratification of drawings, transparencies, pencils, plastic models and prints complemented and completed the work done on the computer. The process of comparison, the atelier work typical of the applied arts, the approach of the handicraft designer that characterised our design style was performed between the drawing board and the computer monitor in a sort of blended design.

Let's shift to February 2020. These were the days when my new course should have begun in the first year of technological creative design. As a teacher who wants to convey to his students not only theory, but also experience and practice, I based the course on enhancing the presence of the "teacher's body"[1] in the classroom. The belief is that teaching inside the university classrooms should transmit more than what is written in the texts, that it

should not follow a "transmissive" and "wikipedian" approach to knowledge, but that it should be built on rapport and feedback, because the textbooks already transmit the notional components of the subject. I had set myself the task of bringing building materials into the classroom, building systems for students to touch with their own hands, I had set up didactic experiences in a sort of laboratory for handling materials.

All of a sudden, classroom teaching was suspended. My course had to start in distance learning mode with one hundred students that I had never seen and to whom I would not be able to expose to the experience of manipulating materials and elements of creative design.

After the initial discomfort I said to myself: "But wasn't I the one who experimented with the use of computers in architectural and technological design, the one who spent many years doing research on e-learning in European and national projects? Moreover, now, all those tools that a few years ago, while we were doing research, we only dreamed of having - like a graphics tablet, an efficient network, programmes that allow you to share the screen, a repository to share content – they are at my disposal, so let's use them and make the best of them, imagining "digipolation" laboratories". Using all the means available with the spirit of the handicraft enthusiast, I have transformed, like all my colleagues, the didactic approach from a classroom course to an e-learning course, trying to adapt the tools that have been provided to us in an ad hoc process - and it must be emphasized with great professionalism, effectiveness and speed - from our universities. However, we are relying on knowledge-sharing systems managed by multinationals and the global market, designed for use as business tools despite the fact that shared folders use terms that refer to the class or work team in a workshop.

These considerations clearly show the need to be able to take advantage of a dedicated e-learning system.

A system owned and managed by the Italian university system and designed for courses dedicated to the culture of creativity and creative design as understood in all its forms.

In order to understand how such a system can be conceived, it is necessary to analyse what the ways of transmitting knowledge in these sectors are.

Still today, the methods of didactic transmission of theories and design techniques in architecture - but equally in all the disciplines of creative design - remain principally in the domain of an oral/visual tradition (conferences with projected images), to the methods followed in ateliers (exercises, ex tempore, workshops: conducted collegially in the artistic classrooms) and to design exercises carried out individually or in groups by students at home and periodically subjected to correction by teachers.

All these methods of transmitting architectural knowledge and know-how are obviously difficult to effectively render practicable online. In fact, creative design constitutes a moment of great synthetic effort, in which different kinds of knowledge - related to the artistic-poetic side, as well as the technical one, but also to the skills of the different scales of project design - are assembled to flow simultaneously.

How can all this be made accessible in the relationship between a student, his computer, the web, the teacher's computer and the te-

acher? Can any unexpected positive result be expected, surpassing traditional teaching?

We believe that these questions can be answered in the affirmative. To make this possible and above all to structure, starting from the considerations on the transmission of knowledge briefly introduced above, an e-learning system - whether of the blended type, to support and integrate classroom teaching, or completely distance-learning - it is necessary to consider two requirements that must be supported and assist the whole system.

The first concerns the possibility of carrying out on-line a substantial part of the work which traditionally in architecture has been defined as "atelier practice"; that is, the work that students carry out as applicative activity on the project by putting into practice the theories learned in the classroom lessons. As is well-known, this work, which occupies a predominant amount of the time dedicated by the student to the course during its duration, is carried out largely independently at home or in the classrooms of the universities.

The second concerns the need for a system of acquisition and structuring of knowledge and experience that is formed in the relationship between students and teachers around a table in the classroom/laboratory; a system that can gradually acquire information, according to procedures tending towards automation, in the perspective of an intelligent system that is self-teaching.

Two pillars for a system architecture

In transforming requirements into functional characteristics, two main elements can be identified:

1. a virtual atelier of student/teacher interface in the correction of the exercises;
2. a logical model and a repository for the general history of the atelier activity of the course, capable of gathering and cemen-

ting the teaching experience, of self-learning and updating the knowledge system and of offering it online.

The first refers to the possibility of establishing, through a virtual atelier, a permanent exchange community between students and teachers and of registering and making available to all members in real time, in a structured knowledge system, these collaborations at the drawing board which represent the most demanding didactic commitment. The second is linked to the need for

a general history, a dynamic information archive with examples, ready for consultation and navigation by students through concepts and key terms arranged according to a semantic-perceptual structure.

This history can be connected online to other databases, both of academic documentation and in reference to the wealth of knowledge of the industries and the production system of the country. In addition to being a permanent aid to the conduct of normal teaching activities, a system organised in such a way can become a space for the collective sharing of knowledge capable of offering interesting epistemological values and contributing to a disciplinary evolution of the subject taught.

The virtual atelier

As part of the courses dedicated to the system of creativity and creative design, in which notional knowledge is integrated with

aspects of project planning, the atelier activity plays a fundamental role. The peculiarity of the atelier lies largely in the physical support of the teacher-student interaction, which is made up of elaborate graphics, such as the work-sheet in the teaching of architecture, or by other media where visual communication and illustration is predominant with respect to written communication. This construct, which for brevity we will call the work-sheet, is the ideal space for the projection of ideas that are expressed according to "natural" and well-defined representation protocols. Here the revised work-sheet, marked by the teacher with sketches, suggestions, notes, represents an essential moment of synthesis in the teaching.

To make this possible within a distance learning model, a system is necessary for the correction, in synchronous or asynchronous mode, of analytical, study and creative design work-sheets produced by students.

In an ideal mechanism, through a system that students and teachers access at different levels, students share their work-sheets, these are corrected and notes are made by the teacher and made visible to all students of the course. The system keeps track of all the communications/corrections that the student and teacher exchange at the virtual work desk.

The relationship with the classroom community - current but also future students - is guaranteed by the real-time publication of the work-sheets and related observations in the virtual atelier. The materials (corrected and with notes attached) produced by the courses from previous years always remain available on the web, constituting a source of information and documentation of great educational value.

It is easy to imagine how this tool can also play an important role in classroom teaching. The ability to capitalise on the drawing

work done in the classroom by transferring it into the parallel virtual atelier, integrates "traditional" teaching but above all it produces a quantity of knowledge of comparison, and not transmissive, in the form of annotated and corrected documents that, in addition to containing "corrected" design solutions, also include errors that should not be repeated, for a learning model that integrates notions with experience.

A dedicated repository

The amount of information that comes into play during the generative process of a project is enormous and comes from the most disparate fields of knowledge. An architect, a designer, an expert project planner, in his historical/humanistic and technical/scientific culture, moves easily through this relevant and multifaceted flow of information: they are the fundamental contents that he has absorbed during his training and have become the relative references - the models of creative design behavior, the example of his teachers or colleagues, the recording of project and/or construction experiences, the typical situations of crisis in the generative process of the project, and the mistakes made on previous occasions.

The teacher-student relationship, in artistic and technical disciplines, generally sees the contrast between an expert designer and a pupil who is more or less a novice. The student generally has great difficulty not only in emulating the teacher's skills, but, very often, also in understanding what the teacher exactly requires.

Thus a dynamic archive of information and examples to support teaching, ready for consultation and navigation by students through concepts and key terms ordered according to a semantic-perceptual structure, becomes a fundamental tool.

The idea is to use this repository not only as an intelligent encyclopedia, but also as a personal "learning notebook" that accompanies students throughout their course of study.

At first glance, this unfinished production, which materialises in sketches, preliminary drawings, graphics, diagrams, (in digital or paper format), can be considered irrelevant. However, that would be a mistake. In reality, this production represents the phases of realisation of a project and assumes enormous importance, since it explains critically, through a detailed trace of the process, the meaning of the result achieved. Unfortunately, much of this knowledge is not capitalised; it grows every day in the classrooms of the universities during the courses dedicated to creative design, but it is lost at the end of the day. It lives on only in the pages of the student notebooks with the teacher's notes and corrections, and most of the time these are thrown away once the exercise is finished.

In short, we can say that the typical characteristics of the transmission of knowledge in creative design courses are the following:

1. the large amount of notions created and shared is lost in a very short time;
2. most of the skills and acquired competences around a drawing board are deployed to educate a single student or a very small group;
3. very often there is no record (intended as memorising or conserving) of any of these notions, reflections, abilities to exhibit or exchange of opinions.

Everything is quickly "burnt" in the immediate connection between student and teacher, and even if these notions are recorded, they will be fragmented and disconnected. This exchange of knowledge could be easily recorded and translated into "knowledge experiences" to be conceived as elements of learning thereby avoiding a huge waste of the teaching as described so far.

Thanks to such an organised system, the knowledge produced within the practical work of the communities - whether online or in the classroom, synchronous or asynchronous - would be processed and become part of the entire knowledge base of the system, indexed and filtered on the basis of a semantic taxonomy which is in turn influenced by active communities.

In light of these considerations, a logical model and repository for the general history of the atelier activity should:

1. adopt an indexing system based on a specially designed taxonomy;
2. offer a flexible indexing technology that allows both domain experts and end users to create, maintain and share indexing systems with limited semantic drift;
3. offer a series of knowledge bases on topics related to the specific interests of teachers and those shared in the thematic network;

4. capitalise on the large amount of "daily knowledge" produced between teachers and students during the atelier activity.

Note
1. An expression used by Alberto Melloni in his article "I limiti dell'insegnamento digitali. Il Corpo del docente" ("The limits of digital teaching. The teacher's body"), in «La Repubblica», 16th, April, 2020..

#7

Designerly ways of thinking

Matteo Zambelli

The way of thinking as a creative designer has specific characteristics that an educational platform must absolutely take into consideration.

An educational platform for the area of creative design in the field of architecture and design must be based on identifying the cognitive dimension of the ways of learning, understanding and acting like a creative designer that distinguish it from any other discipline.

The English scholar Nigel Cross has explicitly spoken of Designerly Ways of Knowing and design (in the English meaning of the term) as a discipline to be taught at a basic education level alongside the sciences and humanities. Cross distinguished three cultures: scientific culture, humanistic culture and design culture. His starting point was the results of the research project entitled "Design in general education" (1979) conducted by the Royal College of Arts with the aim of defining the "third culture" in the best possible way and of expressing "Design with a capital D". The report illustrated the differences between science, humanities and design, to make it clearer what is meant by design and what is unique to it.

- The study phenomenon in each culture is:
    - in science: the natural world;
    - in the humanities: human experience;
    - in design: the artificial world.

- The appropriate methods in each culture are:
  - in the sciences: controlled experiments, classification, analysis;
  - in the humanities: analogy, metaphor, criticism, evaluation;
  - in design: modeling, pattern formation, synthesis.

- The values of each culture are:
  - in the sciences: objectivity, rationality, neutrality and concern for "truth";
  - in the humanities: subjectivity, imagination, involvement and concern for "justice";
  - in design: pragmatism, naivety, empathy and concern for "appropriateness"[1].

Creative designers are "finalised for solutions"

Nigel Cross, taking inspiration from the results of Bryan Lawson's experiment which had shown how creative designers are trained to solve problems and not to analyse them, maintains that a fundamental characteristic of creative design activity consists in its reliance on the speedy generation of a "satisficing" solution rather than getting lost in in-depth analysis of the problem. Cross changes the concept of Herbert Simon's satisfactory solution, according to whom the creative design process is a process of "satisficing" rather than "optimising" the solution; that is, the creative design process consists in producing any of those that could belong to a wide spectrum of satisfactory solutions rather than trying to generate "the" best solution, impossible to achieve.

While scientists can suspend judgment with the excuse that more research is needed, the creative designer is obliged to produce a specific and unique result, feasible in a precise and limited period of time. It is for this reason that the creative designer is oriented towards the solution and not the analysis of the problem.

I progettisti affrontano problemi mal definiti

The characteristic of creative design problems is that they are poorly defined or poorly structured. Poorly defined problems are the problems for which the designer has neither a formula, nor a procedure, nor all the information necessary to solve them with the certainty of the correctness of the result obtained.

In such a context it becomes clear why a solution-oriented strategy is preferable to a problem-oriented one: you can proceed at will with the analysis of the problem, but

the objective of a creative designer is, and remains, the proposal of a solution.

It is only in terms of a hypothetical solution that the problem can be contained within manageable borders. What designers tend to do, therefore, is to try to impose a guiding principle or "primary generator" capable of delimiting the boundaries of the problem and suggesting the nature of its possible solution.

Cross then refers to some authors who warn against confusing creative design with science and publishes some quotes[2] which qualify the peculiarities of creative designers' ways of thinking.

"The scientific method is a pattern of problem-solving behaviour employed in finding out the nature of what exists, whereas the design method is a pattern of behaviour employed in inventing things of value which do not yet exist. Science is analytic; design is constructive" (Sydney A. Gregory, 1966).

"The natural sciences are concerned with how things are... design, on the other hand, is concerned with how things ought to be" (Herbert Simon, 1969).

"To base design theory on inappropriate paradigms of logic and science is to make a bad mistake. Logic has interests in abstract forms. Science investigates extant forms. Design initiates novel forms" (James G. March, 1976).

Construction and abduction

The way of thinking of a creative designer is characterised by being constructive, because: "The creative designer recognises (consciously or unconsciously) that some ingredients must be added to the information he already has in order to arrive at a unique solution [...]. The creative designer must go in search of an extra ingredient and to do so he uses his ability to conjecture and think in an original way. So, what is this extra ingredient? In many cases, if not in most of them, it is an "ordering principle"[3]. Constructive thinking is based on a form of abductive reasoning. Such a form of reasoning, according to Charles Sanders Peirce differs from deductive and inductive reasoning because "deduction proves that something must be; induction shows that something is truly operational; abduction simply suggests that something might be".

Abduction is a form of reasoning defined as creative par excellence, because it formulates hypotheses that allow for logical leaps, that is, linking known information to potentially new knowledge.

Any platform should stimulate "reckless" links between the items of information it contains to stimulate creative thinking.

Dangerous liaisons

The cognitive psychologist Philip Johnson-Laird maintains that the product of an act of creation "is formed from existing elements, but according to new combinations for the individual and (in the most fortunate cases) for the whole of society"4. In perfect harmony with the psychologist, Bruno Munari in the book *Fantasia* claims that

"the product of fantasy, like that of creativity and invention, arises from relationships that thought makes with what it knows".

"The imagination will therefore be more or less fervent if the individual has more or less ability to make relationships [...]. If we want the child to become a creative person, with a developed and not a suffocated imagination (as in many adults) we must therefore make sure that the child stores as much data as possible, within the limits of his possibilities, to allow him to make as many relationships as possible, to allow him to solve problems every time they arise"[5]. To be creative, and therefore to design, it is necessary to possess a vast reservoir of knowledge, hence the essentiality of the history of architecture, from which to source and establish relationships and connections, as that reservoir is memory.
In architecture and design, knowledge is called references, precedents or cases, which are nothing other than examples, total or partial, of architectures, of design artifacts, of paintings, of

installations, of sculptures, of novels, of films, etc., which can be reused in various ways (from the generation of the concept to the solution in detail) for a new project, after having being recalled by memory. The use of examples is typical of any creative activity, and it is no accident that in architecture and design schools, creative design courses are based on the illustration and explanation of examples from the past or present, and many authors from different creative disciplines recognise the importance of using knowledge from the past.

A platform for teaching creative design must develop navigation and visualisation systems that stimulate the spontaneous generation of relationships between the examples stored in it.

Case-based design. The role of past experience
The cognitive model based on the creative reuse of past knowledge stored in the creative designer's memory bank is known as case-based reasoning, and when applied to architecture is called case-based design.
Case-based reasoning is a cognitive model formulated in the late 1970s by artificial intelligence scholars and cognitive psychologists with the aim of improving a computer's ability to perform intelligent tasks. The basic idea was to be able to discover what humans do when they think and learn in order to model these activities so as to build smarter machines. Christopher K. Riesbeck, computer scientist and expert in artificial intelligence, and Roger Schank,

cognitive psychologist and expert in artificial intelligence, whose studies are at the base of CBR theory, claim that

case-based reasoning is the essence of how humans work. People reason from experience.

"They use their experience, if they have a significant one available, or they use the experience of others in order to derive information from those experiences", and, the scholars continue, "virtually, whenever there is a case from the past available about which to reason, people will find it and use it as a model to make their decisions in the future. This 'case-based reasoning' process can be very beneficial for those who have to make decisions and know a large number of cases and have been able to index them in a such a way that the most relevant cases come to mind when they are needed"[6].

The case-based reasoning approach overturns the traditional cognitive model - according to which knowledge resides in human memory in the form of general and abstract principles, as are rules (in which case we refer to "rule-based reasoning", and models (in which case we speak of "reasoning-based on models", otherwise called "reasoning starting from first principles"), and people reason by applying the principles appropriate for the problems they face - arguing that when a person reasons, he/she does not create relationships and links with abstract elements of knowledge, but remembers and recalls "concrete examples" of the past in order to compare them with a new situation, to take, by virtue of these, adequate decisions to solve a particular problematic situation or to understand a situation.

The advantage of a case is that it offers those who need to solve a problem a concrete example of how a similar problem has been solved in the past. It is a very efficient, fast way, and it is based on not too complicated inferences.

Case-based design is an advantageous cognitive mechanism for creative designers who, given that they do not possess "formulas" to solve a problem and be sure of the correctness of the result, can however resort to cases which, recalled and recombined, can satisfactorily solve a poorly defined problem in a reasonable time. Any platform dedicated to creative design subjects must contain suitably indexed cases in order for them to be summoned.

The "sketched" dialogue between teacher and student. The place where knowledge is put into action

The "locus" where the student puts knowledge into action is in the dialogue sessions on creative design with the teacher. It is an intermediate context between professional practice and the specialist world of academic knowledge. Here the student learns by doing in two ways: dialogue (maieutic) with the teacher and the sketch.

The sketch is a meta-language through which the creative designer is able to translate the abstract thought of a functional request into an artifact.

According to Nigel Cross, one of the inherent characteristics of the way of thinking of a creative designer is the ability "to think in the

form of sketches, in this way the abstract patterns of user requests are translated into the concrete patterns of a real object"[7].

The designer's thought processes are based on the relationship between internal mental processes and their expression and re-presentation in the form of sketches. Santiago Calatrava states that "you start by seeing the thing in your mind, it does not exist on paper, and then you start making simple sketches and organise things and then you put one layer on top of the other [...]. It is above all a question of dialogue"[8].

By recognising the dialogue or conversation between internal and external representations means admitting, says Nigel Cross, that "design is reflective"[9]. The sketch is a medium that allows you to express preliminary ideas on which to reflect. Ideas to be taken into consideration, to be reviewed, to be developed, to be cancelled and which can be revisited.

All these verbs act during the correction sessions in the form of dialogue and illustration between teacher and student, between expert and novice. It is precisely there that the aspiring creative designer learns, when the teacher analysing together with the student the sketches and illustrations which is the precise one during the design process that manages to bring out his student ideas and give them shape or a new rearrangement by suggesting project references that he/she believes have solved or can solve similar issues and teaching, through dialogue and sketching, inexperienced students how to develop that case or cases adequately.

According to Donald Schön, architecture is the discipline in which "reflective conversation between the professional and his objects"[10] takes place to the maximum degree during action, and that "reflection in action" is a professional competence typical of creative designers.

A digital platform for/by designers must implement tools that sti-

mulate and encourage reflection in action during the correction sessions, otherwise it is destined to remain unused.

Note
1. Nigel Cross (2006), *Designerly Ways of Knowing*, Springer, London, pp. 1-2.
2. *Ibid.*, pp. 7-8.
3. *Ibid.*, p. 8.
4. Philip Johnson-Laird (1994), *Deduzione Induzione Creatività. Pensiero umano e pensiero meccanico*, Il Mulino, Bologna, p. 163.
5. Bruno Munari (1999), *Fantasia*, Laterza, Roma-Bari, pp. 29-30.
6. Riesbeck, Schank (1989), *Inside Case-Based Reasoning*, Lawrence Erlbaum Associates, Publishers, Hillsdale, New Jersey, cit. nel paragrafo "1.3 The Basic Planning Algorithm" (ebook edition).
7. Cross, cit., p. 33.
8. Bryan Lawson (1994), *Design in Mind*, Architectural Press, Oxford, p. 8.
9. Cross, cit., p. 33.
10. Schön, Donald Alan, (2006), *Formare il professionista riflessivo. Per una nuova prospettiva della formazione e dell'apprendimento*, Franco Angeli, Milano, p. 79.

#8

A necessary objective: Design Oriented Learning Management Systems

Alberto Giretti

The key role that the formation of creative skills plays in the national education system and, more generally, in the national economic system, as well as the specificity of the requirements required by this area in terms of academic organisation, systematisation of the training process and the adequacy of the cognitive-pedagogical construct, raises the problem of defining adequate computational architectures to support the formation of design thinking. The system of requirements that guides the development of these architectures extends along a very broad horizon of problems, from more strictly strategic academic issues to tactical questions of intellectual capital management generated by decades of excellence training, right up to the point of pedagogical-cognitive issues related to the cognitive engagement of the learner.

The strategic plan

The drive for innovation that is enhanced by creative processes underlying creative design activity is playing an increasingly important role in production processes, making the training of designers a key element for competitive development and sustainable growth. However, the teaching of creative design in universities does not seem to adapt to the training needs of a highly dynamic and specialised intersectoral industry.

Universities are characterised by a substantial isolation of the centres of learning, by a clear division between the various curricula and by their excessive rigidity.

All this entails a pervasive difficulty in harmonising disciplines quickly and effectively according to the dynamic needs of the skills market. Modularity of content, system of skills and flexible, multi-disciplinary and complementary management policies of the rigid academic structures are the organisational challenges that arise for new generation training systems.

The tactical plan

We are witnessing a total absence of the enhancement of excellence produced by the education system. The training of the creative designer is not yet seen as a source of knowledge and a melting pot of innovation. The centuries-old education activity of creative designers in the various environments of architecture, industrial design, and mechanical, electronic and construction technology has not produced an explicit and significant sedimentation of training competences. Schools follow one another, excellences leave footprints that tend to fade with time, and the system tends to evolve with a marked lack of optimisation. The knowledge produced in the creative design education process, due to the open nature of creative design itself, is characterised by a strong component of uniqueness, due to the specificity of the teacher-learner interaction. This singular factor, a fundamental educational value that characterises the training of creative designers, is left to fall into disuse from time to time because of a training methodology based on traditional and, in many ways, obsolete techniques. In the last few decades, the training of creative designers has had unprecedented opportunities to exploit sophisticated and powerful operating tools, which have however been hardly used for the purpose of enhancing the knowledge generated by the process itself.

Knowledge management positions itself therefore as the discriminating element to characterise design-oriented training systems. Knowledge generated, capitalised and reused to amplify the dynamics of the learning process, and to make explicit the unique values offered by the education system.

Knowledge management systems, therefore, but oriented towards creative design: Design Oriented Ontologies, but also Case Based Design Systems, as well as Design Rationale Capture Systems perfectly integrated in the education process.

The operating plan

We have already partially discussed the specificities of the cognitive system that must be developed for an adequate education in design thinking, for creative ideation and systemic management of ill-defined processes. In this context, the specificity of the exploration of a non-superordinate space of solutions and the dynamic structure of the system of requirements raise the need to implement sophisticated man-machine interaction solutions that mature in the learner the ability to manage their own meta-cognitive plan. Many tools can be used for this purpose, some of them typically analytical-procedural, capable of amplifying the exploratory phase, others of a more conceptual nature, capable of supporting reflective moments. On the one hand we include the generative grammars and in general the exploratory techniques of computa-

tional creativity, on the other the interfaces oriented to brainstorming and reflective thinking[1].

State of the art

The systems currently used in distance learning support can be classified into three main categories:

- systems for collaborative work (Computer Supported Collaborative Works - CSCW);
- systems for the management of distance learning (Learning Management Systems - LMS);
- virtual laboratories (Virtual Laboratory - VL) which include support systems for experimental laboratory activities and virtual reality systems.

Computer Supported Collaborative Works - Collaborative work support systems have been developed for team management in the corporate sphere. They allow for a quick configuration of work groups to which resources are assigned for document and workflow management. They are designed to best support information sharing, operational collaboration and to virtualise the dimension of co-presence through videoconferencing. Appropriately configured, these systems can offer substantial operational support for distance learning, even if their workflow, somewhat rigid and oriented towards productivity, poorly supports the cognitive system underlying distance learning.

Learning Management Systems - LMS systems are dedicated to the management of the delivery of educational content, encoded in interoperable formats (e.g. SCORM) and to the automation of the process of assessing the skills acquired. Their application varies according to the needs of the application context. In a corporate

environment, LMS systems are applied with a high level of auto-mation, as the continuous training cycle which when implemented still guarantees an acceptable return-on-investment. In the univer-sity environment, where the training system is one of the organi-sation's core businesses, LMS systems are mainly used in blended mode, as systems for the rationalisation of content management and support for some phases of the education process.

Virtual Laboratories - A virtual laboratory is a learning experien-ce that simulates the experimental dynamics of a real laboratory. The software moves this crucial part of scientific education into the virtual realm by allowing students to complete laboratory experiments and explore concepts and theories. Virtualisation has several advantages in terms of operating costs and above all of the number, variety and variability of the experimental appara-tus. There are many types of virtual laboratory simulations, from simple 2D animations, which can be viewed on the desktop, to ad-vanced 3D experiences, which can be viewed in immersive virtual reality headsets. Experiments can take whatever form a simula-tion model can develop, from elementary physics to the simulation of complex processes, such as those of building and infrastructure construction.

Design Oriented Learning Management Systems
Developing an architecture for LMS that meets the needs of design training basically requires the integration of support systems for distance learning and team work, subject to some fundamental pa-radigmatic shifts and functional extensions that offer effective and significant support to design thinking.
The technological scenario that we have illustrated so far raises some fundamental questions:

poor attention to creativity and, in particular, to visual thinking, lack of support for reflective thinking, lack of integration of operational knowledge and, more generally, lack of management of the knowledge cycle.

Interfaces

In its more generally accepted sense, which also includes architectural and creative design projects, the creative design process can be seen as a critical path that combines formal aspects and functional needs in defining the structure of the artifact.

The formal conception triggers a reflection on the visual plane which can be amplified through the support of generative and transformative algorithms. The integration of these computational modules in the user interface greatly expands the exploration possibility on a perceptual level. Virtual reality systems function along the same line, which in fact extends the exploration of the perceptual field to the complete kinesthetic sphere.

The semantisation of the formal idea leads, instead, to a creative design reflection on the logical-conceptual level. Thought takes on a dialogic-critical form that finds its substance in categorical and relational systems.

The visualisation of the category structure allows the critical analysis of the semantic structure of the artifact and contributes to the strategic and therefore meta-cognitive vision of the creative design process.

Lastly, technical operations are substantiated by the interoperabi-

lity of a plethora of applications designed to quantify the functionality of the artifact in the different performance domains.

The system of interfaces thus defined recreates an eco-system of tools for creative design support that on the one hand is spread over the various operating levels, from conception to technical development, and on the other colours all forms of reasoning of design thinking.

To date, however, there is no platform capable of guaranteeing the correct interoperability of the computational systems that can contribute to the creation of this eco-system at the different levels of abstraction and cognition. The ultimate limit is to be found in the difficulty in defining the system and dynamics of ontologies that regulate knowledge in the various cultural spheres and allows the various systems to cooperate on a coherent, however dynamic, basis of knowledge and representation.

Design Flow Control

Creative design is a notoriously ill-defined process, meaning that the space of progress of the project, i.e. the articulation of the various generative possibilities, is dynamically defined in parallel with the development of the creative design idea. The creative design process cannot therefore be reduced to a simple problem-solving step. Its control requires an open structure, along the lines of blackboard systems. The logic behind the functioning of these systems can be profitably used as a metaphor for creative design in a team. Blackboard systems are made up of a shared workspace (the blackboard) consisting of several knowledge sources capable of interpreting and processing the information present in it, based on an agenda of operational tasks proposed from time to time by the individual protagonists. The individuals react to the insertion of new information according to their areas of expertise by propo-

sing new tasks, which are managed by the control agenda. Knowledge sources can be both creative designers who collaborate in teams and automatic computer systems. The definition of the task execution order is defined on the basis of heuristics. The heuristics can be defined in the most appropriate ways, for example, in the conceptual ideation phases, morphing algorithms or shape grammars can be activated to deepen the morphological exploration, or, alternatively, pattern recognition systems for the semantisation of the form generated.

Blackboard systems are suitable for the management of ill-defined processes with high complexity and high knowledge density. In their goal-oriented attitude, they extend the collaborative paradigm of generic groupware systems to support co-design. On the didactic-educational level, goal-oriented systems facilitate the establishment of team learning processes. In fact, the appropriate environment for collaborative learning requires well-structured situations in a rich operational-professional context and materials organised specifically to reflect the development of creative design ideas.

Creative design is a knowledge-intensive process. It uses large quantities of knowledge and produces knowledge, both as an absolute value (ideas, innovation) and as a didactic value with high educational merit (typical errors, significant cases, new conceptualisations, etc.).

Conoscenza

Broadly-structured knowledge capable of semantically enriching the content of creative design solutions in the ideative moments creates the conditions for the cognitive engagement of the learner, that is, for the application and strategic use of knowledge, in a self-regulated learning process and conducted on a meta-cognitive level.

One of the aspects that most characterises the development of ill-defined problems is the need to define the problem space at each step of the creative design iteration. Defining the space of the problem means establishing the system of relevance and pertinence relating to the open issues in the project agenda. Technically this problematic aspect is called a frame-problem. Solving frame-problems involves the use of models that cannot be defined in closed form, due to the complexity of the state space.

On the conceptual level, the semantic web lends itself to the codification of open categorical structures, with nuanced logic, and, similarly, neural systems can introduce interpretative skills on the perceptual plane.

With respect to this perceptual-conceptual potential, it is possible to define technical solutions that reflect the traditional practice of using creative design references in academic education. Case-Based Reasoning (CBR) is a process of analysis and development of problematic issues that exploits the analogies with situations for which a good structured knowledge base has already been built. CBR is a form of analogical reasoning based on prototype theory, therefore it is also a cognitive model of human reasoning, and can be profitably used in the proposition, analysis and development of creative design issues.

Design Knowledge Management

A provocative question asks: "If you're so intelligent, why aren't you rich yet?"[2] The problem lies in the fact that the knowledge we all generate is rarely capitalised. Intellectual capital is material knowledge, an experience that can be used to create wealth. It is collective brain power. Intellectual capital is difficult to identify and even more difficult to implement effectively, however, once discovered and exploited, it becomes the competitive factor. Design Knowledge Management is the capacity to capitalise on the values of creative design, the formal and technical solutions that have encapsulated the winning solutions or the most penalising errors.

Implementing the knowledge management cycle requires the extraction of knowledge, coding and storage for its reuse.

The cognitive qualities of the technical eco-system outlined so far are therefore fundamental for the enhancement of the knowledge cycle that is implemented daily and generates a highly competitive potential in our training experiences in design thinking.

Conclusions

The discussion held so far has outlined the characteristic features of design oriented architectures, has highlighted the key aspects which, implemented in a technological eco-system, not very dissimilar in any case from the frameworks existing today, would allow for the amplification of the value generated by the training processes referring to design thinking. We have seen how the main

obstacle that prevents the construction of such an eco-system lies mainly in the lack of a substrate of coded knowledge that would allow the various technological systems existing today to make the functional leap and become cognitively adequate machines. Unfortunately, we are still far from defining knowledge engineering techniques that allow us to codify and functionalise large sectors of disciplinary and methodological knowledge. On the other hand, this is a road that is currently unavoidable, whose main protagonists are not so much the managers of technical skills as the holders of knowledge of the subject. Only through long and systematic work of structuring the subject skills will it be possible to bridge the functional gap of the current training systems to achieve genuine design-oriented training.

Note
1. Donald A. Schon, (2006), *Formare il professionista riflessivo*, Franco Angeli, Milano.
2. Thomas A. Stewart (1999), *Il capitale intellettuale. La nuova ricchezza*, Ponte alle Grazie, Firenze.

Biographies

Federico Cinquepalmi holds a degree in Architecture and Planning from the Università Iuav di Venezia and a PhD in Science and Technology of Industrial Innovation from the Sapienza Università di Roma. Since 2009, he has been a permanent researcher/technologist at the Istituto Superiore per la Protezione e la Ricerca Ambientale (ISPRA) in Rome. Since 2010, he has been a Director at the Italian Ministry of University and Research, first as Director of the Office for the Internationalisation of Italian Research, and from 2015 until today as Director of the Office for the Internationalisation of Higher Education. Over the past twenty-five years, he has concentrated his research and teaching activities in the sectors of technologies applied to building environments, sustainable development and energy and environmental policies, carrying out his activities in numerous universities and centres of national and international research. Among others: the Università Iuav di Venezia (Italy), the National Research Council (CNR); the US National Oceanographic Atmosphere Administration (NOAA); the University of Massachusetts - Urban Harbor Institute of Boston; the Sapienza Università di Roma; the Geography Department of the University of Cambridge in the United Kingdom and the Polytechnic University of Tirana in Albania.

Elisabetta Cianfanelli, architect, graduated *cum laude* and with the publication of her thesis in architecture from the Università degli Studi di Firenze. Winner of the Compasso d'oro (Golden Compass) with her graduation project, she achieved her specialisation in Design at the Università degli Studi di Firenze with a thesis in Design of Urban Transport Systems. Full Professor of Design, President of the Master of Science in Fashion System Design course, Director of the rei | Reverse Engineering and Interaction Design Laboratory, Director of the dit | Laboratory of Italian Design for trains and Director of the smi | Laboratory of Science for Made in Italy. Since 1995, she has carried out research at dida in the fields of design for project research of complex products, and product systems, arriving at the study and testing of new processes aimed at the wearable products system. She is the head of science for Italian and European research projects in various areas of design, in particular in the evolution of processes for Made in Italy products and, in the international field, in interdisciplinary research in the most innovative fields of design, in particular those emerging from the relationship with digital technologies.

Massimiliano Condotta, architect, graduated cum laude in architecture from the Università Iuav di Venezia and holds a PhD in "Architecture, city and design - New technologies and information territory and environment" at the same University, where he is lecturer in Technological Design and Technology of Architecture.
He carries out research in various national and international projects.

The research topics concern: the use of innovative technologies and IT for the management and construction of architectural projects and as tools to support creative design; sustainable architecture understood as the design of ecologically efficient buildings, but at the same time in dialogue with the living environment and the urban context towards an integration between energy sustainability and cultural sustainability, and the environmental design of urban contexts with the experimentation of innovative models for the governance of projects and co-creation assisted by new technologies.

He collaborates with the Getty Research Institute of Los Angeles, California, at the International Terminology Working Group of the Digital Art History Access Department, and with the University of Manchester - Faculty of Humanities, where he is visiting professor at the School of Environment, Education and Development (SEED).

Debora Giorgi, architect and PhD, from January 2018 she has been a fixed-term researcher type "b" in Design (ICAR/13) at the Department of Architecture of the Università di Firenze (dida-unifi) and in September 2018 she obtained the national scientific qualification as associate professor. Since 1991, she has been dealing with issues related to Sustainable Local Development and the social and educational implications of the project in the context of Service Design.

For over twenty years she has worked as coordinator or expert in international projects in Ethiopia, Algeria, Tunisia, Morocco, Yemen, Jordan and Haiti, with the major national and international donors: WHC - UNESCO, UNCCD, World Bank, European Commission, WMF, AICS.

Since 2011, she has collaborated with dida-unifi - as well as in research and teaching, she participates in the development of educational and training internationalisation projects (Tempus and Erasmus+ projects). She also actively participated in the construction and implementation of the MIUR project for the co-creation of the École Euro-Méditerranéen d'Architecture Design et Urbanisme at the Université Euro-Méditerranéene de Fès (EMADU - UEMF) in Morocco.

Alberto Giretti is full professor at the Department of Civil Engineering, Construction and Architecture (DICEA) of the Università Politecnica delle Marche. He obtained his Master's degree in Electronic Engineering in 1990 at the Università Politecnica delle Marche and a PhD in Artificial Intelligent Systems in 1995 at the same University. His research interests concern the application of artificial intelligence to support design processes and to the management of the construction process. Alberto Giretti has participated in numerous national and international research projects since 1991. Among these, he was scientific coordinator of the European 5th FP WINDS project, he was responsible for the UNIVPM group in the European eContentplus MACE project and the scientific coordinator of the European 7th FP SEAM4US project. He has carried out

technology transfer and consultancy activities for the public administration and private companies. He was co-founder of the spin-off company Nautes, where he directed the research from 2001 to 2005. In 2012, he was Application Grant Reviewer for the National Science and Engineering Research Council of Canada. He served as vice-president of the MACE association, an international follow-up to the EU MACE project. The publication of the results of this research led to the Best Paper Award at the 2009 EATEL conference. Since 2005, Alberto Giretti has taught courses in area 08/C1 (Design and Technological Design of Architecture) at the Università Politecnica delle Marche on Digital Construction Management and Facility Management. He has been invited as a speaker to international conferences and seminars. He has been a degree and doctoral thesis supervisor, and has also been an international member of three doctoral commissions abroad. Alberto Giretti has published more than 100 articles in national and international scientific journals.

Saverio Mecca, architect and full professor of building process management at the Università di Firenze, he is currently Director of the Department of Architecture of the Università di Firenze, since January, 2013. From 2015 to 2020 he was President of the Italian University Conference of Architecture (CUIA) and of the Association of Italian Universities of Architecture.
Former researcher at the National Research Council in the sector of economics and construction process management, he was full professor of Construction Technology at the Università della Calabria from 1992 to 1999, at the Università di Pisa from 1992 to 2002 , and subsequently full professor in the sector of building process management at the Università di Firenze since 2002.
He has also worked as a professional architect and as a supervisor for the construction of architectural projects.
He works actively in the academic research of his university department, in the field of architectural heritage and construction management and, of course, in architectural design. In recent years, he has actively worked on European projects for degree and postgraduate courses in the macro-Mediterranean region; he is also a member of the ISCEAH - ICOMOS group of UNESCO.

Antonella Trombadore, architect, graduated cum laude in Architecture from the Università di Palermo, obtained her doctorate from the Università di Firenze in Architectural Technologies with a thesis in S*ustainability and E-learning. New didactic paradigms for the diffusion of the principles of Sustainable Architecture in developing countries.*
Fixed-term researcher type "a", qualified for II band 08/C1, she is a lecturer at the Environmental Design Laboratory in Florence and Tirana. Since 1999, she has carried out research at the dida and the Interuniversity

Centre ABITA on international projects such as TIA (Teaching in Architecture), TAREB (Teaching About Renewable Energies) for the creation of multimedia teaching packages, including the definition of the ABITA European Masters Course and coordinating the blended Master SUARCH (Sustainable Architecture). Team leader of numerous European research and Erasmus+ courses, she has organised the scientific and design activity on the interdisciplinary declinations of the quality and environmental sustainability of buildings and urban systems, towards eco-compatible technologies for the regeneration of the existing building heritage in the Mediterranean context. Contract expert with the Research Executive Agency of the European Commission for the evaluation of horizon projects, she is the author of numerous scientific publications and a member of international networks such as PLEA and WREC.

Matteo Zambelli graduated in Architectural Design at the Università Iuav di Venezia and obtained a PhD in Building Engineering at the Università Politecnica delle Marche. He has held courses in "Architecture and architectural composition" and "Theories of architecture" in the Engineering Faculties of Ancona and Trento. He was a fixed-term researcher of type "a" at the Department of Architecture of the Università di Firenze (dida-unifi), where he was responsible for the "Methods for the quality of creative design" course. He is interested in Design Methods and approaches to teaching of creative subjects. He has taken part in national and European research projects dedicated to distance learning in the field of architectural design, architecture technology and construction management, in particular WINDS (Web-based INtelligent Design tutoring System) and MACE (Metadata for Architectural Contents in Europe). He has written and translated architecture theory books; recently, he has published a book dedicated to cognitively-based approaches to creative design entitled *The Mind in Creative Design. The analogy and metaphor in architecture and design*. He is co-founder and director of the series "La Mano che Pensa" for Safarà Editore. He contributes to the magazines «Abitare», «Arketipo» and «L'Industria delle Costruzioni».