

# PROLEGOMENA OF THE FUTURES OF HIGHER EDUCATION 2051

**Piero Formica,**

**Innovation Value Institute, Maynooth University, Ireland**

**<https://ivi.ie>**

In this preliminary exposition of the principles and propositions for the future of higher education, I will focus on the universities. I address some issues to be incorporated into the work plan, for they influence the evolution of higher education according to the decisions to be taken and implemented.

The University is 'Multiversity', enunciated the first chancellor of the University of California, Clark Kerr. The term 'multiversity' he coined describes the multiple and parallel missions that universities have to fulfil. These missions range from education to moving the frontiers of knowledge forward and breeding new generations of transformational entrepreneurs – those who create "innovative solutions to the world's biggest problems that are scalable, sustainable and systematic".

## **1. GOVERNANCE**

### **History and established practices**

Governance outlines and guides the decision-making process that charts the course of studies and research.

The person in charge of the university is either appointed or elected. The two methods influence the formation of the decision-making process differently.

In 1088, Bologna brought an invention to the international knowledge community: the 'University'. The website of the Alma Mater, the University of Bologna (unibo.it), states:

*The Studio Bolognese was not created by the will of a sovereign or by an organised group of masters but arose through some students' spontaneous and informal initiative.*

In short, a university created by students for students. They were organised in *Nationes* according to the origin and language of their members.

The practice established over time shows a patchy landscape. Here are a few examples:

In the US, the President is usually an internal professor, appointed by a board that governs the university (i.e., by representatives of shareholders, if private universities or state bodies, if public).

In private, not-for-profit universities, there are diverse appointment systems, but often alumni associations play a significant role.

Among successful universities with high international rankings (see QS World University Rankings), Oxford's Chancellor is appointed for life by the Convocation, which *consist of all the former student members of the University who have been admitted to a degree (other than an honorary degree) of the University, and of any other persons who are members of Congregation or who have retired having been members of Congregation on the date of their retirement.*

In 2021, The Governing Authority of Maynooth University has appointed President Eeva Leinonen, a Finnish professor from Murdoch University in Perth, Australia.

In Italy, there is an election and, therefore, there are electoral campaigns with promises and exchanges of votes between candidates. A vote is cast within the framework of an enclosed garden. Quasi strangers are the students who had a right to vote lighter than a feather in the 2021 elections at the Universities of Padua and Bologna. And yet, it was students who gave birth to the two universities.

## **2. STUDIES**

### **From Specialists to Polymaths**

The University is 'Multiversity', enunciated the first chancellor of the University of California, Clark Kerr. The term 'multiversity' he coined describes the multiple and parallel missions that universities have to fulfil. These missions range from education to moving the frontiers of knowledge forward.

From the juvenile period of the universities onwards, for several centuries, the universities trained individuals whose knowledge spanned a substantial number of subjects. Students acquired the 'Polymath' profile, the multifaceted and versatile person having learned a great deal to excel in different bodies of knowledge and combine them to generate change.

For some time now, universities have been mainly organised into disciplines isolated from each other and with few links. Each student enters a disciplinary silo, a well of knowledge that the student descends to the bottom. This is how one becomes a Specialist, a person who knows more and more about less and less until she or he knows everything about nothing. The deeper the well, the less the light that penetrates into it. Each specialisation is a repository of knowledge, better known in the professional circles as the 'knowledge map', where nothing should be left to chance and

nothing improvised—something that is perhaps reassuring but which at the same time exposes its outer edges to dramatic events. We need only to recall the sinking of the RMS Titanic in 1912, a vessel of which it was said at the time that nothing had been left to chance according to the knowledge of experts, who failed to recognise their errors.

Nowadays, we run the risk to regress towards mediocrity while a large set of converging technologies, such as cloud computing, machine learning, artificial intelligence, blockchain, brain-computer interfaces, nanotechnology, robotics, Internet of things, digital medicine, synthetic biology, genomics, genetic engineering is gaining ground very fast.

A revolution can present itself at the same time as a season of light and darkness, an age of wisdom and madness, the best and worst time to live. To turn the tide in our favour, we need to hold hands to solve the real problem that, according to the behaviour psychologist Burrhus Frederic Skinner (1904–1990), 'is not whether machines think but whether men do'.

It is up to human beings to think socially to communicate and collaborate in such a way that robots are assigned tasks that benefit humanity. For this purpose, the university should place the Polymath under the spotlight. Informed by credible and consistent narratives of the role played by a versatile and contrasting personalities such as Marin Mersenne (1588–1648), students will be trained to participate in collaborative processes, building a bridge between science and humanities studies. Father Mersenne was a French polymath who fought the custom of secrecy of the calculation experts of his time, who were named 'cossisti' derived from the Italian word 'cosa' ('thing') because they used symbols to represent unknown quantities. 'Secretary of cultured Europe', as René Descartes (1596–1650) appealed to him, Mersenne believed in the equality of intelligences and encouraged the exchange of ideas and working in a spirit of collaboration, thus pre-empting the birth of the Academy of France.

### **Setting sail towards transdisciplinarity**

Interdisciplinarity has entered the scenario representing the future of university studies. Interdisciplinarity combines two or more disciplines to a new level of integration. Component boundaries start to break down. A further step forward is transdisciplinarity. Transdisciplinarity means that two or more discipline perspectives transcend each other to form a new holistic approach. Moreover, its practice transgresses disciplinary boundaries.

As the various scientific and humanistic branches of knowledge converge, integrative thinking should be promoted So much that the most advanced educational models break down traditional knowledge barriers, building transdisciplinary bridges. Students should then be allowed to carve out

custom-made study clothes, contaminating scientific subjects with humanities. This means that subjects about natural sciences, human and social sciences (law, sociology, philosophy, psychology, economics, politics, and the like) climb out of the deep hole of their super-specialised knowledge wells.

Last but not least, research around issues such as artificial intelligence, data science and behavioural science is increasingly transdisciplinary. Consequently, the third-millennium university is called to promote STEAM (Science, Technology, Engineering, Arts, and Mathematics) over STEM (Science, Technology, Engineering, and Mathematics) by crossing all subject spaces. Accordingly, technological artefacts are the other face of acts of humanity conceived by human beings.

### **STEAM education**

In our time, the rise of artificial intelligence and digital transformation has put technical know-how on the ropes, and it can only be brought back to life if it is coupled with Thinking, Imagining and Understanding. A combination of the 'four forms of knowledge' that requires familiarity with the arts. The 'STEM' of Know How To Do gives way to 'STEAM', which breaks the spell of incomprehension and incommunicability between literati and scientists. It is replaced by mutual attention and dialogue, as advocated by the English scientist and writer Charles Percy Snow (1905-1980) in his book *The Two Cultures and a Second Look* (Cambridge: University Press, 1959).

The intertwining and merging of knowledge give rise to new thoughts that lead to discoveries and innovative entrepreneurial activities. Einstein said that reading the Scottish philosopher David Hume's writings helped him formulate the theory of special relativity. Assimilating the thought of the humanist Pietro Bembo, the technologist Aldus Pius Manutius invented the pocketbook, the one that can be read anywhere and not only in libraries and lecture halls. Charles Darwin is said to have considered the paintings of plants and landscapes by the botanical artist Marianne North to be excellent examples of his theory of natural selection.

The proximity of art to business was explored and experimented with by artists whose apprenticeship took place in the cradle of craftsmanship. Thus, the futurist Fortunato Depero, whose early experiences were forged working as an apprentice in a marble workshop, came to design graphic symbols and typefaces for industrial products. From his experiments in miniature art, the carpenter Ole Kirk Kristiansen laid the foundations of the Lego Group, the Danish manufacturer of toys (plastic 'bricks'), turning an artistic production into a major industrial success. These are but two examples among many of the intertwining of art, craftsmanship, innovation and business.

In science, the medical industry using virtual reality requires artists and designers who can collaborate with scientists to develop new interactive and immersive models and tools for medical research, training and education, and drug discovery, simulation, and modelling.

### **From teaching to learning how to walk in a vacuum**

Teachers instruct learners how to use the maps of consolidated knowledge – containing what needs to be learned to be competent to perform a specific activity. However, it is 'not knowing' the engine that drives the exploration process to design ex nihilo ('from the void') innovative paths. The probability of success relies not on objective analysis as on a feeling, an estimation or a belief of learners featured as path creators who have clever legs and a foolish brain, enabling them to be flexible and responsive to opportunities.

Ideas are shaped by walking into the void of knowledge without predetermined destinations. Learners creating paths enjoy competitive pastimes, discover subtle analogies and, by sagacity and accident, exceed the boundaries set by knowledge maps to open up new, unprecedented routes and connect them. In changing trajectories, path creators reveal latent, unexpressed people's needs, who will replace their traditional wants with new, revolutionary ones brought forth from seemingly nothing.

Those learners are creative ignorant constantly search for the inner nature of things through intuition. Here the process of 'learning by learning we were wrong' – Professor Stuart Firestein says – takes over the teaching process. Learners exploring ignorance – 'agnotology' is the term coined by the historian of science Robert N. Proctor – understand that ignorance is healthy rather than a misguided deviation from the norm. At Columbia University, Firestein, Chair of the Department of Biological Sciences, is an explorer. He claims that overcoming the limits of the known requires an ability to remain in the realms of the unknown, which, to adapt a saying of Confucius, can be likened to finding a black cat in a dark room, especially if there is no cat. In his own words,

*I began to sense that the students must have had the impression that pretty much everything is known in neuroscience. This couldn't be more wrong. I had, by teaching this course diligently, given these students the idea that science is an accumulation of facts. Also not true. When I sit down with colleagues over a beer in meetings, we do not go over the facts, we do not talk about what's known; we talk about what we'd like to figure out, about what needs to be done.*

The Contamination Lab (C\_Lab) at the University of Padua is equipped with an experimental business laboratory where the learning process takes over the teaching process to cultivate abstruse questions that reveal unusual paths to go. Learning prepares the mind to understand ignorance as

something normal rather than deviating from the norm. C\_Lab learners exploring ignorance take pleasure in not finding what they were looking for, and they are not afraid to confront the uncertainty that comes from the 'unknown unknowns'. That is how the facts classified as immutable, fixed once and for all, are challenged and proven wrong.

### **Wandering students**

Founded in 1088, the *Alma Mater Studiorum*, the University of Bologna, was entrusted with the mission of bringing knowledge and culture out from the monasteries. Mother of the universities of the Second Millennium, it was the favourite destination and centre of gravity for students wandering along the pathways of knowledge.

Contemporary, talented individuals who circulate internationally are the wandering clerics of the twenty-first century. It is they who create and participate in networks that exist without borders on the value-added flow of collaborative advantage, which connects research at its source to downstream commercial exploitation through the creation of companies involved in the new markets for knowledge. This international free flow of talent enables knowledge-intensive, globally conceived start-ups to flourish. These are the people and the enterprises that shape the highly dynamic, emerging knowledge zones populated by new, creative professionals.

## **3. RESEARCH**

### **Useful and useless knowledge**

Reassessing what is termed 'useless knowledge' is a task to be addressed in planning the future of higher education.

Useful knowledge is the knowledge that changes behaviour. New ways of thinking and acting make acquired knowledge obsolete. The obsolescence leads to such accelerated changes in the status quo that the ability to understand the present and predict the future is greatly weakened.

Benjamin Franklin, the eclectic scientist and one of the founding fathers of the United States, emphasised useful knowledge, i.e. knowledge that can be applied to a specific use. It is the outcome of conversations that occur in collaborative investigations in the course of experiments. The Open Innovation Strategy and Policy Group of the EU (<https://ec.europa.eu/digital-single-market/en/open-innovation-strategy-and-policy-group>) aims to achieve with experiments the flow of knowledge from its source upstream to the point of exploitation downstream.

It was Abraham Flexner, an American educational theorist, who emphasised the usefulness of (apparently) useless knowledge. He said so

in an article entitled *The Usefulness of Useless Knowledge*, which appeared in Harper's Magazine in the June-November 1939 issue, *From a practical point of view, intellectual and spiritual life is, on the surface, a useless form of activity, in which men indulge because they procure for themselves greater satisfactions than are otherwise obtainable. In this paper I shall concern myself with the question of the extent to which the pursuit of these useless satisfactions proves unexpectedly the source from which undreamed-of utility is derived.*

In the 1930s, the philosopher Bertrand Russell wrote in his essay *In Praise of Idleness* (London: George Allen & Unwin Ltd, 1935), *Perhaps the most important advantage of "useless" knowledge is that it promotes a contemplative habit of mind. There is in the world too much readiness, not only for action without adequate previous reflection, but also for some sort of action on occasions on which wisdom would counsel inaction. People show their bias on this matter in various curious ways. Mephistopheles tells the young student that theory is grey but the tree of life is green, and everyone quotes this as if it were Goethe's opinion, instead of what he supposes the devil would be likely to say to an undergraduate. Hamlet is held up as an awful warning against thought without action, but no one holds up Othello as a warning against action without thought.*

### **Pure and applied research**

Einstein said that the mind is like a parachute; it only works if it opens. However, if there are walls in our mind, the parachutist lands on a closed space. Researchers willing to cross over into fundamental research after having fought on the other side and vice versa broke down those walls.

As the historian and sociologist Steven Shapin put it in an interview following his book *The Scientific Life. A Moral History of a Late Modern Vocation* (The University of Chicago Press, Chicago, 2008), *If we look at the pure research done in industry and that done in academia, many of the most popular contrasts describe the situation rather poorly. If autonomy is the issue, many industrial scientists from early in the twentieth century enjoyed as much of that as their academic colleagues. And the same applies to notions of secrecy and openness. A clear contrast of quality between the university and industrial science similarly seems not to hold, while a presumption that applied research and development requires less brain-power than pure research is just dogmatic.*

In innovation, what counts is the researchers' reflexivity and speed once they move from pure to applied research, from publication in the most authoritative international journals to the entrepreneurial translation of the scientific discovery by its author.

### **Non-institutionalised research**

Today, highly institutionalised research programmes abound. In the future, more space will have to be given to low-institutional programmes.

The words of the research are challenging: controlled sloppiness, distraction, oversight. One thinks of the sloppiness of the Scottish scientist and Nobel Prize winner for Medicine Alexander Fleming, who neglected cleanliness and order in his laboratory; from one of his mould-contaminated cultures, Fleming would go on to discover penicillin.

Advocated by the microbiologist and Nobel Prize winner Salvador Luria, controlled sloppiness leads to improvisation, contradiction, combining logic and intuition, and exploiting inexperience. All these are mental attitudes that are oblique. Furthermore, this serpentine path leads to creating entirely new things rather than merely improving on the existing ones. Obliquity, which interested so many Renaissance writers and artists, was identified by them with the mythological figure of Hermes, the Olympian god who plays different roles while simultaneously travelling in different directions. Later, the oblique approach was a favourite subject of Francis Bacon, the multifaceted English intellectual and scientist, and, in our times, of the English economist John Kay in his 'oblique thinking' (*Obliquity: Why Our Goals Are Best Achieved Indirectly*, London: Profile Books, 2011), to regenerate the art of politics that is skewed towards the narrow linear path of planned evolution.

When research is institutionalised, philosopher Geoffrey E. R. Lloyd has put it (*The Ambitions of Curiosity: Understanding the World in Ancient Greece and China*, Cambridge: Cambridge University Press, 2002),  
*.... less room the individual may have for genuinely innovative ideas. The more the programme of research enjoys the blessing of approval of the authorities, the greater the pressure to conform to it. The obvious danger is that .....individuals [finds] it extremely difficult to introduce new ideas, let alone to suggest new direction for the programme itself.*

## **4. KNOWLEDGE TRANSFER**

### **The interaction between academia and business**

Knowledge transfer covers the processes of transferring knowledge – research, skills, experience, and ideas – within the universities and from universities to the greater community of users (the business sector and the wider community), to increase economic returns from this investment and achieve cultural, educational and social benefits for society.

Universities search for new avenues for knowledge transfer to and interchange with business conducive to higher productivity, economic growth and entrepreneurial activity from exploiting scientific and

technological knowledge. Transferring knowledge is more than a communication problem that information technology tools can fully accomplish. The process is complex and non-linear with many interactions, not simply a matter of knowledge linking academic researchers upstream and their business counterparts downstream.

Trustful and outward-looking knowledge brokers (the 'multilingualists', intermediaries capable of understanding and practising the research and business cultures) with excellent interpersonal skills, commercial awareness and contractual experience secure a better future for knowledge flow between universities and firms. Trust is a critical component of the business formula for those who should build bridges in a field so subtle and ambiguous as transferring know-how, knowing what, know why, know whom, and know when.

Universities must design and promote collaborative research to promote a context where academic researchers work alongside company employees to create, develop, and test prototypes based on their reciprocal ideas. Collaborative research can be carried out in a 'collaboratory' – an appropriate lab type infrastructure that links teams of people from university and companies with disparate cultures, different cognitive systems and skills. In a 'collaboratory', research is focused on specific company problems, and scientific research is carried out through the interactions between academic trained corporate researchers and university researchers willing to apply their experimental results to practical use.

## **5. ACADEMIA WITH ENTREPRENEURIAL MINDSET**

### **Academic enterprise**

The academic enterprise is born out of research and is its commercial arm. Research staff promote its creation, participate in its foundation and support its take-off.

Academic enterprises demonstrate the ability of universities to master the entire knowledge chain: from creation to dissemination, conversion and entrepreneurial exploitation of learning, scientific discoveries and technical breakthroughs.

By investing in academic enterprises, universities promote entrepreneurial innovation with new knowledge and participate in ventures for acquiring companies whose products or services have a high market potential that entrepreneurs at their helm do not fully or adequately exploit.

In medieval Bologna, its university triggered an intellectual movement that sowed the seeds of the entrepreneurial soil from which the modern liberal professions sprouted. As in those days, university communities should strive for a change of phase, succeeding in channelling their students and

knowledge workers along the most promising paths of innovation leading to the creation of academic enterprises.

Whether in the fields of food, medicine, health care, energy, the environment, construction techniques, clothing, furniture and much more, the entrepreneurial imprint of scientific research is visible. Material science, chemistry, biology and earth sciences are just a few of the categories in which new scientists blaze the trail for brilliant entrepreneurial insights.

By moving towards entrepreneurship built on science, the number of intellectual capitalists in the entrepreneurial knowledge economy would grow among the university population.

### **Entrepreneurial university**

The entrepreneurial university acts as an open-circuit enterprise of ideas, developing small science and not just big science, i.e. also engaging in transfer sciences (such as engineering) that link basic and applied research. It enters the body of knowledge to extract entrepreneurial DNA from it and manage entrepreneurship and innovation, generating knowledge whose output is companies founded by graduates, researchers and academics.

These spin-offs also assist in financing university departments, as Oxsoft, a company created by a professor of cardiovascular physiology at Oxford University. Ultimately, a university aiming at research results turned into attractive goods to which technology marketing strategies are applied, with financial spillovers on its balance sheet and, above all, with innovation spin-offs indispensable for developing the local communities in which it is rooted. John Seely Brown and Paul Duguid ("Space for the chattering classes", *The Times Higher Education*, supplement, 10 May, 1996) have designed the entrepreneurial university as a network of freely associated and complementary bodies. Precisely:

- The Agency sets quality standards, hires teachers and enrolls students in numbers compatible with the available resources.
- Faculties are independent contractors of one or more Agencies.
- Service Companies manage classrooms, libraries and research laboratories.
- Laboratories test innovative start-ups initiated by professors, researchers, graduates and students in collaboration with industrial partners and international investors. In addition, the laboratories make entrepreneurial use of studies and research carried out at the entrepreneurial university.

In the entrepreneurial university, former students participate in the network activities through 'learning contracts' signed by themselves and their employers.