PEDAGOGY IN THE AGE OF DIGITAL REPRODUCIBILITY[1] :

MOOCs, digital trivialization and new pedagogical spaces

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« *Our fine arts were developed, their types and usages were established, in times very different from the present, by men whose power of action upon things was insignificant in comparison with ours... In all the arts there is a physical component which can no longer be considered or treated as it used to be, which cannot remain unaffected by our modern knowledge and power... We must expect great innovations to transform the entire technique of the arts, thereby affecting artistic invention itself and perhaps even brining about an amazing change in our very notion of art.*"

Paul Valéry, The Conquest of Ubiquity
Pièces sur l'art, Paris, 1934, p. 103-104 (Bibliothèque de la Pléiade, Tome II, 1960, P 1284)

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1   The title is inspired by the Walter Benjamin's magnificent essay: "The Work of Art in the Age of Mechanical Reproduction". We wish to thank Nassim Taleb for his commentaries.

Introduction :

This quotation from a short essay by the French poet appears as the epigraph of Walter Benjamin's groundbreaking text: *The Work of Art in the Age of Mechanical Reproduction*. Authored in the 1930s by two men of letters, their writings constitute a visionary interrogation on the status of the work of art at a time when technology renders it reproducible *ad infinitum*. Walter Benjamin's interest in the question did not arise haphazardly. His passion for photography was such that he devoted a book to its history. For him, photography is a form of art unlike the other arts insofar as a negative allows for a multiplicity of prints remaining "identical" to the original. This also pertains to motion pictures, in which film ensures ubiquitous projection. As technology permits large-scale reproduction of a work of art, Benjamin puts forward a key question: In what respect are we called upon to reconsider the duality between original and copy "authentically" distinguishing a painting, for example, from a duplicate? What becomes of the creative act in a context propitious to mass production and dissemination of the copied? What is to become of the work of art and the fine arts in a world of untethered reproduction?

In order to address these far-ranging interrogations on art and its practice, Benjamin puts forward a simple question: What, ultimately, distinguishes an original from its copies? According to Benjamin, the original is a physical object characterized by its presence in space and time: its "*hic et nunc*" (here and now) and its belonging to a cultural tradition. The here and now circumscribe the precise time and place of the original; they are constitutive of its authenticity. Benjamin writes that "*The whole sphere of authenticity is outside technical -- and of course, not only technical -- reproducibility[1].*" He adds: "*Secondly, technical reproduction can put the copy of the original into situations which would be out of reach for the original itself.[1]*" According to Benjamin, the transfer not only alters the here and now of the work of art, but also jeopardizes another dimension, namely "*the authority of the object*". When all is said and done, states Benjamin, "*that which withers in the age of*

mechanical reproduction is the aura of the work of art[1]." He sums up: *"One might generalize by saying that the technique of reproduction detaches the reproduced object from the domain of tradition. And by permitting the reproduction to meet the beholder or listener in his own particular situation, it reactivates[2] the object reproduced."* The original is consequently unique insofar as its "here and now" and its aura are unique; any reproduction is an alteration of the "here and now" and the aura. On the other hand, and this is a fundamental point, reproduction reactivates the object reproduced. And reactivation is a source of potentialities, of innovations and novelties of which we fail to realize, in the immediacy of reproduction, the range and scope.

Some eighty years later, the questions raised by Walter Benjamin and Paul Valéry are strikingly echoed in the domain of pedagogy, which is being thrown into upheaval by the emergence of Massive Open Online Courses (MOOCs, also known by the French acronym FLOT), of which the best-known avatars are Coursera (www.coursera.org), Udacity (www.udacity.com), FutureLearn (www.futurelearn.com), EdX (www.edx.org) and OCEAN (http://www.ocean-flots.org/)[2]. It is not by chance that the mergers and consolidations of business schools, for instance, have been occurring at a time of digital fever. And having previously escaped the digital tsunami that has wrought havoc on industry, economic institutions are now in the eye of the storm.

In a nutshell, MOOCs are courses to which millions of students throughout the world have free access via the web. Outfitted with a pronounced community dimension, the classes are neither walled off nor subject to geographical boundaries; generally speaking, as is the case with Coursera, they are drawn up from the lectures given in renowned colleges and universities such as Stanford, Yale or Princeton. The recent popularity of extra-mural pedagogy is nothing short of phenomenal; over the same lapse of time, student enrollment in Coursera has increased far more rapidly than member registration in Facebook or Twitter! As of now, Coursera counts more than four million students scattered around the world. Given these figures, it may be claimed

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2   One may add iTunesU; while it does not deliver MOOCs in the strict sense of the expression, it enables users to follow courses and debates taking place in numerous universities all over the world.

that pedagogy has entered the age of large-scale technical reproducibility. Needless to say, e-learning and distance learning came into being prior to MOOCs, but neither of them has been able to attain comparable quantity (number of enrollees, countries and universities involved) or quality (worldwide learning communities, dissolution of the focal point of pedagogical authority). Michel Serres, the veteran philosopher and eternal optimist, is hardly worried by the shape of things to come: "*Far from disappearing, the class is plugging itself into the network and restructuring itself following an open and participatory model. It was previously formatted following the model of the page of a book: The teacher was in front of his class and held the position of the author, of the person who knows and transmits to those who are not in the know. Nowadays this model is falling to pieces.* »

Notwithstanding the optimism manifested by Michel Serres, the shattering of the model is tantamount to the loss of the *hic et nunc*, the "here and now" of the original, namely a professor's lecture in an amphitheater. The master lecture is inherently theatrical; it brings together the actors in a classic unity of time, place and action. It is built around a focal point, the podium; as Serres mentions, the lecturer's platform is a Power Point in the original sense of the word.   The short-lived unity, which is anchored in long-standing academic tradition, endows the lecture with an aura that is dissipated by MOOCs and the new technologies. A MOOC is initially a large-scale copy of the original, a copy rendered possible by the technological resources of the Web. And yet, it is far more than that; it is a reworked copy that Benjamin might have termed "reactivated"; it is a copy preserving neither the "here and now" nor the aura of the original, and which may be said to trumpet its infidelity with regard to the original. And far from figuring as a net loss, the infidelity is ultimately a reflection of the ever-present tension provoked by technology between fidelity and convenience, of the tension considered by the American essayist Kevin Maney as characteristic of what he terms the "fidelity swap". Later in this paper, we will go into detail on the "fidelity-convenience" couple. In a nutshell, what the user (whoever and wherever he is) loses in fidelity (in "here and now") should be regained in terms of convenience.

This shattering could not help but vitally interest the co-founders of Cyberlibris (www.cyberlibris.com), who are co-authors of the present paper. Cyberlibris is a response to what we call the tyranny of the single, authoritative manual, and to what Serres terms the model of the page of a book. Like it or not, the book has entered the age of   mechanical reproducibility. Similarly to MOOCs (Massive Open Online Courses), which emancipate pedagogy from the enclosed space of the classroom by detaching it from the focal point represented by the overhyped Power Point towards which the gazes of students seated in a lecture hall are supposed to converge, the digital book separates the contents from the "Gutenberg" container. Access to reading is consequently overhauled. A learner is no longer in a state of dependency with regard to the imposed focal point, the officially mandated book. When he reads a copy he is no longer depriving the other learners; queuing up and rationing are a thing of the past. As a digital community library dedicated to business schools, ScholarVox (www.scholarvox.com) epitomizes pedagogical and book-related emancipation. Day in and day out, several hundreds of thousands of students, professors and librarians converge towards a digital location where they can share their readings and manage, by design and community-based serendipity, to discover works they would surely never have otherwise known.

Needless to add, the library is anything but a new idea. On the other hand, the emancipated and emancipating library without walls is new indeed. Goodbye to the linear model of the appraised and validated, purportedly authoritative text; hello to a model of reading that is profoundly organic, literally natural; doesn't nature proceed tentatively and uncertainly, by trial and error? Doesn't nature constantly make mistakes, and isn't that what allows it to move forward in its untold wealth and multifarious diversity? The digital commons is a library creating a space in which serendipity ceases to be an exception, and becomes the rule. Given the library-based luggage we carry, we could not help but ask ourselves questions on MOOCs and their repercussions on the arts of learning and teaching and, more plainly, on education and the institutions with which it has been associated.

There are at least two reasons why this type of examination is indispensable at a time when MOOCs are becoming mainstream. The first of them is put forward in the highly pragmatic words of Sir Kevin Robinson:

« I mean, I always think this: Kids who start school this year in Australia in primary school will be retiring round about 2070. You know, nobody has a clue what the world will look like this time next year, let alone 2070. So, yes, parents are concerned and they're right to be concerned. I'm concerned. I've got two kids. But I'm concerned that they get an education which is tailored to these circumstances rather than the ones that obtained 150 years ago. » http://www.abc.net.au/7.30/content/2009/s2600125.htm

Our educational model is derived from a long-standing tradition dating back to ancient Greece and the Gutenberg printing press, and it was late in 19th century that presently existing compulsory education systems came into being. Since that time, their overall design has undergone hardly any genuine change. It remains permeated with a model derived from the master ironworkers of yesteryear. It is high time to voice some concern; from this standpoint, MOOCs serve as active catalysts.

The second reason for questioning is that the diploma = employment equation that functioned so effectively for a number of decades has broken down. And as underlined by Sir Kevin Robinson, the very notion of a degree is being trivialized:

« More and more people are now going to college and getting degrees. There are two reasons for this expansion. The first is population growth. In the last 30 years the world population doubled from 3 billion to 6 billion. The second reason is the growth of the knowledge economy and the growing demand for intellectual labor. The combined result is that in the next 30 years, more people will qualify, through formal education and training around the world, than since the beginning of history. This is an historic change in the demand

for education, and it has huge implications for the nature of it. »
http://www.ecs.org/clearinghouse/60/51/6051.pdf

How Creativity, Education and the Arts Shape a Modern Economy,
April 2005

Our personal conviction, our gut feeling is that MOOCs are providing a once-in-a-lifetime opportunity to comprehensively review and revise our thinking on education, pedagogy and the institutions through which they are administered. Unfortunately, debates on MOOCs are often limited to them alone, even though they function as revealers of the issues and limits pertaining to traditional ways of teaching. The resultant comments and questioning are usually those provoked by any form of technological upheaval:

⌈ Do the children of the Internet, those so-called digital natives, still know how to learn?

⌈ Do MOOCs herald the trivialization, if not the disappearance of the teaching profession?

⌈ Aren't MOOCs a form of cut-rate education?

These questions are lacking in an overall framework for thought such as the reflections put forward in their time by Walter Benjamin and Paul Valéry on the fine arts and the work of art. Our ambition in this article is to open up a space for reflection and to provide readers with a sampling of our "ruminations". We hope it will serve as a support for discussions and exchanges that will be lively, contentious and ultimately fruitful; after all, our children and, more specifically, the education they shall be receiving are stake.

We have organized our "ruminations" as follows. In the first part, we shall discuss the economic factors that distinguish traditional compulsory education, which in France dates back to Jules Ferry, from the digital education embodied by MOOCs. Economic considerations are fundamental insofar as they allow us to understand in what ways the economy of ideas (inspiration) differs from the

economy of physical goods (perspiration). The point to remember at this first stop is that our educational system remains profoundly permeated with the spirit of the master ironworker. Education is conceived as a "linear" and standardized production chain in which primary raw material, in this case a brain and a brain alone, is fashioned in accordance with a "Taylorist" protocol so as to deliver a finished product validated by a degree and ready for use. While this linear process has had its glory days, it is no longer suited to a world requiring an organic approach reminiscent of what has always been applied by Mother Nature. What was one cast in stone is now distinguished by its brittleness.

We will then make a second stop so as to try to understand the identity of MOOCs and, more specifically, what their appearance tells us about the future of education and the persons involved. We differentiate what we call the traditional benchmarks, which are related to analysis of the Web, from the new benchmarks, namely the hypothesis we shall formulate on the potentially transformational impact of MOOCs on education and the educators as well as the educated. We are convinced that MOOCs provide all of them with the capability of experimenting, of learning from rather than being punished for their mistakes and of consequently being impregnated with the spirit of "Thumbelina" that Michel Serres holds dear. Our is a clear message: We are betting on MOOCs as the early manifestations of a profoundly organic education and art of pedagogy divested of the multifarious norms characterizing the old and outdated model.

At a third and final stop, we shall undertake a Prévert-style inventory of the practical, pragmatic questions arising from the MOOCs, for which the answers have yet to be put into words.

Obliquity and economy of ideas: when two and two make eight

What magic formula is hidden behind the decidedly bewildering arithmetical equalness of the above title? Response: The more knowingly and the harder

we try to "get it", the less the likelihood of our doing so. On the other hand, once we agree to let go, two and two can indeed equal eight. As was aptly pointed out by the English economist John Kay, in many cases the objectives we achieve are not those we were striving to achieve; according to him, oblique approaches are often the most successful; a recent work of his is entitled *Obliquity*.

The signs of the times are anything but oblique. Students are compelled to pass their exams and get their degrees, schools are called upon to obtain the most prestigious accreditations, companies and their directors have got to concentrate all their efforts on a single objective, which is to satisfy their shareholders by enriching them. Each party must act in such a way as to attain the objective that has been set for him in advance, and in terms of which he is graded. To borrow a mathematical metaphor, each party must maximize the function that has been assigned to him, and to do at each stage of his life. Each party must adopt optimizing behavior in order to succeed. Nothing, however, is set in stone, and there is no reason why this type of quantitative, optimizing, rational approach must inevitably should invariably lord it over a more holistic approach.

On this subject, John Kay draws a compelling metaphor from a true story involving the United States National Park Service, one of whose missions is to preserve forests by preventing devastating forest fires. At one time, this mission took on the simplest of forms: zero tolerance. Any and all fires were to be extinguished immediately, whatever the cost. Not even the slightest fire outbreak would be tolerated. In practice, however, intransigent policy yielded rather embarrassing statistics; rather than forestalling conflagrations, the National Park authorities observed an upsurge in fires reflecting the egregious failure of their mandated mission.

How are we to explain a paradox in which the stringency of the target fails to pay off? In point of fact, forests are complex systems in which fires display highly varied behaviors. With regard to forest fires, it is oftentimes preferable

to tolerate the small fires that consume unwanted underbrush and thereby prevent it from fueling greater and more dangerous fires. Rather than implementing a policy of zero tolerance, the authorities would have been better off letting the park rangers in the forests judge for themselves and determine, according to their observations, whether or not a given fire outbreak should be allowed. Rather than proclaiming and applying an optimization principle (drastically minimizing forest fires), they would have been better advised to adopt a holistic strategy of adaptation (by the boots on the ground) to different situations as they arose. That, fortunately, is now the prevailing approach.

The "adaptive" model is of particular relevance in non-linear frameworks. Complex systems such as forests, fires, the Underground and education are typically non-linear entities in which small causes can produce large effects. Attention must be paid; let us now examine the example afforded by MOOCs. With massive open online courses, there is massive movement from an economy of pedagogical perspiration (the camps, the walls, the classrooms, the teaching staff...) and diminishing returns (once a classroom is full, new students necessitate another...) towards an economy of pedagogical inspiration in which economies of scale are rare, yields are higher, and serendipidity is maximized: Who knows whether or not, among the millions of poor African students who have had no chance of acceding to the nirvana of a physical campus and who currently study in cybercafés with Coursera, will emerge hundreds of entrepreneurs, teachers and researchers whose discoveries will turn the world upside down? The MOOCs give wings to ideas by emancipating them from physical constraints. As intangible goods, ideas are pronouncedly different from traditional assets. The fact that someone is applying the Pythagorean theorem in no way prevents other persons from doing so simultaneously. If a person is driving his car, on the other hand, nobody else can do so at the same time! Moreover, ideas can procure legal monopoly power: a patent or a copyright can define the terms of use by others, who may be required to pay royalties. In addition, the economy of ideas is characterized by a peculiar structuring of operating costs. A classical article, stemming from

"perspiration", must be manufactured unit by unit, one after another, in order to be sold. Each unit demands a given amount of mobilization costs. By contrast, an article stemming from "inspiration" requires substantial upfront cost (for the initial unit), followed by minimal marginal costs of production. A prime example is that of Microsoft Windows. Microsoft imposes a "very high" price for a copy of the software, even though the production cost of the supplementary unit is ... that of its copy! If Microsoft manages to bring this off, it is because millions of users work with PCs requiring Windows to function and communicate.

The following question has become unavoidable: How is it possible to invoice an item for which the costs of reproduction are negligible and thereby recover the high cost of the first item manufactured? In order to answer, the American economist Brian Arthur of the Santa Fe Institute has drawn a contrast between the world inhabited by the British economist Alfred Marshall (1842-1924) and the modern era of increasing returns. Marshall's world was industrial ("perspiration"-based) and characterized by constrained capacity (a factory cannot produce more than its capacity) and diminishing returns. In this world, one day or another profits are established at their "normal" level. In his *Principles of Economics*, Marshall clearly demonstrates that the attendant analytical tools are those of optimization: price, average cost, cost function derivative, and so on.

The world of increasing returns is another story entirely. It is a world in which things move intensively and spectacularly; when they go up, the sky's the limit; when they go down, they bottom out. Just think of the network effects so speedily generated in eBay. The sellers are on the Internet auction site because they know that that's where the buyers are. The buyers are there because they know that sellers shall be found. And the grand winner, eBay, wins hands down. Coursera is presently enjoying similar success. Students are converging because they know they will find remarkable and free-of-charge instruction. Academic institutions and their teachers are investing in MOOCs because that's the way for them to meet students scattered all over the planet.

How should individuals, academic institutions and companies behave in a world so different from Marshall's? Should they persistently optimize, striving to attain the metrics that have been set for them? Or else, should they adopt holistic behavior comparable to that of today's American forest rangers? It would appear obvious that in the contemporary world, which is a mixture of Alfred Marshall and King Arthur, a sixth sense of adaptation is a *sine qua non*. After all, floods and earthquakes are complex phenomena; they are difficult to predict. By contrast, it is easy to adapt; you would be ill-advised to build your house in a reputed danger zone or risk area.

What with the emergence of technology-propelled MOOCs, academic institutions, launching grounds for the best and brightest of ideas, have been advancing by leaps and bounds not only into a world of increasing returns, but also into a world of deep-seated cognitive changes of which we are far from having taken full measure. The new deal will demand development of a sense of adaptation hardly compatible with the institutional metrics and the architecture of existing campuses. Mark Twain was so skeptical about the capacity for self-reform of academic establishments as to state: « *College is a place where a professor's lecture notes go straight to the students' lecture notes, without passing through the brains of either.* » Michel Serres is on the same wave length when he writes: "*Why is Thumbelina less and less interested in what is said through the megaphone? Because, given the growing supply of immense layers of knowledge at our fingertips anywhere and everywhere, one-off supply has grown derisory.*" Knowledge has become boundless, and MOOCs are avatars of today's overabundance. Knowledge is no longer a rare commodity; more precisely, it is no longer confined to campuses, which in Serres's terms have become similar to the camps of the Roman army.

Thanks to knowledge that is no longer stored exclusively in libraries or professors' minds, but is simultaneously distributed and accessible everywhere and anywhere, increasing cognitive returns are beginning to appear. MOOCs are in the vanguard of a new economy of shared knowledge likely to be

mobilized opportunely and that turns our brains not into empty space, but rather into liberated, that is to say free and imaginative space. And yet the new liberty, which holds out untold promise and is in its infancy, makes us lose our bearings. In the next paragraph, we will try to identify the tracks that may be taken by a form of freedom whose growth is nothing less than exponential.

Treasure hunts: Which are the right tracks?

On the beaten tracks of the Web

The beaten tracks are four in number. First, nowadays it is recognized that the Web allows its users to express their requests at a granular level; music is purchased title by title, piece, by piece. Second, the reader is surely aware of the debates engendered by free-of-charge access to the Internet; some have argued that the cost-free is the antechamber for paid entry; this is the well-known freemium model. Third, when freemium does not apply, third-party payment is a necessary option; the most emblematic model on the Web is that of advertising. Lastly, free-of-charge access is frequently set up with the hope of enrolling tens if not hundreds of millions of internauts; sooner or later, by hook or by crook, profitability will ensue. We shall now examine each of these explanations as pertains to MOOCs.

Disaggregation: Long live playlists!

The first traditional analytical track arises from the havoc that digital reproducibility has wrought in the music industry. At Apple's iTunes store, it is henceforth possible to purchase music unit by unit; you no longer need buy the complete album; all you have to do is download the track of your choice. Some will contend that the musician's work, which is embodied in the long-playing record, is thereby unconscionably denatured; others will laud supposed respect for the music consumer's desires. Isn't none other than Mick Jagger said to have opined: "*Two tracks are good, the rest is crap*."? Be that as it may; the fact of the matter is that the consumer's choice has become increasingly granular; it is only the tune he hears *ad infinitum* on the radio that

he would like to acquire. Similarly, amidst the expansive portfolio of Coursera courses, the student may wish to take but a single course, for example the one given by Franklin Allen of the Columbia Business School. He is no longer required to tackle the whole Columbia curriculum after having been allowed to indulge his passion for finance. That much said, the comparison with a musical "single" is not totally accurate; unlike the piece of music purchased in iTunes, the Coursera course module is free of charge. And the freedom offered by MOOCs is utterly unfettered; there is no such thing as an imposed curriculum. Each of us can draw up his or her "pedagogical playlist". For some, this flexibility is perceived as the necessary entranceway to the freemium model.

Freemium and filtering

In the freemium model, part of the offer is free of charge, while the other part is not. It is a question of attracting the customer and subsequently convincing him to adopt the fee-paying model. Scrutiny of the Coursera's geographical data shows that many registered students reside in the emerging or underdeveloped countries[3]. They undoubtedly students could not immediately have afforded the onerous tuition fees for Yale or Stanford, which means that these universities are not on the face of it losing any money at all. That much said, two scenarios may be imagined. The first is based on the notion of filtering. By taking and passing the course units they have chosen, the students directly signalize their value to the universities involved and can easily be identified; when appropriate, they could be offered scholarships enabling them to accede to degree courses. The second scenario is inscribed in the same perspective. A student who one day was allowed to discover the source of his passion is unlikely to forget a decisive turning point in his life. It may even be presumed that when the time comes, he will decide to register in the university of which one of the on-line courses functioned as a revelatory foretaste. He will receive credit for the course.

Third-party payment

The free-of-charge model is remembered by the user of what was once called

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3(http://www.ted.com/talks/daphne_koller_what_we_re_learning_from_online_education.html)

TSF (wireless transmission). And radio is free; it can broadcast because third-party payers agree to substitute for the end user. It is easy to imagine that many of the former, particularly potential employers, will show interest in the data whose collection will be effectively facilitated by MOOCs. One can also suppose that companies will agree to finance and sponsor courses so as to derive benefit from information likely to serve the purposes of their selection and recruitment units.

⌐ « **Build, enroll fast, grow the numbers, money will follow** »

This is the strategy that is financially backed by numerous venture capital firms, particularly in Silicon Valley... At this point in our tour, we wish to insist on the difficulty and opportunity engendered by technical reproducibility. The difficulty les in the fact that once an initial investment is agreed upon, the marginal cost per supplementary unit is low; advancing from two hundred to twenty thousand students poses no major problem; everyone has access to the same MOOC. As a result, and in accordance with the teachings of microeconomics, it may become difficult to determine a price for the supplementary units that would remain higher than the marginal cost and thereby generate sustainable income. Opportunity is the other side of the coin, and it consists in the increasing returns offered by MOOCs. Co-founder of Coursera, Daphné Koller has mentioned that at Stanford, the "Machine Learning" course given by Andrew Ng, the other co-founder of Coursera, draws 400 students. On the Coursera website, however, more than 100,000 students take the "same" course; in order to achieve an identical result, on the Stanford facilities Andrew Ng would need to offer that course for one quarter of a millennium! Moreover, success breeds success. The more a course boasts a favorably inclined audience, the more candidates and the more students it attracts, and the more its franchise is reinforced. The fundamental question then consists in how to reconcile increasing returns and capacity to pay a price higher than the marginal cost. In the minds of venture capitalists, the equation is simple enough; an option on the aforementioned income has got to be activated, and one day, in one way or another, the option will be "monetized".

New benchmarks

Each of the traditional benchmarks outlined above has its merits, but all of them are overly general; they are generic markers of the numerous activities and services displayed by and on the Web. MOOCs address the significant issue of education and pedagogy in the age of connected communities. On this subject, it is hard not to be a trifle appalled when comparing s a photographed classroom in 1900 and a photographed classroom in our time; it would appear that little or nothing has changed.

Sir Kevin Robinson has been unstintingly repeating that we continue to apply a pedagogical modeled derived from the day and age of ironworkers; it is a linear and standardization model implicitly premised on the notion that "one size fits all". According to Robinson, this model ignores or feigns to ignore three key principles:

- Human beings are unbelievably diversified, and they are rich with their differences.
- Children are naturally gifted learners. They are congenitally curious, and inclined to try things out. They are not afraid to make mistakes. They are born tinkerers, in the noble sense of the word.
  (http://www.ted.com/talks/gever_tulley_s_tinkering_school_in_action.html;
  http://www.ted.com/talks/sugata_mitra_the_child_driven_education.html)
- Nature and human life are incessantly and astonishingly creative processes; that is the reason why nature is so diversified, and that is why human life demonstrates such breathtaking cultural wealth. And yet, we are prone to "counter" this ebullition with standardization and, more concretely, with rigid assessment criteria stigmatizing human error.

It stands to reason that when considered in its broadest sense, our educational system is incompatible with the preservation and valorization of these three principles. It was designed to meet the needs of an epoch that called for and

placed its hopes in the standardization execrated by Ivan Illitch.

The technology embodied in today's MOOCs offers a unique opportunity to reconfigure for the benefit of one and all the pedagogical landscape and academic institutions along with their outdated architecture. In the lines you are about to read, we will set forth a Prévert-like inventory of the fault lines necessitating overall reconfiguration; they may be considered as construction sites.

Are we all tinkerers?

The fact that MOOCs open the door to granularity is consequential. The notion of curriculum established by the empowered academic authorities is in almost all cases the dominant model. A student must fit in and meet its demands; if not, he runs the risk of failing to be awarded the coveted diploma. The curriculum contains a beginning, an end, and programmed progression. MOOCs, on the other hand, are pace in accordance with his wishes and his passions, and he does so outside the usual institutional boundaries. A finance-based comparison illustrates the repercussions of non-linearity. It is inspired by the markets for the financial securities termed options. Any option trader knows that an option portfolio is of more value than an option on a portfolio. As regards the latter, any possible gain is binary; either the option is or is not remunerative. As concerns an option portfolio, on the other hand, possible gains are decidedly more varied; each option may or may not contribute to the final gain. A greater number of lucrative possibilities consequently exist. It is preferable to dispose of a large number of "small" options on different assets rather than a "large" option on a single asset; does this not epitomize the logic of trial and error? You try something out, you are mistaken. Since the trial is limited in scope and deleterious eventualities, the damage is minimal. MOOCs encourage a type of "tinkering" in which, when taken on its own terms, nature is specialized. They offer flexibility allowing the learner to "goof up" and enabling him to make one attempt after another, and to achieve self-discovery through experimentation. Far from stigmatizing error, they encourage him to learn from his mistakes and to wind up finding the right match for his needs.

The learner thereby engages in the "convex tinkering" recommended by Nassim Taleb and becomes "antifragile", which is a word coined by the same author. Bumbling, fumbling and stumbling are at once desirable and beneficial. And they are by no means detrimental to academic institutions, which derive benefit from the 1/N strategy by enlarging the pool of talents knocking on their doors. This is a crucial point; whether from the learner's or the establishment's standpoint, pedagogy has got to be convex. It has got to be not the locus of a single possibility, but rather the meeting point of everything and anything possible; this is the best way to address and respect the wide variety of the cognitive abilities presented in human beings.

Are diplomas yesterday's papers?

This spatial and temporal granularity and non-linearity of teaching has radical repercussions on the very notion of a diploma. It is highly likely, if not a safe bet, that the notion of a diploma, taken as the ultimate validation of a finished industrial product, is bound to disappear. We will have to get used to attending fewer formal graduation ceremonies replete with their commencement addresses and caps and gowns; is this really a loss? Paul Valéry was unsparing in his condemnation of the diploma: "*I do not hesitate to declare ; the diploma is the mortal enemy of culture. The greater the importance diplomas have been given in life (and their importance has steadily grown due to the economic circumstances), the lower the yield of teaching. The more prevalent the exams being given, the poorer the results. Poor in terms of their effects on public spirit and the spirit in general. Poor because they create hopes and illusions of acquired rights. Poor on account of the multiple stratagems and subterfuges they imply, the strategic preparations and, all in all, the use of all the expedients needed to cross the redoubtable threshold*".

If one nonetheless wishes the conserve the term, the diploma will be the business of a lifetime. Each one of us will build the curriculum that suits him or her the best. There will be no more passive demand face to formatted and imposed supply. The "diplomas" and itineraries will be as numerous as the learners. The diploma will no longer be a piece of parchment paper issued by a

particular institution, there will rather be personalized sampling of the courses given by a large number of institutions. The constraints of time and geography will have gone with the wind. A diploma will no longer be the threshold detested by Paul Valéry; it will be a permanent individual and group building site.

The virtues of syndication

How will this granularity affect existing institutions? There is a high likelihood of creation of granular models of "coopetition", which means models in which educational institutions agree to cooperate while competing with one another. This is already happening in Europe in the framework of the Erasmus exchanges and the ECTS reform. MOOC technology will render it phenomenon systematic and, crucially, planetary. One may imagine Harvard "labeling" a MOOC originating in Yale and integrating it to one of its degree-granting programs. Just like EdX and Udacity, Coursera will surely be called upon to become a MOOC syndication platform. Syndication will enable it to institutionally monetize the MOOCs available on its platform and by doing so, to generate income while remunerating the universities having become beneficiaries of the MOOCs.

A wealthier ecosystem

Coursera and the other educational technology companies herald the arrival of pure players whose talent will consist in selecting among the dedicated portals the relevant MOOC "bricks". One may imagine a group of reputed professors building a platform containing their own MOOCs combined with those having been syndicated around Coursera. The platform's validity will be premised on the professors' reputations and the originality of their proposals. Initial free-of-charge access will take on its full meaning insofar as it paves the way to setting the prices of syndication; the most popular free courses will, once syndicated, become the most expensive.. In any event, academic institutions with a poor reputation will be comprehensively called into question by the arrival of the MOOCs, as is made crystal clear by Professor Timothy Devinney:

«Having been at the top and bottom of the academic food chain (being both at U. Chicago and now in Australia at what is dominantly a teaching factory) I have seen the differences. The students at Chicago get knowledge at the coal face by people who understand what is both leading edge and sophisticated. Students here get commoditized information delivered by individuals who only know what they read because they are not leading edge scholars. Indeed, where the MOOC Tsunami will hit is on this commoditized end of the business. » Timothy Devinney, http://www.ft.com/cms/s/2/cde6163c-7f4a-11e2-97f6-00144feabdc0.html#axzz2QABQsuIB

⌈ **Research: 1 point; Pedagogy: 1 point**

The above remark by Timothy Devinney calls for a commentary. It may be considered as elitist insofar as the perfection of an academic institution would mainly reside in the quality of its professors' publications. We will not take sides in a debate as to what determines the scientific value of an article. This is neither the time, nor the place. On the other hand, Devinney's emphasis on the importance of scientific research spurs us to ask questions on the reasons for the omnipotence of accepted submissions. One of them has to do with their digital visibility, which reaches its peak in businesses or institutions such as Elsevier, SSRN and ArXiv. The articles and their authors are visible; they are digitally accessible. Up until recently, however, pedagogy and the pedagogues were not exactly in plain view. More precisely, they were visible within but not outside the walls of academia. Research carried the day for want of a visible opponent.

Emergence of the MOOCs represents a new deal; the pedagogues have advanced *urbi et orbi* to the forefront. We can henceforth take it as a given that the promotion of professors will no longer exclusively depend on their research; it will also hinge on their pedagogical savvy and savoir-faire. In this respect, the filtering mentioned above will not involve the learners alone; it will also involve pedagogues, whose pedagogy will at long last be seen in the light of day. Learners will filter with the rigor and vigor that the Net encourages. Academic institutions will strive to hire the best pedagogues in order to endow

their portfolios with the richest, most widely varied and relevant, not to mention the most audacious MOOCs.

⌈ Going off the (re)beaten tracks

At this time, MOOCs are backed up - in terms of framework, headings and contents - by the curricula of academic institutions. In their seminal phase, it is par for the course that they rely on existing infrastructure. However, the audaciousness of the offer consists in their emancipation from existing forms. Teachers will have the opportunity to experiment with courses outside the tried-and-true taxonomies. More broadly speaking, a recovery of pedagogical liberty will be given impetus by an open invitation to take risks and engage in pedagogical tinkering. MOOCs will to an ever lesser extent be homothetic to a preexisting frame; they will rather devolve into a privileged field for large-scale experimentation and collection of data efficaciously contributing to understanding of learner behavior. New subjects will emerge, and they will flout the usual disciplinarily specialized pigeon holes and compartments.

⌈ The art of conversation or the art of exposing oneself to risk

MOOCs restore prominence to the art of conversation that Michel de Montaigne held so dear as to prefer a brain well-formed to a brain well-filled. Today's classrooms remain hierarchical organizations in which pedagogy is aimed at filling heads up. However, it is obvious to any visitor in these precincts that heads are no longer content to be docilely "crammed". Quite on the contrary, they converse, they chat either physically or virtually. Only distractedly do they hearken to what's being professed on the podium. They are free because they know that the connected place providing access to the stock of knowledge is right before their eyes: the laptop, the tablet, the smart phone are screens that screen out the academic monologue. And new heads require new rules of engagement compatible with the tools they are helping to fashion. The "knower" (the professor) finds himself amidst the "knowing" (the students) as *primus inter pares*, first among equals. He has no choice but to run the risk of casual, informal conversation; he has no choice but to lay down his arms as an authority figure and to recognize that far from being the sole driver, he is

himself a passenger. The knower and the knowing form an enigmatic couple that brings to mind the hedgehog and the fox, of whom the first recorded mention dates back to the 7th century before Christ. In a stand-alone verse of the poet Archilochis, as cited by Isaiah Berlin, we may read: « *The fox knows many little things. The hedgehog knows one big thing."* In other, more recent words, "*The hedgehog always remains at the same place, stalking the prey within its reach. As for the fox, he is ever on the move, hunting for a wide variety of game."* (Irène Tamba (2012)). The professor, or the hedgehog, the porcupine, symbolizes centripetal force. The student, or the fox, symbolizes centrifugal force. If a classroom wishes to have a ghost of a chance of renewing the "hic-nunc-aura", triptych, it must mutate into a space of sharing, of invention, of assumed orality. But that alone cannot suffice; the site where the rejuvenated class will provide new food for thought shall have to be reconceived. Its architecture should not survive in a form inspired by "power point" pedagogy. Its libraries must not remain storage zones. Its territory has got to be transformed into an agora where silence is the exception, and not the rule. All told, campus architecture will need to be reviewed to as to emancipate itself from the "Roman camp" model castigated by Michel Serres.

The digital "trivializes" pedagogy, rendering it reproducible. By contrast, the physical pedagogical site cannot and must not be trivial. It has got to be difficultly reproducible, it has got to make the seeker of knowledge desire to enter. After all, it is a site made for meetings of minds, and that is the way it has got to be thought out. It has got to be unique, and equal to the challenges posed by the encounters, the "*hic et nunc*" exchanges between human beings who will never be wholly reproducible.

⌈ The art of space: From Euclidian to non-Euclidian geometry

In order to explain why the art of place in pedagogy is an important question, we shall use an example with which we are intimately familiar, that of the library[4]. Libraries have been around for quite a while. Their occasionally contradictory missions consist in conserving books and disseminating reading.

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4   This example is transferrable to the bookstore, which has likewise become technically reproducible and thereby trivialized.

They are part and parcel of university precincts and serve as a support for research and pedagogy. In our day and age, they have come to coexist with their digital equivalents.

A physical library is a remarkable tribute to Euclidian geometry. Two books are separated by one bookshelf. Two parallel bookshelves cannot cross paths; never the twain shall meet. In the confines dictated by this geometry, books are lined up in accordance with the assigned metadata; books on nuclear physics or the art of cooking are birds of a feather that flock together... Euclidian libraries serve as interfaces facilitating discovery of the works they contain. In Kevin Maney's grid for reading, their geometry provides them with a high degree of fidelity but also a lower degree of convenience, words that he defines as follows:

« *Fidelity is the experience of something – not just how good it is, but how it makes you feel or what it lends to your personal identity. Convenience is how easy it is to get something. So if a product or service is ubiquitous and cheap, it's pretty convenient. Think Wal-Mart or McDonald's*. »

While a physical library generally (but not necessarily!) constitutes hospitable space and represents an interface to which the centuries have conferred a patina, it remains the case that whether a book is borrowed or browsed, one copy, which may be the only one, can be read by only one person at a time. As regards the library itself, you can't take it home with you; it is bounded in space, and its storage capacity is far from unlimited. The works of yesteryear are weeded out and eliminated in favor of more recently published writings.

When the library becomes digital, the loss in fidelity (and quality of experience) is tantamount to a gain in convenience. The reader no longer has at his disposal a physical space in which he can easily cast a gaze on a complete collection, query the librarian, move around and sit down for several hours of comfortable perusal. On the other hand, he can take the library home with him through an Internet connection. It is possible for him to read a given

piece of work even though two thousand other persons are proceeding likewise at the same time. The following graph visually summarizes the advantages and drawbacks of the two libraries:
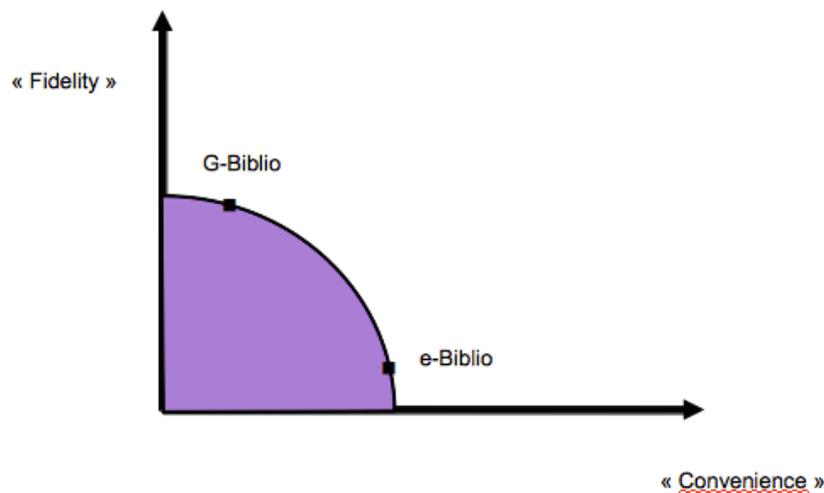
G-Biblio represents the physical library, and e-biblio the digital library. G-Biblio offers its users a high degree of fidelity and experience but is not without drawbacks that decrease its convenience. While highly practical, E-Biblio is an interface devoid of the warmth emanating from its physical alter ego. All in all, what we agree to lose in terms of fidelity is something we insist on regaining in terms of convenience. Provided that the result stays close to the black perimeter, we are willing to accept the trade-off. None of the dots inscribed in the violet area are right for us, the reason being that all of them are overhung by the dots of the black perimeter, which delineates the compromise between fidelity and convenience on which we are ready to sign off.

As of now, numerous libraries are at once physical and digital. They put the two interfaces on display for their users. So much said, most of the time the display is limited to juxtaposition, to addition of the two potentialities, and there is no exploration of the ways in which one might modify the other, and vice versa. Their simple cohabitation is summarized in the following graph:
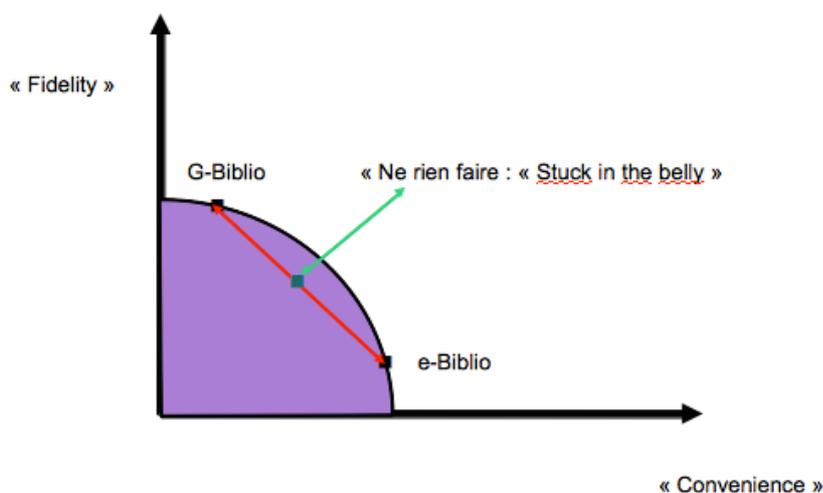
The red line illustrates the different possible combinations of the two libraries according to the importance of one of them with regard to the other. For instance, the green dot at the middle of the red line indicates that each library is granted the same importance. The key underlying point in this geometry of physical and digital combinations is that mixtures of the two are essentially passive. Nothing is accomplished other than allowing the physical and digital libraries to coexist. Users will at times use one, and at times the other. Introduction of the digital library will have in no way modified the design and organization of the physical library.

This is the nub of the problem, the rub: Located within the violet zone, the green dot is « stuck in the belly ». It constitutes a weak spot because it is not situated on the perimeter; it is overhung by the dots scattered on the latter; all told, it represents a poor and unwieldy compromise. On second thought, however, fallback onto an unsatisfactory middle ground is far from astounding; at this stage of the game not even the slightest synergy between the two libraries has been explored, much less put into play. That much said, it would be regrettable and a trifle surprising to consider withdrawal into the belly as the last word. The two libraries are perhaps bound to enrich one another, and one may dream that the initial perimeter staked out by the physical and the digital could move towards the northeast, thereby freeing up new and more fruitful opportunities to effectively connect fidelity and convenience. Can a

felicitous displacement be carried out? The response is affirmative, given an active, dynamic approach. To successfully make the move, numerous professions will be called upon to render an original contribution; the respective skills of the architect, the engineer, the designer, the data scientist, the web designer and the architect will all be brought to bear.
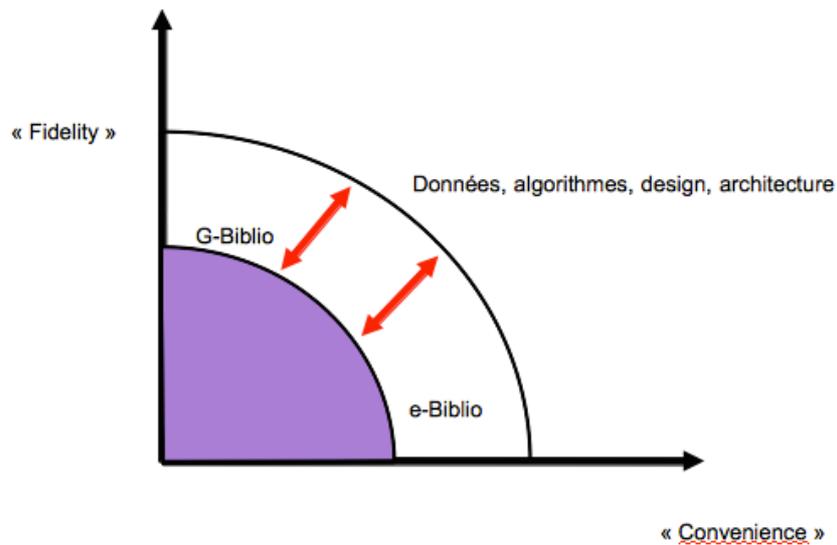
The coordinated efforts of the different professionals could hasten the emergence of a new perimeter that would be a vector of couples (fidelity / convenience) with enhanced appeal for each and every user.

More precisely, the objective is to reach a point of convergence (such as the one indicated below) at the intersection of the two orange segments:
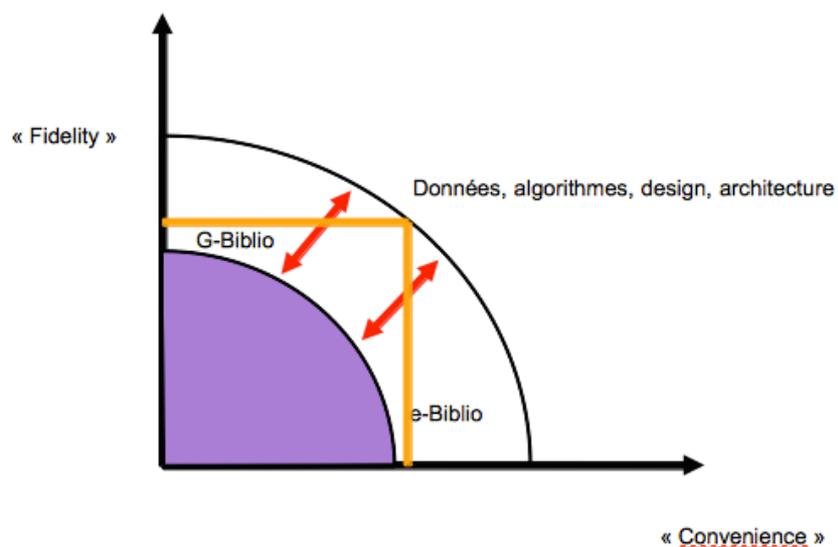
This new point concomitantly offers more fidelity and more convenience than would the physical and the digital library taken individually. The user is better off in all respects; he can benefit from a library experience that is at once of enhanced quality and improved convenience.

Then again, isn't this point a chimera? Does it actually correspond to a new and readily accessible physical and digital space? How can the previously mentioned professions effectively contribute to its elaboration?

The massive arrival of the digital trivializes the physical library, which can no longer settle for the status quo. As for the digital library, it cannot content itself with mere imitation of the physical library; even were this to be its objective, it would be counteracted by its territorial limitations as a computer or tablet screen. However, there is one resource that the digital library _can_ exploit, which is the wealth of the data generated though its use; you and I are the metadata of the books we frequent. In a digital library, it is in real time that readers leave multiple traces: the books they read, the intensity of their reading, the books they install on their bookshelves, etc. These data are added to the traditional metadata employed by librarians. They transform the geometry of the library, which becomes non-Euclidian; between two books there can be several shelves; those of Dick, Jane and so on... The question that comes immediately to mind is the following: What happens to the spatial organization of the library when it is digitized and when the usual metadata are taken into account? In order to answer, it is necessary to call upon computer specialists and data scientists, whose art and science consists in building algorithms that digest the data with which they are fed. It is to be hoped that what we shall call the social graph of reading may be the fruit of their algorithmic labors. along with those of the indispensable "infodesigners". With the help of the graph, we are all in a position to visualize on a screen the new spatial and social organization of books, to do so according to their nearness or remoteness, to filter the organization by schools, by types of readers, by country, by types of book, by publishers, and to find out how to

move on from a given book to its successive neighbors[5]. In a nutshell, a reader can move from the traditional Euclidian stage, which proceeds by categories, to the non-Euclidian stage, where attention is paid to correlations, all of which are stories to discover and narrate.

This graph, which is a carrier of correlations, requires the contributions of artists and designers, without whose input, visualized information would remain aloof, arid and unsatisfying. It likewises require the availability of new technological interfaces: an interactive white board, a connected and large-scale touch screen... It is incumbent on the designers and architects to rethink the space of the physical library in such a way as to host the users, the algorithms, the screens and the new forms of interaction between them. It is highly likely that in this new space, silence will more often be the exception than the rule. In France, the space most strongly gravitating toward the new geometrical and social organization is the HUB of the Kedge Business School on its Marseille campus. In this way, and contrarily to conventional thought, digital space and physical space are not bound to divorce. The former does not obliterate the latter. By trivializing it through technical reproduction, digital space rather tends to redefine and to reactivate physical space, as sensed close to a century ago by Walter Benjamin. Little by little, we are about to witness the emergence of new areas of library experience. Moreover, what pertains to a library is equally relevant to campuses themselves, once they shall have been trivialized by MOOCs. Indeed, campuses shall undergo the same metamorphosis as libraries (and vice versa). They are not about to disappear. Their geometry and functions are different; they will lend themselves to an art of conversation and to a shared work environment ("co-working") that will be enriched by the dividends drawn from the digital.

It is now time to conclude by focusing on some of the practical questions that MOOCs and, more generally, technical reproducibility can't help but entail. These questions are anything but ancillary. The answers will help to redefine our usages pertaining to knowledge: To whom does it belong? How is to be

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5   This graph exists; it has been developed by Cyberlibris and goes by the name of DICE (Digital Content Explorer).

assessed? What are the germane rules and regulations?

Some practical questions of immediate interest

The "ubiquitousness" of MOOCs gives rise to practical interrogations demanding thoughtful consideration.

To whom does knowledge belong?

A MOOC is structured around one or several professors, who hold positions in academic institutions. How are we to define intellectual property when knowledge is disseminated via a MOOC? Let us imagine for illustrative purposes that a Yale professor, author of a successful MOOC, leaves his university for Harvard. Is he the proprietor of his MOOC, or has he ceded the copyright to the university of which he is now an employee? Once employed in his new university, can he bring into being a similar MOOC without being considered as an intellectual hacker? The intellectual property issue is far from negligible, and it shall need to be treated with vigilance and diligence by the universities intending to utilize MOOCs. One may imagine that a system similar to the one governing the economy of books will be put into place. While the professor will take on the role of the author, the university will assume the role of the publisher. The publisher will agree with the professor on contractual terms, operate the MOOC of which the professor is the author, and remunerate him according to the sales recorded by the MOOC.

How to evaluate, to certify, to accredit?

Traditionally, an educational system hinges in the notion of grade or mark, of an evaluation given by instances the legitimacy of whose authority cannot be called into question. With regard to MOOCs, on the other hand, observers have noted some trending towards peer evaluation, which is no longer wholly vertical, but also and significantly horizontal. On this subject, a method has been set up in Coursera (http://help.coursera.org/customer/portal/articles/1163294-how-do-peer-

assessments-work-,   https://www.coursera.org/about/pedagogy) . T h i s
assessment is premised on the community-based dynamics constituting one of
the guiding principles of the MOOCs. A student can draw support from a
widespread network of other students registered for the same MOOC;
horizontal pedagogy both complements and supplements vertical pedagogy.
Mutual pedagogical assistance brings together students who up until the
moment before were total strangers. Digital solidarity is a common
phenomenon on the Web; question & and answer forums are but one example.
As concerns MOOCs, it is of paramount importance; in fact, digital solidarity is
their alpha and omega, and it is no surprise to find it present in the
assessment process.

What happens to confidentiality?

This is a recurrent preoccupation on the Web. Whether voluntarily or
involuntarily, internauts leave behind a number of tracks and traces that pique
the interest businesses. MOOCs can hardly be immune from ongoing debates
on protection of private data. It is all too easy to imagine the hunger of
companies for the academic records of MOOC users, which are essentially open
for inspection! This is by no means an unreasonable concern. That much said,
it must not lead to obliteration of the collective intelligence that aggregation of
individual information allows to emerge. As we observed in the paragraph on
the art of place, analysis and visualization of data drawn from MOOCs
contributes to the development of new pedagogical tools and of new interfaces
facilitating interaction with digital contents.

In praise of Babel : What is to happen to the public education authorities?

MOOCs are a homage to the Tower of Babel. Persons from hundreds of
countries converge towards the MOOCs, which are derived from similarly
multifarious professors and universities. Their diversity is an undeniable source
of wealth. However, it just as undeniably raises questions concerning the
supervisory authorities in public education and their mission consisting in the

recognition of diplomas. Once degrees have become granular or gone so far as to disappear, what role shall national ministries of education and higher learning have to assume? What will be their missions in a geographical perspective dispensing with boundaries between nations?

Conclusion :

In his best seller "A Whole New Mind"; the American author Daniel Pink writes: "*When facts become so widely available and instantly accessible, each one becomes less valuable. What begins to matter more is the ability to place facts in context and to deliver them with emotional impact.*" So it goes with pedagogical contents; when they become so available, so abundant and accessible in so little time, they take on less importance. On the other hand, the ability to put them in context and provide them with emotional impact is perhaps what matters most.

As Walter Benjamin so accurately sensed, it is from technical reproducibility that arises the abundance that leads, for instance, to interrogation on the work of art and its status. In the digital age, technical reproducibility has become the rule; more than that, it is the foundation of the digital economy and the peculiar structuring of its costs. It is hard if not impossible to avoid; just think of pedagogy, libraries, bookstores, retail and photography, all of which have been "trivialized" by the insatiable machine of technical and digital reproduction, for which the Internet provides a formidable lever for dissemination. And so it is that the art of pedagogy and the enclosures in which that art has been practiced for centuries finds itself viscerally challenged by the MOOCs, as well as other modern means of sharing such as YouTube and Dailymotion. No wonder Michel Serres' delightful treatise is entitled "Thumbelina".

Today's upheavals are particularly captivating insofar as they are likely to call upon our cognitive processes in many more ways than one. Subsequent to the works of Professor Roger W. Sperry, winner of the Nobel Prize for Medicine, we

now know that the two hemispheres of our brain fulfill different yet complementary functions. The left hemisphere is the site of sequential thinking; the right hemisphere is the site of simultaneous, holistic thinking. Daniel Pink sums up the duality as he writes:: "*The left hemisphere specializes in text; the right hemisphere specializes in context.*" To summarize by once again citing the celebrated fox/hedgehog aphorism dating back to the 7th century before Jesus Christ, the left part of the brain assumes the role of the fox, while the right part is reminiscent of the hedgehog. In his work on behavioral psychology, Neil R. Carlson indicates that while the left hemisphere contributes to information analysis, the right hemisphere has the ability to gather together the isolated elements in order to arrive at an overall or global point of view[6].

Given this set of observations, here is what we wish to conjecture. MOOCs favor sequential learning and serial tinkering; they enable us to learn many things. In this respect they favor what Daniel Pink terms left-brain thinking, which is connected to the left hemisphere. What matters is to endow sequential tinkering with meaning and to arrive at a synthesis, which is what right-brain thinking has to contribute. In our context, classroom pedagogy, which has so often been premised on left-brain thinking (it has been awarded cult-like status), is challenged to capitalize on right-brain thinking. It is in this way that a pedagogue is called upon to place himself at risk as he puts to work his faculties, his dimensions of emotion, of esthetics, of context, of synthesis, of overview. Excepting the initial conception of MOOC, he is no longer the pope of left-brain thinking. In his pedagogical art, he has got to transform himself into an apostle of right-brain thinking. The architecture of the sites in which right-brain thinking is called upon to express itself has likewise got to be comprehensively transformed. Today's academic architecture, which is built around "Power Point", corresponds to that of places where foxes in the know train the foxes yet to be. The future architecture of pedagogical sites shall have to develop in such a way that the foxes from MOOCs and their pedagogues can also act as hedgehogs who know that connection is worth at

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6   Cité par Daniel Pink, L'homme aux deux cerveaux, Robert Laffont, 2007, p 33

least as much as connection. In the short term, the gift of ubiquity and of consequent notoriety conferred to a university professor by a MOOC should allow him, during hours indicated on line and as he makes his way around the world, to organize micro-sessions in cafés, which are perfect places for conversation. It is safe to say that ephemeral sites of pedagogical conversation and social interaction shall be popping up here and there, wherever and whenever...

This type of mutation is already underway in the libraries previously considered as examples. The physical library is a place for classification, a place for detail, a place for Euclidian analysis of information. In this respect, and with possible exaggeration, it is a place for left-brain thinking. The emergence of digital libraries is good news; they shall establish some balance by tilting towards right-brain thinking. The physical-digital alliance facilitates transition from a universe in which categories predominate (the physical library) towards a universe in which correlations (the stories between books) are to be discovered, towards a universe in which we seek out meaning as we collate our individual readings. This world of synthesis, of the interrogation of correlations, is that of right-brain thinking. That said, we must not forget that it is rendered accessible by judicious mobilization of left-brain thinking through which algorithms wind up emerging, algorithms that can transform the le tsunami of data that digital capture engenders. That - and that alone - is the transformation that right-brain thinking strives to render meaningful. And once again, perhaps, cafés are where it's at.

In his *Essays*, Montaigne wrote that he preferred a well-made to a well-filled head. A full head is inclined towards left-brained rather than right-brained thinking. As of now, you can't have one without the other. When push comes to shove, a well-made head is one that details and connects; neither function systematically wins out over the other.

In an age of technical and digital reproducibility, will pedagogy rose to the challenge of facilitating the flourishing of well-made heads?