Projet Erasmus+ D-Transform

Guidelines

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The place and the role of the university in the digital transformation affecting society are fundamental issues that inevitably challenge its governance, in a time when society is being thoroughly transformed, shifting from a society based on trade and exchange, to one based on usage (CNnum 2016). This transformation is having a significant impact on the university's environment, forcing it to reinvent itself. For the past few decades, the university has been subject to numerous factors driving change, notably as its mission has evolved from educating the future elite for their position in society, to training entire cohorts to enter the job market and become enlightened citizens. In addition, the implementation of the Bologna Process has entailed harmonisation of the educational systems across Europe, and has considerably changed the way in which training is organised. The university has also been disrupted by a transdisciplinary approach that applies to both research and training, and more generally, by the breaking down of borders (such as the creation of university consortiums[1] or the merging of institutions in France, plurinational teams on European projects or teams with multiple profiles on large-scale projects, the emergence of new topics of study on the fringes of disciplines, with students tending to go back and forth between firms, universities, disciplines and cultures as they change their majors, do internships or participate in Erasmus exchanges, etc.).

The development of digital in all segments of society and the arrival of learners who are 'digital natives' have had an inevitable impact on the university. However, its transformation cannot be reduced to simply computerising its management and the administrative processes that ensure its smooth logistical and administrative operations. Although many educational innovations can be noted in coursework, there has been no true academic modernisation to adapt the university to the new requirements of a society imbued in digital technology and resolutely focused on learning (CNnum 2016).

In one of its most recent reports,[2] published in June 2016 on the topic of higher education and digital learning, the CNnum (*Conseil National du Numérique français*, the French National Digital Council) casts light on educational techniques, which it believes should be the focus of all attention and the target of most efforts, as in its view, 'the digital transformation of higher education is connected with an overarching need for new teaching techniques, new ways of working, of learning [and] of sharing that are already being practised by students and by some teachers'. The report does not mention 'a transformation in the way courses are taught, but instead a transformation of the learning environment as a whole.' To achieve this, a collaboration between 'students, teachers and administrative staff, and more broadly, all stakeholders, companies, public-sector authorities and associations…' Lifelong learning goes hand in hand with the changes in work being driven by digital technology: 'The consequences are considerable for higher education, which is being asked to welcome students of all ages, from diverse cultural, social and geographic backgrounds, which is a source of both wealth and new challenges – whereas the most visible current audience is in the 18-23 age bracket.' According to

[1] Fioraso Law – 2013.
[2] http://www.CNnumerique.fr/wp-content/uploads/2016/05/CNnum_Référentiel-de-transformation-ESR.pdf

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CNnum, it should be considered natural to turn to the university to learn, to obtain training, and to return to the university whenever one chooses. But here, too, the educational techniques must adapt.

1. An environment undergoing in-depth change

For the past few years, we have seen a reshaping of the entire ecosystem of learning and training. This is a fundamental transformation, with notably an internationalisation of learning, thanks to the development of online learning (with learners of various backgrounds, teachers from different universities, and international recognition of diplomas or accreditation), the expansion of informal education with the emergence of MOOCs (Massive Open Online Courses), the arrival of new players that are developing around private platforms and through possible partnerships with universities, the 'uberisation' of some university activities (some functions are already accessible via digital services that address individuals and learner communities directly), etc. The 'University of the Future' survey,[3] carried out by consulting firm Ernst & Young in 2012, noted four major changes:

- **A democratisation of access to knowledge.** Traditionally, universities held the key for access to the knowledge that was created, stored and accessible in a 'physical' location (university libraries, research centres or auditoriums). Online training courses (and more recently MOOCs) and digital documentation have increased the spread of knowledge and broadened access to university teaching, thus contributing to a transformation in the university's role.
- **Increased competition between universities on a global level, whereas public funding is being cut.** This competition runs the risk of fostering the emergence of a small number of 'elite' universities, with an increase in students' global mobility (both actual and virtual).
- **The need to create new business models** able to grasp future educational needs. Usages must be taken into consideration, and probably costs must be viewed on a per-activity basis and no longer in terms of complete costs.
- **The arrival on the market of new private players.** The relationship between the socioeconomic world and higher education is changing and diversifying, moving from what was frequently a client/provider relationship to a partnership-based one, along with the rise of competitive ties.

The university must reinvent itself at a time when various kinds of alternatives are emerging. Otherwise it may see its students turn to other more attractive players, other more intuitive tools or other effective approaches. All too often, the issue of digital transformation of learning is addressed in terms of the availability of tools and platforms (often quite diverse but lacking in ergonomics, and thus not allowing for sufficient promotion of content) or the transformation of teaching techniques (which most often depend on teachers' willingness). The time has come to think of the transformation of the learning environment as a whole, in connection with the

[3] http://www.ey.com/Publication/vwLUAssets/University_of_the_future/$FILE/University_of_the_future_2012.pdf

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transformation of society around characteristics such as sharing, lifelong learning, disintermediation to reach a 'flatter' organisation of activities and structures, or the dissemination of knowledge.

The crucial challenge for universities is to position themselves as the key players in lifelong learning. This notably entails that they must create all the factors for a high-quality, high-performance initial experience; that they must be able to take account of each learner's constraints, personal goals and abilities; that they must reinvent themselves to factor in peer-based learning, informal learning and new evaluation techniques… This is a genuine 'cultural revolution' that can only be achieved if university governing bodies have a clear view and an effective strategy driven by shared, assertive values, and made operational through a coherent action plan and adequate means.

1.1. A success story

US-based Arizona State University (ASU) completely transformed itself thanks to the digital shift. When he became president of ASU in 2002, Michael Crow set a goal of training many more students, more efficiently and at a lower cost, because in his view, the university of the future must be inclusive.[4][5] He created *ASU Online*, an online university with seventy degree programs.[6] In 2015, after six years of existence, *ASU Online* already had 19,000 registered students. *ASU Online* allows ASU to enrol students from all across the US, while tackling the college dropout phenomenon (note that in US universities, 40% of students drop out without obtaining their bachelor's degree). ASU defends the idea that online methods, because they are more flexible, are more suitable for various audiences (including young people who work while they study, have children or live in rural areas, as well as older students or those changing careers, etc.) and thus reduce the risk of dropping out. Indeed, *ASU Online*'s retention rate, after the first year of studies, is 80%. To achieve this educational transformation, ASU created a department of around one hundred employees (not counting teaching staff) to work on developing *ASU Online*. Twenty-five online course designers (combining teaching and IT skills) are notably responsible for helping teaching staff adapt their courses to online formats and make them more appealing.[7] Lastly, the digital teaching approach initiated with *ASU Online* has spread through ASU itself: 25% of courses are now 'flipped' classes,[8] according to Adrian Sannier, Chief Academic Technology Officer at *ASU Online*.[9] Since 2007, ASU has also set up an online student advisor system, called eAdvisor, that lets students follow their own progress, choose their courses more effectively, and receive personalised online help.

[4] https://asunow.asu.edu/content/asu-tops-us-news-world-report-list-most-innovative-schools
[5] Educpros 11/2015, http://www.letudiant.fr/educpros/actualite/ numerique-arizona-state-university-la-pionniere-de-l-ouest-americain.html
[6] http://asuonline.asu.edu
[7] See above.
[8] Before class, course content is studied online so that face-to-face class time can be used for exercises, projects and discussion.
[9] See above.

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ASU currently has around 70,000 students enrolled on its four campuses, i.e. a 43% increase in ten years. It has also become the US benchmark in terms of *adaptive learning*, prioritising the creation of personalised courses. In September 2015, ASU launched the Global Freshman Academy, in collaboration with the MOOC platform edX. This general programme of eight MOOCs allows anyone, after a year's studies, to obtain the equivalent of the first year of university coursework, and then to register as a second-year student at ASU or another university. In this programme, the MOOCs are free of charge, but fees apply for obtaining university credits. The cost is around $6,000 for one year, about half the cost of a year's tuition at *ASU Online*. The student pays for each course separately, and only if he or she wishes to sit the final exam ($200 per credit hour[10]). Tuition for *ASU Online* is $500 per credit hour, i.e. $15,000 for a year's coursework of thirty credits. In the traditional university system, tuition ranges from $18,000 to $32,000 per year. Since its launch in August 2015, the Global Freshman Academy has signed up 12,000 students from around the world.[11]

This example is particularly interesting because in ten years, Arizona State University has gone from being a mass-market establishment with mainly a local enrolment, to being an innovative digital university (enrolling students from all fifty states[12] and from 135 countries worldwide, with 6% international students[13]). This public institution has forged itself a prestigious reputation thanks to its digital transformation strategy, ranking No. 1 in 2015 as the most innovative university in the US, according to *US News & World Report*[14] (Stanford ranked second, MIT third).

A clear strategy is made even more necessary by the fact that new educational players are emerging, such that competition in the educational and training sector is constantly increasing. ASU has successfully created partnerships with companies such as McGraw-Hill and Pearson, and has also innovated in the sector thanks to its collaboration with Starbucks. Since 2014, the coffee chain finances *ASU Online*'s the tuition fees for its employees who want to do a degree (they can choose their own course of study). This programme is expected to enrol 15,000 students by 2019.[15]

Digital leads to new knowledge acquisition and appropriation processes that are more agile, more collaborative and less top-down. Likewise, the accessibility of online training enables learners to have personalised programmes. This observation should challenge the educational system and prompt it to adapt rapidly in order to avoid falling prey to disintermediation or even being replaced by new educational players in the current period in which universities' reputations, both locally and internationally, also depend on their online offer – as shown by ASU's example.

[10] https://asunow.asu.edu/content/asu-tops-us-news-world-report-list-most-innovative-schools
[11] https://annualreport.asu.edu/sites/default/files/asu_innovation_2015_yearinreview_web.pdf
[12] http://www.asu.edu
[13] http://universites-americaines.findthebest.fr/l/86/Arizona-State-University-ASU
[14] http://colleges.usnews.rankingsandreviews.com/best-colleges/ rankings/national-universities/innovative
[15] See footnote 2.

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1.2. New educational players

Notably, the higher education and lifelong learning market is attracting interest from the web giants. GAFA (an acronym for Google, Amazon, Facebook and Apple) and other web giants aim to take advantage of the transformation of learning and access to knowledge by marketing a training offer that fully leverages their expertise, while also promoting their usual services. In particular, GAFA have very high-quality digital expertise, high-performance tools that have been tried and tested in other fields, large-scale robust infrastructure, and the human and financial resources needed to tap into the digital transformation of education. In the next few years, the web giants will position themselves as genuine educational players. They will do so either by developing their own educational expertise, or by supplying platforms and data to traditional institutions (in order to assist them in optimising their offers, reaching new target audiences seeking training or new skills and reducing their overheads) and to the general public in a social and collaborative approach to learning. As summarised by the vice president of an Australian university: 'Our major competitor in ten years' time will be Google… if we're still alive.'[16]

Apple and Google recently announced their desire to enrich their platforms and software ranges in the learning field. Microsoft, Google and Apple have already launched their own educational programmes ('Apple for Education', 'Microsoft Education' and 'Google for Education'). LinkedIn is betting on an approach of assisting its users from university up to retirement. In late 2015, Mark Zuckerberg (Facebook) and his wife announced that a portion of the $45 billion fund they are setting up will be used to develop software 'that understands how you learn best and where you need to focus.'[17]

Global e-commerce heavyweight Amazon already had already entered this field back in 2013 by acquiring TenMarks, an online math education company, which it turned into its Amazon Education division. Thus, during the National Conference on Education held in the US on 12–14 February 2016, Amazon announced that it intends to launch a service for schools. This platform, called Amazon Inspire,[18] was launched in beta during the ISTE 2016 Conference in Denver; it will enable teachers to discuss their teaching objectives, to share their educational resources and to co-create new materials. Note that Amazon already has the largest book database in the world. Transforming this into a global knowledge bank, negotiated with publishers and other partners, that could customise an offer based on the reader or learner's needs, would open up unlimited prospects in the educational field. In the same vein, Google knows our interests, preferences and habits thanks to the big data that it collects and analyses. Hence it also knows how to customise information and advertising, automatically and very efficiently… And so if Google decided to use its databases for educational purposes, we could imagine it launching its own educational content and training offers in the future. Furthermore, Google supports research in this field (e.g. it sponsors Carnegie Mellon University's MOOC research).

[16] 'University of the future, a thousand year old industry on the cusp of profound change', Ernst and Young. available online. cf. footnote 3.
[17] http://www.edweek.org/ew/articles/2016/03/07/facebooks-zuckerberg-to-bet-big-on-personalized.html
[18] http://go.amazoneducation.com/earlyaccess

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The growth of digital learning is bringing new private-sector players onto the higher education sector, where they position themselves as educational partners of traditional academic institutions. For example, the French company OpenClassrooms,[19] which states on its website that it 'wants to make education accessible for everyone and to favour community-based and committed learning', and that its aim 'is to accompany you throughout your life and career'. OpenClassrooms offers open classes and, in 2012, it began to offer courses with accreditation. With nearly three million users per month and more than 1,000 online courses available, it has developed its economic model around service and support (it offers three service levels). It has partnerships with a few prestigious French institutions (École Centrale de Paris, École Polytechnique, etc.) and awards level II certificates recognised by the French state and included in the European Skills Passport (Europass). OpenClassrooms provides its first level of support free of charge to all jobseekers in France as part of a partnership with Pôle Emploi (the French unemployment office) signed by French President François Hollande.

Although redefining the university's role must include the extrinsic phenomena related to the development of an educational ecosystem and its internationalisation, it still cannot ignore the intrinsic transformations related to the teaching possibilities made available by digital technology.

1.3. Digital, a factor for the educational revolution

According to educational historian Antoine Prost,[20] a teacher can be either a *speaker* (i.e. transmitting information) or a *magister* (i.e. holding the keys to knowledge). The digital revolution, by enabling any individual to access a colossal mass of information, raises even more acutely the issue of building, mobilising and interacting with knowledge. The teacher takes on the full dimension of *magister*, leaving the *speaker* role to the digital support materials. This is notably why digital teaching causes a significant transformation in the teacher's role. In addition, the learning relationship must change, moving towards greater student involvement in producing content and in evaluating the work done on an individual and group level.[21]

Thanks to digital, university institutions can personalise learning and assist the student in defining his or her own academic pathway and personal work. For example, *learning analytics* and *adaptive learning* use the digital traces of learning interactions to understand individual learning modes better, and thus to provide students with individual follow-up. Learning analytics can be regarded as an interpretation of a broad range of data produced by, and collected on behalf of, learners in order to assess their academic progress, predict future performance and identify potential problems. The data is collected based on students' tangible actions, such as their homework assignments or exams, and related activities, such as social networking interactions, extracurricular activities and messages on discussion forums, as well as other activities that are not directly considered in traditional student evaluation methods. The

[19] http://openclassrooms.com
[20] 'Eloge aux pédagogues', [In Praise of Pedagogues], 1985, quoted on p. 25 in the reference below.
[21] http://www.lecese.fr/sites/default/files/pdf/Avis/2015/2015_06_pedagogie_numerique.pdf

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analytical models process and display the data in a legible format, helping teachers and training managers define and plan effective, relevant educational actions. Thus, the objective of learning analytics is to enable teachers and educational institutions to adapt potential course materials to the needs and abilities of each student. However, learning analytics must not focus solely on learners' performance. It can also be used to evaluate courses, training programmes and institutions, to contribute to existing evaluation efforts on a campus, to help provide a deeper evidence-based analysis, or be used to transform teaching more radically. Learning analytics could also be used by students themselves, creating opportunities for an overall synthesis of both formal and informal learning activities. Learning analytics is an obvious contribution to the wide-scale industrialisation of individualised training, partially or fully online (known as *adaptive learning*), which would be impossible without automation.

However, the digital shift has given rise to many myths; the D-Transform project has studied these in three different reports.[22] The following section provides a quick overview of the main findings of these reports.

2. Myths, revisited

2.1. 'Digital and open education provide anyone with access to knowledge'

Open-source digital educational resources and free online courses such as MOOCs have given rise to sometimes 'miraculous' expectations in terms of broadening access to knowledge. Indeed, they refer to both the long-standing goal of providing education for all, as defined by UNESCO, and to the habits of the web world, with ties to free services and exchange (see D-Transform report O1.A1*).*

But do online resources and training courses really live up to these expectations? Digital definitely enables broader, more diverse audiences, but these audiences have very specific characteristics. The divide in knowledge access does not disappear, and could – paradoxically – even grow wider. Institutions, both public and private, must thus think carefully about the audiences that they target.

2.1.1. A broader audience…

Some 1.5 million registrations for the FUN-MOOC platform, 3 million for FutureLearn, 2 million for MIRIADA, 17 million for Coursera… The learners are definitely there, but *who* are they really?

Digital resources and systems such as MOOC platforms aim to provide services to teachers, students, as well as to a much broader audience that may or may not be in a professional setting. Hence surveys indicate that the vast majority of users for these systems are 'non-institutional', i.e. without any formal ties to an educational institution (see O1.A3): only 9% of OpenCourseWare users are teachers, 10% of the users of France Université Numérique (the

[22] D-Trasnform reports O1.A1, O1.A2, O1.A3. available online at http://www.dtransform.eu/resources/

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French national MOOC platform) are students; conversely, 40% of the people who use Canal U, presented as the video library for French higher education, belong to the 'general public'…

Therefore, OERs and MOOCs have tapped into demand from an audience that was not necessarily initially anticipated, but which is also a target for higher education in its general role of disseminating knowledge and culture to the entire population (as formalised, for example, by the notion of the university's 'social responsibility' in the 2013 French Law on higher education and research). Free online systems can reach audiences that are unwilling or unable to take traditional higher education courses because they wish to have flexibility in organising when and where they learn, would like to have more focused, modular 'blocs' of knowledge and skills, with or without certification, and because the training costs can be lower, admission criteria less selective (or not selective at all), or because it is not easy to go back to the university after dropping out…

Building up knowledge, gaining skills, improving one's career… The public authorities have latched onto some of these systems. For example, in France, the first level of learner support on OpenClassrooms is paid for by the state for all jobseekers (see A1.O3 §3.4). Udacity cofounder Sebastian Thrun decided to give his company's MOOC offer a 'jobseeker' focus, reimbursing the course fees for any user who fails to find a job within six months after the end of their training course (Educpro, February 2016). This focus of online training services on stronger professional development is bolstered by the fact that some MOOCs, combined with online exchanges among their participants, have built communities that continue to communicate on Facebook, LinkedIn or other platforms even after their MOOCs have ended.

More generally, the already well-established notion of 'lifelong learning' takes on a new reality; the dividing line between education and continuous training has become blurred, just like the line between the university and its ecosystem. This is the context for understanding the assertion that 'the digital transformation leads the university to break through internal borders (between disciplines, departments, years of study) and external ones (between communities of experts and non-experts, between ESR and economic players, non-market players)' (CNUM 2016).

2.1.2. …but an audience mainly of university graduates and English speakers

Digital is often presented as a lever for democratisation in higher education. Yet current data indicates that open resources and systems that favour learner autonomy do not systematically benefit those facing the greatest difficulty gaining access to, and being successful in, higher education. Thus, a majority of MOOC participants already hold a master's degree or higher and live in developed countries. This audience is therefore educated and capable of relative autonomy in its learning practices (see O1.A3).

Paradoxically, this open access to knowledge could actually prove to be a factor for inequality, or even the source of a new educational divide. This may be connected to MOOCs lacking appropriate teaching techniques for different learners (Rohs & Ganz, 2015) outside Western

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university systems, and to the difficulties in creating coherent learning programmes based on a training objective (Brown *et al.*, 2015).

Likewise, the weakest segments of the higher education student population are those that require the greatest level of support, a situation in which face-to-face teaching cannot be neglected. And as for the now-famous 'flipped classroom', we must not be too quick to draw conclusions about its educational success.

Therefore, digital enables a larger, more diverse population of individuals to become learners. Higher education establishments must, based on their strategies and values, reconsider their primary targets and their teaching approaches in this new context.

2.2. 'Digital and open access can help students be more successful'

2.2.1. Quality of digital education and improvement of learning programmes

OERs and MOOCs continue to drive considerable hopes that they will help improve quality, drive the change in current learning and teaching practices, thus also enabling the change that the Bologna Process and national policies have been unable to bring about (EUA, 2014). According to EUA (2013), Home (2015) and IPTS (2016), the development of MOOCs is a major trend in Europe for the years ahead.

So, apart from international visibility and recruiting new students, this is a wager on better learning. But is there a connection between improved quality and open resources?

In its 2006 report on evaluating the results of the OCW platform, MIT signalled that teachers thought that their courses had improved thanks to these open resources. According to the OECD (2007), openly sharing resources can improve their quality, boost creation of new educational resources, incentivise their use, and help higher education establishments promote the use of these resources both internally and externally. Quality would improve thanks to the greater visibility of online courses and the fact that some of these would be designed collaboratively.

However, a gap is observed everywhere between recommendations for OER use and teachers' collective practices. Indeed, teachers show a reluctance to use others' coursework (apart from some formats such as worksheets, mini-units or simulations…), especially because these resources are not always easily subdivided and reusable. Moreover, they remain reluctant, on the whole, to making their own courses public or open, despite prestigious examples such as MIT, due to complex copyright policies or fears of overexposure…

MOOCs, SPOCs, new training formats... with digital, we are seeing hybridisation of training techniques aimed at lifelong learning and a renewed interest in issues of teaching and learning. In the field of continuous education, training courses that combine face-to-face learning and distance learning are gaining ground so that employees do not have to miss work too long and so that they can better appropriate knowledge and skills. Thus, the development of OERs and

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MOOCs can tangibly contribute to lifelong learning, with a view to flexible and personalised learning programmes.

In the UK, some partner institutions of OERu use MOOCs as a means to encourage their staff to undertake online teaching for future developments that would be more 'profitable'.

MOOCs have also focused on the contribution to training made by forums, social networks and peer-to-peer relationships, and sometimes on co-construction systems, replicating the evolution of social practices.

2.2.2. The autodidact myth and promoting student support

Over the past few years, this focus on OERs and more recently MOOCs has – paradoxically – cast a fresh light on the importance of *support* for learners. For as Amadieu and Tricot remind us (2014): 'The autodidact myth would have us believe that from the moment quality resources are available, any human being can be an autodidact [...] yet autodidacts are exceptional people who represent just 1% of the population; for the other 99%, they need a guide who guides them to knowledge.' We must acknowledge that the dropout rate for MOOCs is high, even though for many participants, their objective is not necessarily to complete the full training course. This highlights the importance of support and researching new systems.

Coursera will launch its first degree-granting MBA programme based on MOOCs, in collaboration with the University of Illinois: students will have the right to earn a degree and access a series of services (professor interaction, supplementary courses, graded coursework, etc.). To improve the very low completion rates, MOOCs would benefit from being much more flexible, notably by being on-demand and not just in sessions. In keeping with this rationale, MIT is promoting the reverse enrolment method, which gives learners the chance to take MIT courses even before they enrol ('try before you buy'). In order to customise its systems, Harvard has created the Harvard Extension School, which offers over 700 courses that can be taken on campus in the evenings, entirely online through video conferences, or online with intensive face-to-face courses on campus on the weekends.

The advent of the first MOOCs may have raised fears of a return to auditorium-style lectures, but in fact, many innovations are on the horizon in terms of online learning. FutureLearn is developing a 'social learning' model with an interface that, just like social networks, enables real-time communication amongst users, sharing and co-creation of knowledge. US platforms appear to be favouring an individualised model, along the 'adaptive learning' method (i.e. automatically adapting learning processes to each user). Blended learning methods are also appearing: as part of the flipped classroom concept, students study the course content before they attend class, thanks to online content or more recently MOOCs; face-to-face time is reserved for exercises, projects and discussion.

Some establishments are developing mixed-mode instruction as part of their traditional curricula, combining online and face-to-face learning. Thus, iversity partner universities can, for

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some courses, award ECTS credits. To obtain their certificate, students must sit an exam in an iversity centre in Germany.

Other initiatives go further in recognising degrees that are entirely based on online education: As we have seen, edX launched a curriculum with Arizona State University for the 2016-17 academic year, enabling students to complete the first year of studies for a bachelor's degree by taking eight MOOCs.

Therefore, the policies of the past few years prompt us to consider the teacher's role and, more generally, the overall transformations in teaching techniques. Approaches based on digital educational resources thus appear to be one of the *steps* for establishments' digital transition.

Digital does not imply greater success *per se*. It must also be incorporated into an overall innovation process for learning, services offered and campus design, in connection with the local, national or international ecosystem. Only then can it become a crucial lever for establishments and users to produce and acquire knowledge.

2.3. 'Digital natives are a step ahead of the digital transformation'

2.3.1. Digital literacy is indispensable…

Digital technology has given everyone the means to be more mobile, to overcome distance, to form new sociabilities, to access vast fields of knowledge… This is an increase in capacity shared by each and every individual. A smaller number of individuals can leverage digital to create, share and disseminate knowledge. It is still indispensable that the general public appropriates not just digital tools, but also the related skills.

The notion of *digital natives* is misleading. When they arrive at university, today's students already have social practices based on digital technology and can use technological tools with a relative degree of ease. However, it is known that they must still acquire the indispensable notions of digital literacy,[23] as a whole and systematically, in order to be successful in their studies and in their careers. Institutions must research the means and methods for spreading this digital literacy – which is constantly evolving with technological advances and new uses (see the current reform of the French C2i certificate[24], the Erasmus eLene4work project[25], and the OECD reference framework[26]).

[23] 'The ability to understand and employ digital information in daily activities, at home, at work and in the community – to achieve one's goals, and to develop one's knowledge and potential' (see the OECD's definition in *Literacy in the Information Age*, 2000).
[24] https://c2i.enseignementsup-recherche.gouv.fr
[25] http://elene4work.eu
[26] https://www.oecd.org/fr/carrieres/cadre_de_competences_fr.pdf

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2.3.2. …for teaching office software and acquiring new professional and social practices…

Spreading digital literacy means allowing younger generations to develop their mastery of digital knowledge and skills so that they can make digital technology a means for emancipation and involvement.[27] Going well beyond simply accessing and connecting to infrastructure, but also acquiring uses in their simplest terms, such as the ability to navigate the web or send emails, or to become an enlightened citizen in a world being transformed digitally. The aim is to develop instrumental skills such as using hardware and interfaces, creative and productive skills to design, create, modify, repair, etc., technical skills so that users can develop their own programs, modify the programs they use, or at least understand and master their interactions with IT systems, contextual skills to find and understand information, to analyze a situation or a process, and lastly, reflective skills, because digital systems incorporate values and the digital economy represents a transformation that is essential to understand.

2.3.3. …at the same time as students' necessary contribution to the digital transition and training of the elite

The university of tomorrow is being built collaboratively, in interaction with society's needs and the world's changes. On the collaborative aspect, CNnum (2016) even dares to present the idea of building an educational reference framework with the students, who could thus describe their own practices and expertise, their needs, their future occupations, etc. Involving all the stakeholders of education in the overhauling higher education is definitely an important factor for success. *Participatory design* is becoming a collaborative way of working that allows for discussion and triggering a group dynamic needed to meet the challenge of finding the university's place in a digital society.

Lastly, again according to CNnum (2016), which produced a digital transformation reference framework for higher education in 2016, a lack of digital culture in university administrations must be tackled… Otherwise, as the leaders of these structures are also the decision-makers, nothing can be achieved. This is an essential aspect that the Erasmus+ D-Transform project suggests addressing through *leadership schools* that would target the governance of European higher education institutions, in an international perspective.

Thus, students are at the heart of the digital transition for higher education. Because this transition is at the heart of the changing skills that they must acquire. And because this digital transition obviously cannot take place with them, in a co-construction process involving all users and partners.

[27] http://CNnumerique.fr/wp-content/uploads/2015/04/2306_Rapport-CNnum-Ambition-numerique_sircom_print.pdf

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2.4. "Digital, resources and online training provide an open window to the world"

2.4.1. A tool for international development and co-diplomas, and a tool for building establishments' visibility and attractiveness

The European countries are resolutely involved in producing MOOCs. The major platforms, such as FutureLearn in the UK, France's Université Numérique and MiriadaX in Spain, clearly aim to achieve visibility, attractiveness and international competitiveness. In addition, the latter two platforms have an objective of promoting their respective languages and bringing together speakers of their languages based on shared interests (see O1.A3).

MOOCs are clearly tools for institutional visibility (Jansen & Schuwer, 2015), are part of institutional strategy (for 60% of the establishments concerned, according to IPTS [2016]), and are regarded as being communication materials at least as much as educational ones. There is a definite paradox between the humanist values of 'education for all' displayed by the founders of the MOOC movement and their use as a marketing tool to drive the visibility and attractiveness of establishments.

In some countries, online training courses have even become a key way to reach foreign students: in the UK, 36% of students taking part in a UK training course from abroad did so online, i.e. nearly 164,000 students (see O1.A2). More broadly, the geographic distribution of users of major MOOC platforms reveals that around 70% of those signed up do not live in the platform's home country.

2.4.2. A new dimension to the issue of English

The domination of the English language on networks is a very tangible issue. The question is: should OERs be placed in a given linguistic cultural language context, or should they be produced in English in order to reach the broadest possible audience? A growing number of European universities are offering OERs in their own languages (AdultTraining, 2015). The European platforms – notably Spanish and French ones – are promoting materials in their own national languages, or even multilingual training courses (EUA, 2014). A certain number of projects already exist in developing countries and are aimed at creating OERs based on their own languages and cultures (OECD, 2007). While it cannot be denied that the prolific offer of MOOCs in English encourages training in this language, it has been demonstrated that people learn better in their native language because it favours better memorisation and optimises the cognitive process.

Often, English is chosen as the learning language in order to meet the expectations of an international audience, but we must not forget that there is an audience for other languages around the world, notably for French, Spanish and Portuguese. Yet in 2015, less than 15% of the European MOOC offer was in French, despite the existence of a very large potential French-speaking market of nearly 220 million people today worldwide (half of which in Africa), a figure that could reach 770 million in 2050. Due to the cultural diversity of learners (40% of students registered on its platform live in English-speaking countries; data at end 2014) and aware of the

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stakes of multilingual MOOCs, Coursera launched the Global Translator Community in late April 2014; its target is to create subtitles in several languages, thanks notably to the community of learners.

2.5. 'There is no viable economic model for online training and resources'

2.5.1. Free of charge or for-pay: trial and error, linked with the values of each country and community

As OERs and MOOCs are provided free of charge, value-added cannot be generated from the content itself, whereas the institutions need revenues to finance the production of these resources. Both OERs and MOOCs are searching for viable economic models to guarantee their development or their sustainability. MOOC providers are experimenting with various economic models; currently, the most fashionable is *freemium* (a combination of free and pay services). Most platforms offer open courses (free of charge), but with certification or additional services that are for-pay. They set up other forms of MOOC monetisation in order to self-finance or to turn a profit: for-pay tutorials, corporate services, sponsoring, etc.

The four main economic models (see O1.A2) are: (a) *freemium*, as offered by OpenClassrooms or (at least for the time being) Coursera. (b) *Loss-leader*, in which the institution recovers its investment through other activities, with the MOOC acting as a loss-leader. This model is used in FutureLearn, for instance, where learners who appreciate a MOOC are likely to be more motivated to sign up for a master's programme at the university that created in, bearing in mind that tuition fees are generally high. (c) *Social*, in which the establishments regard themselves as having a mission of promoting education for everyone. (d) *Donor/sponsorship*, with the MOOC being sponsored by a corporate entity that wishes to see foster development of some of the skills required for its own growth. There are also aggregators that generate revenue by selling the data they collect to third parties, but this model does not fit in the European university world and could violate data protection legislation.

The table below, from (FranceStratégie, February 2016)[28], summarises the economic models of the main MOOC platforms, including FutureLearn and FUN.

[28] http://www.strategie.gouv.fr/sites/strategie.gouv.fr/files/atoms/files/na40_MOOC_finale.pdf

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Nom de la plateforme	Modèle économique	
	Type de plateforme	Modalités de financement et de génération de revenus
Coursera (US)	Privée à but lucratif	**Financement** : levée de fonds ; **Revenus** : programmes d'affiliation à Amazon ; services d'orientation professionnelle ; certification de cours ; surveillance des examens [2]
edX (US)	Privée à but non lucratif	**Financement :** levée de fonds ; **Revenus** : partenariats comme les fournisseurs de manuels ; assistance dans la conception et l'hébergement de MOOC
FutureLearn (UK)	Privée à but lucratif	**Financement** : levée de fonds ; **Revenus** : certification de cours ; surveillance des examens
FUN (FR)	Publique à but non lucratif	**Financement** : dotations publiques et cotisations des institutions membres (trois paliers : 5 000 euros ; 20 000 euros et 60 000 euros)
Iversity (ALL)	–	**Financement** : levée de fonds ; **Revenus** : certification des cours

These models combine to serve innovative initiatives, such as that of Arizona State University presented above. For example, to resolve both the problems of university validation facing MOOCs and the search for an economic model, MIT offers 'academic recognition of MOOCs' through its first 'MicroMaster'. The student will take the equivalent of the first semester of courses for free via a MOOC, and if he or she wishes, can pay to validate exams and has the possibility of finishing the master's second semester at MIT, in face-to-face classes. Thus, the student will receive the same diploma as those who do their entire master's programme on campus. The objective is to reduce tuition fees almost by half and to attract an international student audience with this new model.

Note also Coursera's shift to a model that lets learners choose to sign up for a MOOC for free, with access to content only, or for a fee, with their homework assignments being corrected.

2.5.2. A broader viewpoint to encompass the full learning ecosystem

A *learning ecosystem* is an environment that is not necessarily a technology, but which must enable learning to emerge. Costs must be considered within the context of the overall ecosystem, including the various players involved, whether they are from the public or private sector. Note that consulting firm Ernst & Young, in its 'University of the Future' survey (2012), mentions the need to create new business models able to grasp future educational requirements. Uses must be taken into consideration, and costs must probably be assessed on a per-activity basis, and no longer in terms of total cost.

In a system in transition, there is a genuine difficulty in taking account of all costs and cost trends in order to imagine new economic models for learning and training…

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2.6. 'Public policies have been a major driver for the digital transformation'

2.6.1. 25 years of public policies supporting e-education

'E-education', a 'complex' and 'proteiform' object, has been the subject of public policies for 25 years now, at the national and EU levels, in connection with the strategies implemented to improve university performances (see O1.A1). We observe effects on teaching techniques, services, students' digital skills…, 'digital at the service of education'… in various forms.

As shown in the report O1.A1, depending on the country, the policies and actions implemented may (or may not) include the following:

- Establishments dedicated to online training (open University, UNED, UOC, Italiy's telematic universities, etc.). There is no dedicated online university in France, as the CNED plays a marginal role in higher education.
- Public financing
- Grouping together establishments
- A focus on adult education

However, over the past few years, there have been some common issues, as well as real investment, supported by the EU. Europe has been committed to these topics for a long time, in forms that have evolved over time. As noted in the O1.A1, 'The European Union has played a major role in the integration of ICT in higher education.' This topic has never left the political agenda, even though the actions implemented have evolved, from the launch of the e-learning project (2001) to the 'Opening up Education' programme (2013). Following the disappointing results of the Lisbon Strategy, the main programme of the strategy focused specifically on higher education, as part of Europe 2020 (2014), is aimed at 'opening up education' and placing ICT use at the heart of university programmes.

Indeed, the old issue of providing access to everyone has been revived with the web, evolving towards the issue of free and open access, and the questioning of economic models. 'Openness' is not a new issue, but it has been revived by the principles and values of the web world. 'Free', 'open', 'collaborative' and 'coproduction' practices, etc., are promoted by the web world as the means to achieve greater agility and overall efficiency.

2.6.2. Mutualisation, supporting experiments

This is the context for understanding the assertion (see O1.A2) that 'few of the topics discussed today are new', which illustrates the hesitation developing a valuable new educational market, and continuing to promote the values of open access to education.

Although there are significant differences from one country to the next, we can identify four major themes for public policies (see O1.A1):

1. IT facilities
2. Computerising university administration

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3. Digital literacy
4. Digital teaching techniques: producing resources/training materials; as noted in the report O1.A1, beginning in the early 2000s in the e-learning field, the importance of the 'continuum' doxa has tended to erase the distinction between face-to-face and distance learning, and therefore the distinction between the production of resources and that of training materials (see O1.A1).

On the first two themes, considerable progress has been made. Currently, other issues involving data centres, Big Data, security and privacy are emerging, and it is indisputable, for example, that privacy and Big Data are subjects that policymakers must address.

There is a strong European mobilisation around OERs and MOOCs. Currently, France is the only country with a national OER policy. With regard to MOOCs, 'Spain, France and the UK have a certain activity in the MOOC field (IPTS, 2015)' (see O1.A3), but'The total study time offering of MOOCs is still a very small percentage of total online learning' (see O1.A2).

In conclusion, 'the presence of ICT in universities is a reality, but the educational transformation has not yet occurred' (PB, 2011, quoted in O1.A1).

OERs have not yet become the drivers of the digital transformation of higher education, but through MOOCs, they have increased awareness (see O1.A3).

An increasing number of possibilities for awareness, support and training are being set up in establishments or within disciplines. The main reason mentioned for this still-insufficient commitment from teachers is the recognition of these new activities (career development and time invested). There is a difficulty or resistance for teachers to become involved in the digital transformation of teaching techniques; 'the heart of the education system is thus affected, the teaching profession changes to combine research, face-to-face classes and production of educational materials; resorting to IT engineers and technicians specialised in educational content production or learning engineers, becomes indispensable' (see O1.A1).

2.7. "No real shift into the digital world despite public policies"

2.7.1. The 'digital transition' has yet to come, co-constructed by all players…

Higher education has entered a different phase. Currently, the issue of e-learning – of which MOOCs are only the most publicised avatar – is one of the factors for the transformation of higher education. It is both a challenge and a lever. 'Today, the question is not just to put more digital in training, but also to guide, along with all players, the transition of establishments into a digital world in full upheaval' (see O1.A3). So, this is no longer just a question of teaching techniques in the sense of the teacher/student relationship. It affects the very foundations of higher education (and thus potentially all the departments of these institutions):

- Job market integration (university 'career services' department)
- Lifelong learning issues (continuous education services)
- Ways of studying, student life and involvement ('student life' department)

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- Geography, design and organisation of campuses (property management, facilities management departments)
- Internationalisation of higher education ('international relations' department)
- 'Brand' and communication (communications department)
- Etc.

Therefore, beyond the strategies of teaching teams or the nationally- or internationally-driven policies, the issue of e-learning affects the establishments themselves, now more than ever, in their role as designers and promoters of a comprehensive strategy for students, staff and the ecosystem as a whole. In other words, e-learning must be addressed at the highest level, with mobilisation of all stakeholders, not just ICTE departments. 'The depth of the coming changes means that all governance must be aware of the stakes and actions to be implemented' (see O1.A3).

This strategy obviously fits into a national and international context. 'The major hypothesis of this work is that the "strategic councils", to have a change of being relevant, must take account of policy changes at the European and national levels' (see O1.A1). But the central role of establishments coincides with the current questions about the role of the intermediary structures that are supposed to act as facilitators (thus, JISC's withdrawal as mentioned in O1.A1 and O1.A2, the shift in the supervision of the FUN-MOOC platform to a consortium of establishments, questions about the sustainability of the Universités Numériques Thématiques that prompted the report,[29] etc.).

2.7.2. …hence the importance of mobilising the leaders…

Three points are worth mentioning:

1. The obligation of acting in **an uncertain environment** from all standpoints (technological, cultural, economic, geostrategic, etc.). So, how can innovation be integrated? Moreover, the context is tense because it is affected by a general reduction in public funding.
2. The necessity of **incorporating digital into an overall vision** of both the establishment and the ecosystem. In addition, a digital strategy is necessary. In France, for example, this is reflected in the fact that each COMUE (grouping of higher education and research institutions) must appoint a digital vice president (see O1.A3), whereas the overall vision or strategy is seldom made public and accessible.
3. Policies that depend on **clear principles and choices**. With a MOOC, the focus can be on the marketing tool aspect (e.g. Coursera) or visibility with a specific audience (e.g. for French-language MOOCs), meeting identified needs (e.g. Courlis, a MOOC set up by an international consortium of establishments to meet a specific training need), or wide-scale training within a network, aimed at streamlining production and tutorial costs.

[29] http://cache.media.enseignementsup-recherche.gouv.fr/file/2016/59/4/2016-032_Universites_numeriques_thematiques_ 603594.pdf

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Often, establishments simply do what everyone else is doing so that they are sure to 'be in on it', without having a clear, precise idea of what it contributes to their strategy.

'In an ever more globalised environment, European universities are seeking to combine the broadest possible access to education (OECD 2002) and a race for excellence, to attract the best talents. OERs and MOOCs can find their place in this dual perspective' (see O1.A3). There is no top-down magic recipe, and each establishment must define its own policy in terms of using and promoting open educational resources and developing open education.

2.7.3. …and inventing relationships with new players

The goal is to invent new relationship modes with the emerging players in the educational sector, even though 'the much-feared rush of capital into private online providers, either replacing or partnering with conventional universities, did not happen' (see O1.A2) because the economic models are still uncertain. The major US platforms are working through trial and error. Questions are arising for the university world: Should universities supervise the major platforms? Form partnerships with them? Leave the non-university target audience to them? Granted, we can only note the importance of inter-establishment cooperation (at the local, national and international levels), particularly – but not exclusively – in the European Higher Education Area. But what forms should this cooperation take?

E-learning must be integrated in comprehensive economic models. As noted in the report O1.A2, there is a 'lack of convincing business model[s] for free courses', because 'there are no established techniques to substantially reduce teaching costs via use of information technology'. And: 'Fruitful directions for cost reduction currently focus on escaping from the prison of Bologna study time norms into a world of ultra-personalisation in a context of competency-based learning so that no student studies "unnecessary" material.'

The current focus is on stronger 'co-construction with users (establishments, staff, learners…) and partners (the economic and social ecosystem…)' (see O1.A3).

In this context of a twofold movement (autonomy and joining forces), it is indispensable to move towards a new stage in the Bologna Process.

In conclusion, a recent but genuine awareness.

Digital is gradually becoming a focus for leaders' concerns (for example, digital was the theme for the annual conference of French university presidents in 2015). Indeed, the university is welcoming new students in terms of their profiles, objectives, use of digital technology, a new context (autonomy, grouping together or merging, the European Higher Education Area), new players, new economic models… There is a need to go further, to see more clearly, for both the long term and the short term: a vision, tangible tools, potential partnerships, to move towards 'agile governance', governance that is both visionary and pragmatic, able to anticipate everything while being anchored in reality, contributing to designing the university of tomorrow without renouncing its foundational values' (see O1.A3).

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3. The need for a strategy: vision, values, objectives, action plan and means

In its essay 'An Avalanche is Coming', the Institute for Public Policy Research lays out five new university models that could emerge in the future. The Institute identifies certain destabilisation factors for the current university model, with an economy undergoing full transformation due to growing digitalisation, increased mobility of people and fierce competition for talent, as well as a struggling economy with youth unemployment at unprecedented heights, rising student debt, plus a devaluation of degrees. Lastly, nowadays think tanks carry out research, private providers give degrees, Thiel Fellowships[30] can be more prestigious than higher university qualifications, and MOOCs enable students to take classes in the best global establishments, whereas until recently, only a small number of people had the possibility of benefiting from these elite institutions. The essay's authors raise the questions of the relevance of university education for being well-prepared for entering the working world and for citizenship in the twenty-first century. They ask whether a university education will continue to hold a privileged position given the rise in university costs over the past few decades.

The higher education models that have appeared since the second half of the twentieth century are now exhausted. Today, individuals must learn throughout their lives and must seize the opportunities offered to them by technologies (currently, through MOOCs). The university is faced with three fundamental challenges:

1. How do institutions of higher education provide education for better employability, given the rise in tuition fees, the lower value of degrees, and high unemployment?

2. How can the link between cost and quality of training be broken, when students can create knowledge individually or collectively?

3. What should be done to compete with new training providers who emphasise learning through practice and mentoring?

Faced with these challenges, we can imagine four basic models – albeit admitting that the answer in a specific case might be a mixture of these options, which are not mutually exclusive.

3.1. Model No. 1: the elite university

A small number of universities will continue to attract the most talented students in the world thanks to their global 'brand', sizeable endowments, centuries-old history and famous alumni. This does not mean that these elite universities will not have to change. Teaching will also have to adapt with technology, which will take an increasingly large place in the learning process. Establishments will have to continue to position themselves with their global peers, while

[30] PayPal founder Peter Thiel awards fellowships of $100,000 each year to 20 young people under the age of 20 who want to start their own companies – provided they stop their university studies.

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questioning the factors for their attractiveness and thinking about the ways to maintain their performance. Decisions on partnerships with global establishments or major corporations will continue to be very important. Likewise, the quality of governance and administration will continue to be decisive. Mentoring will become essential for the students, who will increasingly expect very personalised interactions during their education.

Lastly, these elite universities can continue to prosper thanks to partnerships with local institutions in order to establish remote campuses that aim to offer the same quality as the 'original', such as Yale University's expansion into Singapore in collaboration with the National University of Singapore, New York University Abu Dhabi, or Paris-Sorbonne University Abu Dhabi. The latter is an EAU university, partly francophone, created through an international cooperation agreement between the Paris-Sorbonne University and the UAE Ministry of higher Education and Scientific Research.

3.2. Model No. 2: the mass university

Mass universities will be able to provide a 'good education' for the growing global middle class, taking advantage of content developed globally and adapted to their own students.

These universities will mainly use online or blended learning approaches to reach several thousand students at once. The variety of courses and learning possibilities will enable students to customise and build their programmes based on their personal interests, over a period that suits them best. The programmes offered by mass universities will also have to expand more and more into fields related to companies in order to build students' professional skills.

Certain mass universities will emerge from among current traditional universities. They will shut down their physical campuses to shift to fully online teaching.

3.3. Model No. 3: the niche university

Establishments present on niches will definitely have a future in small cities, with campuses and high-quality teaching focused on the notion of community.

For example, the New College of the Humanities, a for-profit university in the UK, is endeavouring to apply this model in central London by promising its students 'a more personal learning experience'. It is worth noting here that this concept relies very little on technology, whereas Minerva, a university in San Francisco, is attempting to tap into an elite niche market – but only online.

3.4. Model No. 4: the local university

Around the world, a certain number of universities are playing a key role in reviving local or regional economies by developing skills and through applied research.

Thus, the Institute of Business Management (IoBM) and the Institute of Business Administration (IBA), both in Pakistan, have trained a large number of professionals who have gone on to

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become leaders in their companies. These institutes have made an indisputable contribution to the Pakistani economy.

3.5. Model No. 5: the visionary university

Universities in the 'visionary' category stand out thanks to their ability to imagine a vision of what a university education could be, and what their role would be in this framework. As an example, we would mention 42 (or 'École 42') in France, an institution founded in July 2013 to train students in IT development, with a second establishment opened in California in May 2016. This school is private and entirely free (because its founder provided funding to create the school and operate it for ten years). It offers an innovative teaching approach: the 850 students entering each year are free to organise their schedules (the school is open 24 hours a day), either to do projects proposed by the educational team, or to do projects suggested by the students themselves. The students help one another and use the Internet to carry out their projects, with no deadline for submitting completed projects. To validate a project, a student must have it corrected by five other students. When a student's projects are validated, his or her level increases, so that he or she can unlock new, more challenging projects. The business model is based on an assumption that 150 start-ups will emerge each year, five of which will become web giants, and they will fund the school. Let us see if the business model works and if this initiative can be used in other disciplinary fields.

3.6. A few examples of strategies

To meet the current challenges facing society, higher education institutions must not only change their curricula, but also transform the missions of their teachers. When we consider the digital strategies of those higher education institutions that have made such strategies public, four main themes generally provide the basic foundations for the university transformation strategies. The first theme involves the technological environment, notably the development of infrastructure and availability of tools and services. The second deals with teachers and digital, their involvement and the change in their roles. The third focuses on students and the digital skills that they need in order to draw the greatest benefit from the education that is offered to them. Finally, the last theme focuses on pedagogical research and general access to data (research data, educational data).

Thus, for example, the University of Oxford's Digital Strategy[31] begins with this vision: 'The University's reputation in research, education, and engagement will be underpinned by an innovative and holistic digital capability.' This clearly highlights the University's two 'core' missions (teaching and research) and digital in an overall reflection. The strategic aims of this digital strategy involve three main points, all focused on knowledge and the three essential aspects of creation, dissemination and sharing:

- To facilitate the creation, preservation and discovery of knowledge

[31] https://www.ox.ac.uk/about/organisation/digital-strategy?wssl=1

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- To improve utilisation and exploitation of knowledge
- To enable knowledge exchange in a digital environment

The action plan for Oxford's digital strategy can be summarised in four points:

- Invest in digital infrastructure to support improved teaching thanks to innovative tools, as well as research, notably by rolling out a platform for digitalisation and management of collections and research data
- Provide digital training and develop the skills of staff and students
- Create an innovative digital community
- Facilitate access to research findings and data

Firstly, it is interesting to note that the University of Oxford has published its strategy on its website – which is far from the case for all European universities. This capacity and desire to publicise a strategy requires it to be clearly identified, and shows that all members know and share this strategy. Another noteworthy point is the fact that it clearly links teaching to research, enabling easier access to research data and thus creating a continuum between the various 'core' missions of the institution, knowledge creation and transmission, breaking down the traditional silo organisation of most higher education establishments. The link between research of teaching technologies and the digital transformation of learning is not directly mentioned, but is part of a broader framework of access to research data. The clear aim of facilitating access to data also places Oxford within an overall trend of sharing knowledge, thus embodying its humanistic values and prestige.

The main objective of Laval University's digital strategy[32] is that the use of digital technology is an essential skill that must be developed for citizens and workers of the twenty-first century. Many authors have a consensus as to the importance of adopting a systemic approach to set up the conditions required for learning and educational success in a teaching institution. Several variables are part of this educational system; Trilling and Fadel (2012) suggest five essential variables: standards to achieve (exit profiles); evaluation systems; the curriculum and training programmes; professional development; designing an environment for learning. The Commission of Studies at Laval University has set up a systemic plan for supporting the development of digital technologies, incorporating these five variables. This plan breaks down into four main aims:

- Foster the development and maintenance of a high-level digital learning environment
- Support the development of faculty teaching practices
- Encourage research in university teaching techniques and the integration of digital technologies into teaching
- Favour the development of multidisciplinary research and training activities on the use of digital technologies

These main aims are clarified in twelve different recommendations. We note that these actions are grouped around the previously-identified themes, even though training students to use digital technologies does not appear on the level of the aims, but is the very foundation for Laval

[32] https://www2.ulaval.ca/fileadmin/ulaval_ca/Documents/avis_numerique_UL.pdf

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University's strategy. Conversely, it is interesting to note the place given to pedagogical research in this strategic plan, with strong support and linked to the digital transition.

The University of South Africa (UNISA)[33] has the strategic objectives of setting up attractive, enriched programmes through digital, training its students to become skilled professionals in the digital age, increasing its offer of flexible learning systems, positioning its faculty members as leaders in digital pedagogy, and encouraging and assisting lifelong learning. Its action plan breaks down into several key projects:

- UNISA On Line: UNISA's online teaching platform broadens its target audience and gives face-to-face students flexibility in taking their classes. It also helps students to acquire the digital skills required by the corporate world and to collaborate with industrial players, while providing better monitoring by teachers.
- UNISA TV provides all interested audiences (including current and potential students, teachers and the general public) with access to high-quality content that is useful for training and derived from research.
- The teaching infrastructure master plan aims to improve teaching facilities and equipment.
- Strengthening technologies for teaching in order to provide better access to online educational resources, while enhancing the learning platform, by acquiring video production equipment and publishing software so that teachers can produce high-quality content.
- Promoting successful experiences.

Also in this example, the four main aims identified in university strategies are visible here, with particular emphasis on images and video, which holds an important place in UNISA's strategy. In fact, building on its overall coherence, UNISA illustrates this commitment to audiovisual communication by giving a video presentation of its strategy.

4. Conclusion

It has already been indicated on more than one occasion, notably in CNnum (2016), that the digital culture of governing bodies is essential for a successful digital transition in education, because these governing bodies will define and drive the transformation strategies of their establishments. In particular, information about digital trends, gathering the most promising experimentations, knowledge of future users and their typical practices, in-depth awareness of the new demands of the professional world – these are all key factors for defining a strategic vision and developing an action plan to implement that vision.

This document, as well as the previous reports (O1.A1, O1.A2 and O1.A3), reveals that the following themes are crucial, enabling enlightened governance that is suited to today's challenges:

[33] http://www.unisa.edu.au/digitallearning

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1. Understanding digital natives and new digital uses, and determining how to review the establishment's strategies to incorporate this knowledge. This is a fundamental point because one must know a target well in order to adapt teaching and learning to learners' new practices, stakes, needs and constraints.
2. Digital libraries and learning spaces: providing services through hybrid physical/digital infrastructure. Digital technology changes not only how people learn and teach; it also requires modifications to the physical places where this learning occurs. In addition, it changes the virtual places for accessing knowledge, notably digital libraries.
3. Understanding and overcoming the resistance of academics to the digital transformation of teaching. No educational revolution or evolution can occur without teachers' adherence and involvement. This requires understanding the obstacles, identifying the resistance areas, being aware of levers for change, and sharing experiences and success stories.
4. Identifying new challenges, such as new evaluation methods (notably online), recognising informal or non-formal learning, peer-to-peer learning.
5. Being informed about the economic models of MOOCs, distance learning and OERs.
6. Sharing the lessons that can be drawn from innovative private providers and new educational players; identifying the advantages and challenges of partnerships or collaboration.
7. Adapting the institutional quality assurance regime in the national and European contexts so that it encompasses digital learning.
8. Sharing a comparative analysis of progress in digital learning.
9. Understanding the contributions of data analysis to institutional needs, as well as its contribution to personalisation of teaching.

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