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How digitisation is changing higher education

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A stimulus in nine theses

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This paper is based on a talk given at the Villa Hügel Gespräch 2014 entitled “The Potential of Digitisation for Teaching”.

Digital as the new normal

No other topic is discussed more in international higher-education circles than the opportunities and risks presented by digitisation.

This development is being driven on the one hand by **societal conditions** such as technological progress (for example, fast internet and mobile devices), the availability of venture capital in the educational sector, and a new generation of young people who, as "digital natives", have been socialised in an environment where knowledge is available on a nearly unlimited basis, anywhere and anytime, and who are now reaching the university level.

On the other hand, digitisation also offers solutions to previously unsolved **challenges in the higher-education field itself**.

Germany's core challenge lies in the fact that **higher education is becoming the norm,** as the majority of young people studies. However, there are not *only an increasing number* of students, but in particular an *ever more diverse* student body. In the United States, three-quarters of students are already considered "atypical", insofar as they are older than 25 years, study part time or study from home. German universities must also adapt to these changes; in this regard, digitisation can help in negotiating these challenges.

1 Digital natives learn differently

For some time, a new generation of young people has been arriving at universities. Not only do they move through the internet and social networks with great facility, but their learning behaviour also differs significantly from that of previous generations. **The DNA of generation Y is collaborative**: Students today would rather solve problems as a team than alone, and are willing to share their knowledge and their ideas with others. They take pleasure in discussion, are dialogue-oriented, and are unwilling to simply acquire knowledge, preferring instead to comment on it, add to it, change it and recreate it. Though their openness to sharing and the opportunities of networking, these young people as a whole often know more than their teachers. In addition, the "truths" taught to them can today be much more easily checked and questioned. This has changed the balance of power between teacher and student; the hierarchy of knowledge has been turned upside down. These new roles and authority relationships will need to be reflected in universities' educational offerings and in lecturers' understanding of their own responsibilities.

2 Massification, costs and diversity are the biggest challenges to higher-education systems – while simultaneously the drivers of digitisation

Rates of participation in education are rising overall around the world. However, this increasing academisation is being slowed by the often-considerable costs of study and – particularly in emerging markets – the strong gap between supply and demand for university places. Digitisation can help ameliorate both of these problems. It is thus little wonder that it is precisely in countries such as the United States on the one hand, and Brazil and India on the other, that the digitisation of education is proceeding most quickly. In Germany, universities are comparatively inexpensive and easily accessible; in part for this reason, the digital revolution

continues to slumber here, though the increasing diversity of students will serve as a driver in the medium term.

Currently, the most visible trend in higher education worldwide is the **massification** and **democratisation** of education – more and more people are seeking an academic degree. In most countries outside Europe, however, a course of study is expensive: Already today, annual costs in the United States can range up to $60,000 per year. American graduates overall currently owe more than $1.2 billion in debt. For many, inexpensive online courses are becoming the only option by which to enjoy an academic education. By contrast, in emerging markets like India, the number of available study places falls far short of existing demand. In these countries, those who cannot go to university use online offers to obtain whatever **access** to higher education they can.

In Germany, we are standing at another historic turning point: College education is becoming the norm, with more than half of each age cohort pursuing tertiary study. In the last eight years alone, the number of students entering college has risen by more than 40%. And if studying is becoming the new normal, **diversity within higher-education institutions is also increasingly commonplace**. No matter whether a student is a minor fresh out of high school, a master craftsperson making a lateral career move, a working teacher pursuing further education, a part-time student with small children or parents requiring care – all have different needs, and require study conditions that are tailored to their individual life and learning situations. We are failing when we provide them all with the same materials and the same methods, serving them at the same time, in the same space, with the same lecturers, at the same pace. **Thus, our challenge is much less the massification than the personalisation of higher-education instruction.** Especially at a time of mass student matriculation (which in fact will remain at this high plateau for another 30 years), personalisation is overwhelming German universities; while the ideal of individually tailored instruction remains on track, higher-education institutions are finding themselves unable to deal effectively with the growing levels of heterogeneity.

More and increasingly diverse students also mean greater costs. The growing financial needs of higher-education institutions stand in contrast to the excessive indebtedness (and in the future, the debt brake) that characterising many public budgets. In this regard – and this economic peculiarity of the educational sector is critical to understanding the issue – universities continue to suffer from “Baumol’s cost disease”: While in other sectors, automation and mass production have led to higher productivity and higher wages, this is not the case in education. For centuries, a teacher has sat with 30 students in the classroom, and a professor with 30 students in the seminar room. Productivity does not rise (in fact, it has even gone significantly down in primary and secondary schools as a result of increasingly smaller class sizes), but wages and costs rise analogously to those in other sectors.

The challenge for universities is therefore to improve both their productivity and the individualisation of their offerings simultaneously. On-campus study at Oxford with one tutor for just two students will in the future remain the privilege of only a very select few. The question is how digitisation can contribute to enabling other forms of personalised learning at a reasonable cost. Today’s digital-education offerings do not accomplish this.

3 MOOCs are only the beginning: They are important catalysts for bringing about change in teaching, but remain far from reaching their potential.

Hardly any previous development has shaken up the academic world in such a short time as so-called massive open online courses, or MOOCs. This turmoil has been important in making clear to universities the scope of the impending changes. To be sure, MOOCs are today rarely more than a **digital copy of a classic lecture**, often in the form of a bit of video coupled with multiple-choice tests, at most loosely integrated in the existing curricula. MOOCs have to date rarely taken advantage of the opportunity to adapt course contents and methods to individual learning styles, paces and goals; provide immediate feedback; or build in systematic peer-learning elements.

Initial studies also show that **MOOCs do not in fact democratise education**. They are predominantly used by those who are familiar with the academic system and have come to appreciate it: The typical online learner is "white, wealthy and well-educated", and most already have a university degree. To date, MOOCs in Europe and the United States have only rarely tapped into new groups still underrepresented at universities. There is still a long way to go in achieving more individualisation, and thus **greater equity in higher education**.

4 We can learn from other sectors: Massification is the first step towards personalisation.

Digitisation in other sectors has shown the path: **The road to personalisation leads through massification**. At some point, people were able to buy CDs more easily on the internet than in a record shop; thanks to larger volumes and optimised logistics, this was usually cheaper as well. However, customers today no longer want the same CD as everyone else, but instead put together individualised music playlists on iTunes. Or take the example of newspapers: After the print product came the phase of internet massification, in which the same newspaper was offered to everyone, inexpensively and in digital form. Today, new offerings such as the recently launched Read.ly app allow the creation of a unique digital newspaper personalised on the basis of readers' own interests. Even everyday goods such as food can be customised with a mouse click online: For instance, at mymuesli.com, visitors can assemble their own muesli out of 80 possible ingredients and have it delivered to their home. Despite the customised mixture, this costs little more than off-the-shelf goods. Digitisation's magic formula (described elsewhere as Industry 4.0) means: **large quantities, inexpensive, and customised to the individual. "One size fits all" was yesterday**; today, everyone assembles their personal product choices online.

5 Digital education leads to massification and personalisation

As long as digital-education offerings are designed only to provide the greatest possible number of users with the same contents, they are wasting their potential. In the future, online courses must be not only "massive", but above all "personalised" **– "POOCs instead of MOOCs**", a slogan might run: **A customised and personalised education instead of a one-size-fits-all education**.

Some quite preliminary approaches to personalisation in online education exist, but thus far mostly within the primary- and secondary-school context. For example, programmes such as Knewton or Bettermarks analyse mistakes in mathematics lessons and suggest the next assignment on this basis. Thanks to MIT's Affectiva, the camera in a laptop or smartphone measures a learner's attention, and could intervene as soon as the student's focus wanders. In New York City, "New Classrooms" calculates the next day's individualised study programme for thousands of students every night. Every student learns differently there, as their

capabilities and knowledge levels are as different as the students themselves. Earlier, one might either have been forced to wade agonizingly through long-mastered tasks or failed due to too-difficult problems; in a modern educational system of this kind, perpetual boredom and excessive demands belong to the past.

The goal is for **the instruction to adapt to the learner, rather than the learner to the instruction**. This is accordingly paired with a modularisation of educational contents into smaller learning units. Instead of a single big final exam at the end of the semester, digital tools enable continuous learning assessments and immediate feedback. This is the true revolution that remains ahead for our higher-education sector.

But caution is in order: Digital learning has to date primarily enabled the more efficient acquisition of knowledge. It does not replace personal development. The reduction to seven-minute videos shortens learners' attention-span and endangers creativity. Digitisation should not be an end in itself. We should use it in higher education where it is appropriate: A didactically well-designed mathematics prep course might be a useful online offering, for example, while a digital exam colloquium might not be. **Computer technology will never replace the personal bond between teacher and student; but it can free up time to pursue this relationship.**

6 Digitisation helps education practitioners and policymakers cope with the challenges of growing student diversity on campuses. Germany must not slumber through the digital revolution.

If personalisation succeeds at a reasonable cost, then universities can at the same time deal successfully with the growing number of students and their increasing heterogeneity. For this we need flexible learning models such as part-time study, a more individualised means of recognising prior learning, and a larger digital curriculum.

In all of this, the **quality of instruction remains the focus** for Germany: Digital learning can be a useful and efficient supplement to on-site offerings for a heterogeneous population of students. It is not a matter of "either-or", but rather a useful "in addition to", insofar as online and in-person teaching complement each other.

7 Digitisation will change not only university-level teaching, but the entire higher-education system.

Digitisation will change the roles and responsibilities of universities, teachers and students. The classic university has advised students in designing their course of study, and educated, tested and certified them. But what happens to universities when education search engines such as Noodle shift recommendations for individually appropriate educational products to the Net? What happens to universities when more and more students participate in exciting online offerings, and want these to count towards their studies? What happens to universities when online platforms like degreed.com take over their traditional **certification role** by assessing, certifying and making transparent to potential employers individuals' non-formally and informally acquired knowledge as well as their formally acquired learning? Can "universities" come into being that no longer even offer their own instruction, but instead focus on certifying competences and (previously acquired) knowledge, offering credit for courses completed elsewhere, and assembling individualised learning programmes for every student out of the huge amount of educational offerings available around the world? Or will universities arise that

no longer even have their own students, but use their strong brand to produce education products for the world market?

The role of professors too may change dramatically. While we still invoke the unity of research and teaching, the unity of teaching itself is elsewhere the subject of debate. Indeed, we're already seeing an **internal differentiation of teaching staff**: Sensibly, not every teacher writes his own textbook today, and most indeed using the work of others. But what happens when online didacticians design lectures, communication stars deliver and record them, and special coaches support students in their learning, taking over the responsibility for giving grades and tests?

8 Structured peer-to-peer learning is forcing teachers into a new role

Learning has been and remains a social process that has always in part taken place outside the classroom. Digitisation has now made it possible for the networked mass of learners to surpass the teacher, who little by little is losing his monopoly on knowledge. It also allows students to teach one another to a greater degree. Models such as Tandem language learning or peer-to-peer universities are emerging that transform learning from one another from a random, haphazard occurrence into an activity based in structured principles. Methods like "peer grading" are establishing themselves; here, students assess one another's performance, with studies showing that the outcomes are surprisingly similar to those ordinarily produced by professors. Such developments will inevitably weaken the division between teachers and students, and lead to a new understanding of roles for all involved.

9 Digitisation is inevitable. But policymakers and higher-education institutions must actively shape it.

Even if access and cost, the strongest drivers of digitisation, are fortunately not acute problems in Germany, there is no stop button for digitisation more generally. But there are both risks and opportunities. Therefore, policymakers and universities must work to establish the right conditions: On the one hand, they should support the "digital evolution" in order that digital-education products and suppliers developed or located elsewhere in the world do not permanently **dominate the German and European market**; and on the other hand, they must protect individuals from the downsides of the "**too transparent" learner**.

What, then, must happen in order to rouse Europe's universities to the challenge of digital revolution? How can the opportunities presented by digitisation be used effectively? The good news is that the required **marketplace for a digital European Higher-Education Area** already exists. It goes by the name "**Bologna**", and its currency

is the European Credit Transfer and Accumulation System (ECTS). Originally created to promote student mobility within Europe, this framework now enables the mobility of education itself. The ECTS allows the comparison and mutual recognition of study programmes across Europe. In this way (unlike in the United States), the biggest hurdle for the recognition of MOOCs and other online courses as a part of regular study programmes has already been cleared. Europe must use this structural advantage. The prerequisite for this is good content. Only if joint investments in digital platforms and appealing offerings are made will Europe have the chance to prevail against the strong U.S. higher-education brands in the long term. Europe is too small for single nation-state solutions. **"Bologna Digital**" represents a significant

challenge, but also an even greater opportunity to turn this oft-criticised reform finally into a success story.

Yet here in this country, there remain a **large number of institutional barriers** that prevent digitisation from reaching its full dynamic potential. Online teaching often cannot be counted towards an instructor's **teaching load**; thus, there is a lack of incentive for teachers to invest time in the development of good digital course offerings. The **capacity regulation** must be changed to this effect, so that universities won't have to fear legal action if they improve their teaching efficiency through online offerings. The **accreditation system** should be made more open to digital modules. In addition, **copyright law** must be adapted to the digital age in order to offer universities and teachers greater flexibility, and above all legal certainty. And finally, we need more entrepreneurial spirit and **venture capital** in the German education market.

But we must also protect the individual in this new world. After all, anyone who wants to utilise the opportunities offered by individually tailored and cost-effective education must reveal themselves to an extraordinary degree. Only those who disclose their learning data can be successfully led by algorithms through the learning process. However, everything can be derived from this data: the computerised analysis of students' exchanges of e-mail about a lecture enables a remarkably reliable prediction of their final grades; from a half-hour educational game, global companies like Shell judge the career prospects of new employees. Those who can still afford a personal tutor remain hidden; for all others, their data is stored in the cloud. This is similar to other industries as well: personal benefits are offered in exchange for personal information. Thus, an auto-insurance discount granted in return for access to the car's GPS movement data results in the detection of every speeding violation. Everything is stored somewhere on the Net, from the not-quite-understood math assignment to individual keystrokes. There is no longer anything hidden. Therefore, more flexible data-protection legal standards are needed, which **do not categorically exclude learning analytics**, but at the same time take individuals' legitimate interests in the **sovereignty of their personal data** into account.

The far-reaching changes outlined in this paper will not take place overnight; but nor can they be averted. The first universities and federal states have set out on this path, and others can learn from their examples. It is crucial that every university develop its own digitisation strategy; they must assess the potential of digital teaching and learning offerings for their institutions, and take decisions on which to use depending on their individual profiles, portfolios and specific goals.

The failure of the German excellence initiative must not be repeated. At that time, we wanted more international top research rankings – and that entailed treating all 300 universities in Germany alike, neglecting other valuable university profiles. Now we need digitisation. But not all institutions must produce their own MOOCs in every subject. To take advantage of the opportunities offered by digitisation, universities must go their own way and develop individual digital strategies. This will in addition require partners, and a close cooperation with government, the business sector and civil society.

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