

Background Paper

Beyond MOOCs: Transforming Education in the Digital Age

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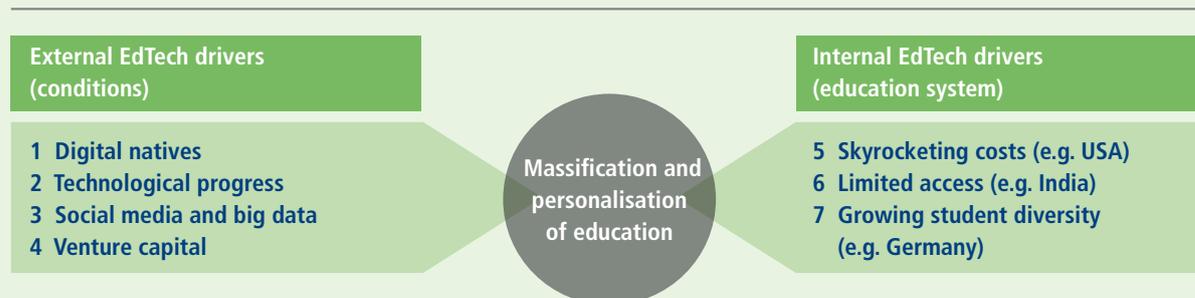
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A previous version of this paper served as background material for the Global Economic Symposium 2014. It is partly based on an unpublished English-language summary of “Die digitale (R)evolution?“ (Bischof/von Stuckrad 2013).

At a Glance: Drivers of Technology in Education

Figure 1: Drivers of technology in education



Source: own diagramme

External EdTech drivers (conditions)

- 1 Digital natives:** The share of digital natives, defined as youth, aged 15–24 inclusive, with five years or more experience using the Internet, ranges from 22.8 percent in the developing world to 81.9 percent in the developed world. Further disaggregation shows a range from 5.7 percent in low-income countries to 89.6 percent in high-income countries (ITU 2013).
- 2 Technological progress:** We have witnessed an accelerated series of important sub-inventions in information and communication technologies since the introduction of the PC in the 1980s, including the world wide web (around 1990), powerful search engines (late 1990s), online social networks (2004), smartphones (2007), the first self-driving cars (2010) and the supercomputer Watson (2011) (McAfee 2013).
- 3 Social media and big data:** Facebook has more than 665 million daily active users, Twitter saw a 44 percent growth in total users from 2012 to 2013, more than 45 million pictures are uploaded to Instagram every day and 120 people sign up to LinkedIn every minute (Demand Metric 2013).
- 4 Venture capital:** US venture capitalists invested \$452 million into educational technology in 2013, and more than €2 billion in venture capital is expected to flow into the education market in 2014 (New Schools Venture Fund 2013).

Internal EdTech drivers (education system)

- 5 Skyrocketing costs (e.g. USA):** Tuition expenses in the United States have increased by 538 percent since 1985, compared with a 286 percent jump in medical costs and a 121 percent gain in the consumer price index (Bloomberg 2013).
- 6 Limited access (e.g. India):** Access to education beyond higher secondary schooling is a mere 10 percent among the university-age population in India (Shariff/Sharma 2013).
- 7 Growing student diversity (e.g. Germany):** The share of eligible university students in Germany has grown enormously from 6 to approximately 50 percent over the last 50 years, with now more than 2.6 million students registered at a German higher education institution (German Federal Statistical Office).



Transforming Education in the Digital Age

Overview: core challenges

The promise and peril of digital technology is currently the most debated issue in international education. The emergence of so-called MOOCs (Massive Open Online Courses) from world-renowned universities, which hundreds and thousands of people have used as a learning resource, has marked the starting point of a period of fundamental transformation in education. There are both external and internal drivers transforming the way people around the world learn. External drivers for technology in education include constant technological progress, the growing dissemination of social media and big data application, a significant boost in venture capital in the United States and, not least, the entry of digital natives into the education system.

Cost and access are driving the transformation in digital education internally. In the United States, skyrocketing tuition fees for a brick and mortar education (on-campus) have created a new market for online learning. In many developing countries, such as India and several African nations, it is the “democratic” (broader) access to educational opportunities that makes technology-supported education a hot issue. In developed countries with a largely publicly financed education system, people are less concerned about the cost and access to higher education. Thus, the drivers for advancing digital learning in these countries are fewer. Applying technology to education is nonetheless an attractive development in these countries, especially with regards to individualising learning in a context of increasing heterogeneity. Digital technology can help educators accommodate diverse learning needs, paces and styles. At the same time, it can significantly increase the size of an audience to be reached.

Technology has the capacity to massify and personalise learning in such a way as to tap the potential for infinitely scalable learning opportunities – and thus mark a real disruptive revolution in education. The digital age is expected to change teaching and learning beyond traditional brick and mortar education, calling for innovation in both traditional pedagogy and business models.

Figure 1: Drivers of technology in education



Source: own diagramme

Critics, however, assert that the widely perceived impact MOOCs are having on education is exaggerated, and that they will not have significant long-term influence on institutionalised learning. They argue that the effectiveness of ICT-based learning has not yet been proven, and that there are very few sustainable business models in this field. Moreover, the US-dominance in the field of technology-supported education has been negatively dubbed a “new wave of digital colonisation”.

This background paper aims to unpack the complex debate on the promise and peril of technology in education. It explains the catalytic function of MOOCs for the development and expansion of new learning technologies, and it explores both international drivers and potential consequences of digitalisation. Having identified massification combined with personalisation as the real disruptive potential for education in the digital age, the paper concludes by outlining corresponding risks, opportunities and strategic options on the policy level as well as for individual universities.

New technologies in education: MOOCs as a catalyst

Individuals and societies benefit from tertiary education. However, high costs, structural discrimination toward certain types of learners and infrastructural barriers narrow the scope of access to it. In the past decade, new technologies have enabled individuals to gain greater exposure to higher education. Global knowledge networks and Internet-based communication have broadened access to knowledge and learning. Digital natives have always retrieved information “on demand” and on almost anything they wanted. The vast amount of data available on how people search for, use and process information has beneficial implications for personalising learning through digital technologies.



How can higher education institutions (HEIs) use digital teaching materials, social media and technological systems to fulfil their educational mandate more effectively and efficiently? While most HEIs today provide students with digitalised learning materials (via learning management systems), some have also been experimenting with virtual learning spaces for co-operation and peer communication. HEIs such as the Massachusetts Institute of Technology (MIT) and other members of the OpenCourseWare-Project have been providing free courses and teaching materials online since 2002. Apple's "iTunes U" platform allows HEIs to publish lectures and course materials that students can download for free. HEIs and independent instructors have been posting lectures on YouTube for some time now. The Khan Academy, which is funded by the Bill & Melinda Gates Foundation, Google and various other foundations, now offers more than 6,000 YouTube tutorials and other teaching formats on a wide variety of topics for free.

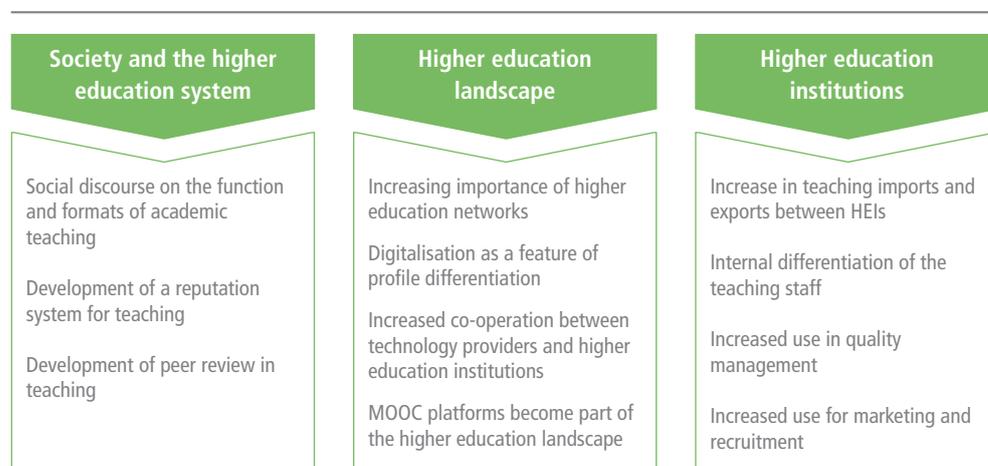
MOOCs are the most prominent example of digitalisation in higher education. They are usually defined as academic courses that are offered to a large number of interested parties (massive), mostly free of charge (open), and available online. MOOCs integrate learning materials such as videos, texts or Internet resources into a package. They can be "consumed" co-operatively and spread via digital social networks. HEIs and private entrepreneurs have created Internet platforms such as edX, Coursera or Udacity that allow various HEIs to offer MOOCs from a hub. Course participation is independent of entry qualifications, formal student status, or other socio-economic preconditions. The learner must, however, have a digital device with Internet access. MOOCs are said to lead to wider and more "democratic" (self-determined) participation in high-quality education (though evidence from first studies user demographics still shows a large dominance of those being well-off). With a two-year delay as compared to the United States, interest in digitalised courses is growing in Europe. In summer 2014, more than 700 of the approximately 3,000 digital courses worldwide were of European origin.

Commentators predict a "revolution in education" sparked by digitalisation. However, the consortia of HEIs that have pioneered MOOCs pursue strategic organisational interests, alongside philanthropic interests. After all, academic teaching at HEIs is unlikely to change radically in the short term via MOOCs and other digitalised teaching and learning formats. This limited impact on traditional academia is partly because university professors are integrated into brick and mortar institutions in multiple ways, and their very stable professional identity amounts to much more than being a virtual instructor in front of a video camera. The number and quality of MOOCs is also subject to the availability of venture capital, which is not everywhere as easy to access as most notably in the United States. Yet with tens of thousands of participants per course worldwide, digitalised teaching is gaining ground. This is impacting the way HEIs think about teaching and learning, and they are starting to change the way they do business. MOOCs could catalyse the development and expansion of new learning technologies. They will, however, most likely only be one of several learning tools in shifting academic landscapes.

International drivers and potential consequences of digitalisation

The new digital teaching models are characterised by the constant availability of content and the possibilities for analysing and typifying learning processes via learning analytics, interactivity, co-operation and instant feedback. These stimuli can significantly influence the higher education system, the higher education landscape and teaching-related higher education strategies. Some of the potential consequences are presented in Figure 2.

Figure 2: Possible effects of digitalisation



Source: Bischof/von Stuckrad (2013)

Looking at **society and the higher education system**, the enormous speed in the development of MOOCs and their institutionalisation on platforms such as edX or Coursera has aroused immense social interest, especially in the United States. The current debate on opportunities for and limitations of the increased use of digital components in teaching provides a starting point for moving away from purely quantitative aspects (such as the number of study places or the amount of resources in the system) towards a stronger focus on the quality and functions of teaching. The development of digital teaching and learning formats could contribute to a discussion about the purpose served by academic teaching in general and digitalised teaching components in particular. The potentially global use of digital educational offers and its resulting visibility could even increase the value of teaching for the reputation and careers of university staff. As is already partly the case with learning materials in the English-speaking world, paid-for licensing of digitalised educational offers such as MOOCs could lead to new income streams for HEIs and university teachers at a global scale. Up until now, and apart from extremely rare peer reviews, it is only the students who are asked to assess the quality of lectures and seminars. The open nature of the new digital educational offers enables peer reviews, and their institutionalisation could strengthen quality management at the operational level.



Concerning the **higher education landscape**, the global accessibility of modularised courses could allow HEIs to develop their own teaching offers by combining and adjusting external content or to integrate complete courses from international universities into own curricula at very low costs. Given such easy teaching imports and exports, HEIs may in the future be asking themselves whether it is really necessary for each HEI to have its own in-house teaching offers for each field of knowledge in each discipline. It would instead be feasible to integrate teaching offers from partner universities (e.g. TU9 in Germany or the Russell Group in Great Britain), from international higher education networks (e.g. LERU) or from MOOC platforms such as edX, Coursera, or Iversity. The digitalisation of already highly standardised content (e.g. basic courses, introductory and overview courses, and bridge courses) has the potential to increase the efficiency of teaching. Thus, it could release resources to be used for more intensive tutoring in other areas (e.g. for more specialised courses or inverted teaching formats). However, in light of the broad need to cut costs, HEI management boards could be tempted to save on staff costs by using digital offers – though such “returns on investment” without negative impact on the quality of teaching are, if at all, only feasible in the long run. It is possible that in the medium term we witness the emergence of education providers that focus exclusively on compiling individualised learning programmes for students by drawing on content from the globally available realm of education. These providers could also certify previously acquired knowledge and assess completed courses. However, such developments are highly dependent on the context of educational traditions, socially recognised educational purposes and legal provisions in which the relevant actors find themselves. Digitalisation may lead to a differentiation of the higher education landscape and partly blur the lines between HEIs and other education providers. On the one hand, the progressive digitalisation of teaching and the opportunities associated with this process allow new actors to enter the education market which provides impulses and reaction incentives for existing market actors. On the other hand, possible systematic effects of the digitalisation trend are closely linked to strategic considerations of existing market actors.

Special importance is therefore attached to the **strategy of higher education institutions**. Indeed, new content production co-operations between HEIs – as part of digitalisation consortia – increase opportunities for additional teaching imports and exports, and for new models of integrating externally produced courses into existing curricula. The scope of such activities would depend on a HEI’s individual strengths and profile (which may also lead to a strategic decision not to participate in digital teaching formats at all). Internal differentiation of the teaching staff stimulated by the increased use of e-learning formats can be strategically significant. Digital teaching formats offer windows of opportunity for the development of new didactic concepts and could therefore also give rise to new tasks and differentiated functions for university teachers. We can assume that experienced teachers will concentrate on content production while others systematically observe the learning progress of students, offer help in discussion forums and on learning platforms or create and supervise assessments. Such a differentiation of teachers’ tasks may result in the creation of new job categories among university teachers. Moreover, the data accumulated in e-learning formats make it possible to integrate learning analytics into intra-

institutional quality management systems. Open teaching formats such as MOOCs also represent a new channel for higher education marketing. Low-threshold digital teaching offers in connection with communication platforms and social networks can make a significant contribution not only to student retention but also to marketing activities and thus, ultimately, the recruitment of new students.

Massification and personalisation of education: risks and opportunities

As with any innovation, the increased use of digital educational offers does not come without risks. The implementation of e-learning elements creates new challenges (e.g. new approaches for monitoring cheating or a differentiated assessment of low completion rates in MOOCs) as well as new fears (e.g. concerning data protection, the growing privatisation of education with in parts unclear business models, or the perceived US-dominance in the field of technology-supported education). The quality of online learning formats is also often criticised. It is argued that there is still no reliable stock of research on the effectiveness of ICT-based learning. However, studies have revealed that distance learning programmes are, as far as learning outcome is concerned, not per se inferior to on-campus programmes. Juxtaposing on-campus programmes against e-learning in this regard suggests a false dichotomy, since there is no homogeneous model of “online studies”. Instead, technological progress offers a number of new opportunities that can be used by HEIs in various combinations, ranging from an enrichment of traditional on-campus programmes (blended learning) up to highly automated MOOCs with thousands of participants.

Despite such reasonable doubts, digitalisation can do more for the future of education than just massively scaling educational resources and thus lowering the existing barriers of cost and access. The smart use of technology and big data is also likely to improve the quality of teaching and learning in various respects. For example, analytical learning software can identify students – especially in introductory courses – who need to catch up or require additional time for the consolidation of the teaching content. HEIs or other education providers can use this opportunity to offer personalised tutoring and advice or, in the medium term, automatically adapt individual curricula accordingly. Already today, inverted classroom formats that use the contact time with a professor for discussing and applying the content of a digitally prepared lecture provide more scope for individualised learning than traditional teaching formats could do. In the end, the promise of digitalised education lies in the hopes of being able to easily design and adapt personalised learning paths suited to each individual’s learning preference, pace and style. Massification combined with personalisation would tap the potential for infinitely scalable learning opportunities – and thus be a real disruptive revolution in education.



The digitalisation of education emerging from the United States is driven by technological possibilities, changing individual requirements and needs, and increasing pressure for efficiency in an increasingly expensive higher education system. However, digital educational offers have promising potential for HEIs all over the world, be it in the improvement of teaching efficiency and quality, in their usefulness in marketing and recruiting for HEIs, or as an opportunity for expanding co-operations with other actors in the field. HEIs that make technological expertise, practical experience and quality content a part of their strategy will have competitive advantages over their peer institutions and – in the area of further education – other education providers. The wave of digitalisation is associated with technological advancement. Both HEIs and policymakers should embrace this process, its risks and opportunities, and thereby actively shape its course so as to reach their systemic or institutional objectives.

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About the Author



Ralph Müller-Eiselt is a Senior Advisor to the Executive Board at the Bertelsmann Stiftung.

Ralph is an expert in education policy and governance reforms with extensive academic and professional experience. He heads a taskforce at the Bertelsmann Stiftung on policy challenges and opportunities in a digital world. He also coordinates the Stiftung's activities in digital education from early education to lifelong learning, targeting in particular the use of digital

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Before joining the Bertelsmann Stiftung in 2010, Ralph worked in the President's Office at the Leuphana University in Lueneburg and served as an advisor to the Ministry of Higher Education in Lower Saxony. Ralph holds a MPP from the Hertie School of Governance where he is also co-teaching a course in managing strategic change.

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Imprint

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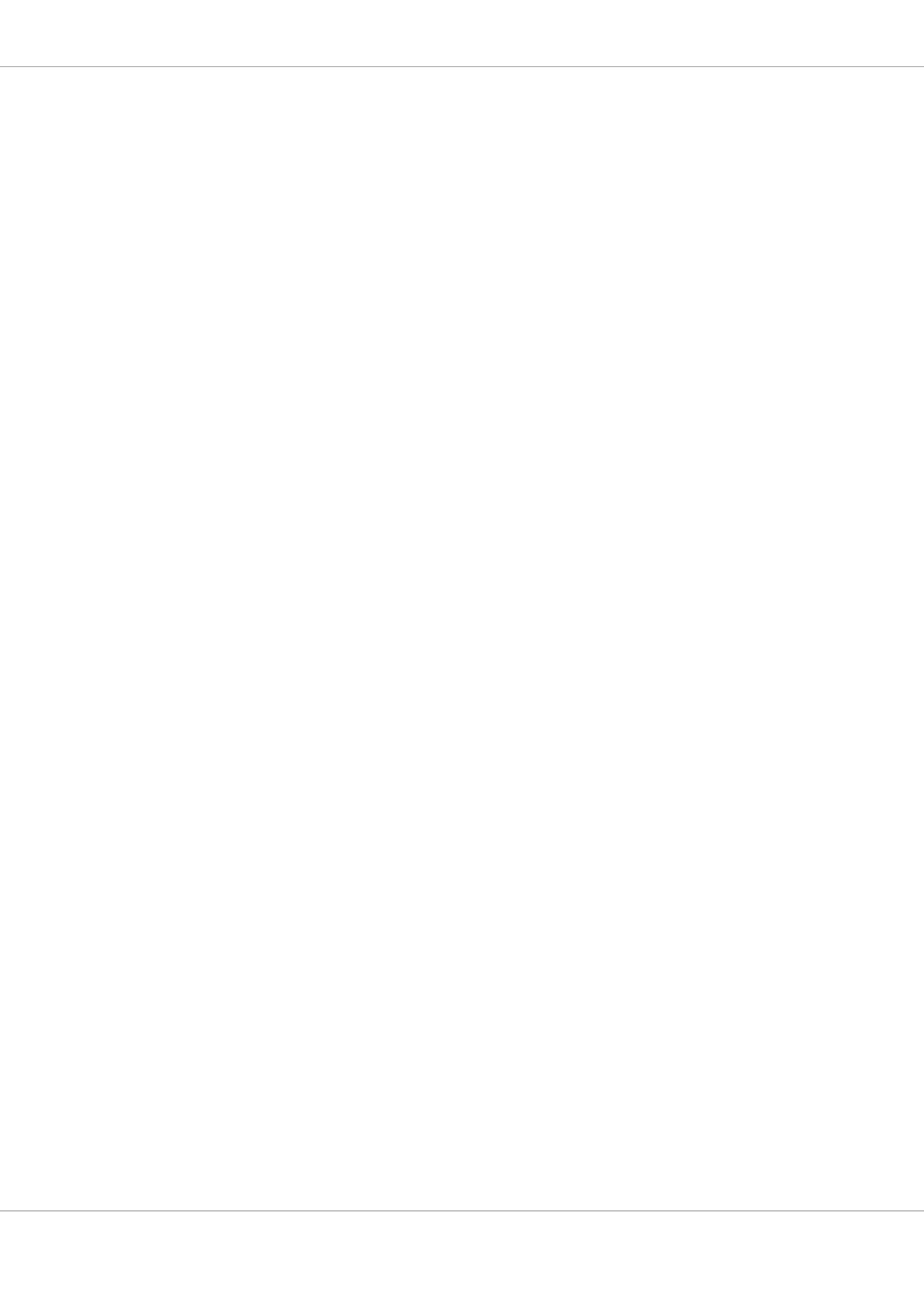
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Design

Nicole Meyerholz, Bielefeld

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