11

Digitization, Disruption, and the "Society of Singularities": The Transformative Power of the Global Education Industry

S. Karin Amos

Introduction

Digitization and algorithmization—the core of innovation and technology in education—are undoubtedly hot topics. The largest and most influential international organizations like the European Union (EU), the United Nations Educational, Scientific, and Cultural Organization (UNESCO), and the World Bank have all put digital competencies and new technologies to augment and enhance learning at the top of their education agendas. The starting page of the World Bank's website on education and technology, for example, states that "World Bank support for the use of ICTs in education includes assistance for equipment and facilities; policy development; teacher training and support; capacity building; educational content; distance learning; digital literacy and skills development; monitoring and evaluation; and research and development (R&D) activities."[1] The World Bank's blog on education for global development promotes "OLE, Open Learning Exchange"—a digitization

S. K. Amos (✉)
University of Tübingen, Tübingen, Germany
e-mail: karin.amos@uni-tuebingen.de

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initiative to foster education in disrupted, violence-ridden, poverty-stricken communities.[2] The OLE mission includes another type of disruption I will describe below in which the shift from teacher-centered to student-centered and personalized learning are constitutive elements. Gert Biesta has described this shift with the phrase, "from education to learnification" (2015).

The European Commission (EC), in line with its high aspirations for driving the knowledge economy, also emphasizes digital technologies in education. The EC's Joint Research Center Policy Report on *Digital Education Policies in Europe and Beyond* (EC, 2017) illustrates how the EU observes and stimulates digitization activities in its member countries and throughout the world. EU member states have equally committed themselves to promote digitization and algorithmization. Moreover, one may declare digitization of education not only one of the top trends of international organizations but also of the member states irrespective of the size of the respective educational programs or the state of their implementation.

Algorithmization and digitization are closely linked to the rise of the global education industry (GEI) which, as I will argue in this chapter, is central to the transformation of education from a modern to a late modern institution. As has been frequently emphasized, education as mass schooling organized by age group and different subjects is essentially a product of the nineteenth and twentieth centuries, when it met the requirements of high modernity in an industrial age. As the mode of production and ideas of life development changed, public education was increasingly pressed to adapt to new conditions. What followed was a huge shift to data collection on student-centered, personalized learning, as well as the abovementioned move from education to learnification in the age of globalization. In this chapter I will:

(1) Highlight some of the major aspects of algorithmization and digitization by way of examples at the national and international levels. Digitization and algorithmization as a significant segment of the GEI often have the effect of masking commercialism and profit. Somewhat paradoxically, digitization and algorithmization are as much a characteristic of elite training as they purport to support democratic and

participatory processes. This is the case because, on the one hand, state-of-the-art hardware and software are expensive and parents who do possess the financial means are willing to pay in order to ensure a competitive edge for their children. It is also the case because top educational programs are a priority for parents who invest in enhancement and augmentation in all areas of life. With regard to the latter, for-profit and nonprofit orientations tend to overlap as market-focus is characteristic of any industry, including GEI. Somewhat paradoxically, however, the low costs of distributing learning programs once they are developed together with the easy accessibility and equally low cost of the hardware, such as tablet computers and digitized products, promise to increase access to education in poor countries. Although the focus of the present contribution is a general systematization and contextualization of GEI activities in the area of digitization, I am certain that a comparison of vertical case studies elicits interesting insights into how the global narrative on digitization is translated and broken down nationally, as well as how various multilevel analyses converge to compose a mutually resonating narrative.

(2) To make the relation between digitization, education, and GEI more clear, I will show how economic disruption factors in. To illustrate I draw on Carey (2015) to look at some successful startups in higher education, and show how these technological trends relate to what Reckwitz (2017) has called the singularization of society. Singularization and personalization are related concepts, which show how education is being transformed from a modern to a late modern institution.

(3) Consider adaptive learning and e-advising as widely used tools in tertiary education. The University of Arizona experience highlights how common the use of such tools already is. Although this particular example pertains to higher education, e-advising systems are more and more often introduced at every level. I have chosen University of Arizona because it is among the many major public universities serving a large and diverse student population with limited resources. As one type of disruption digital instruments promise to do more with less, thus making their implementation attractive and cost-efficient. The University of Arizona experience also shows how difficult it is to

separate commercial use from public service. In many ways, the introduction of these digital monitoring/advising/assisting systems follows the mission of personalized medicine to bring out the best in every individual and help each realize his or her potential to the fullest. The prize to pay eventually is full disclosure of oneself—a paradoxical surrendering of autonomy in order to gain autonomy. The aim of personalization moreover supports Reckwitz' theory of "singularization" (2017), while at the same time undermining notions of the "the general," or "the public." The term in German is *das Allgemeine*, and I will discuss the context of this concept later in the chapter. For now it is important noting that thinking of the GEI as a clearly demarcated area where traditional notions of private and public can be smoothly applied will probably miss the broader implications of this industry.

Digitization and Algorithmization: International and National Examples

Digital competencies of the next generation are an integral component of one of the key EU education strategies, Horizon 2020. The EC's single digital market policy is strongly linked to education in terms of this program by way of "Information and Communication Technologies" (ICT), which purport to help us learn better, more efficiently and creatively, innovate to solve complex problems, and access wider and more up-to-date knowledge. According to the EU webpage, "ICT provides everyone with flexible and accessible learning opportunities, in and outside the classroom."[3] In a similar vein, in 2014 the European Parliamentary Research Service Blog posted that:

> The world of education is currently undergoing massive transformation as a result of the digital revolution. In the European Union (EU), children become active online from the age of 7, and 76% of EU households have access to broadband Internet. However, research shows that early use of digital technologies is not necessarily linked to good digital competencies.

> As jobs are becoming more 'knowledge and digital skills-intensive', continued investment in upgrading education and training systems will be instrumental to maintaining the EU's competitiveness and attractiveness. (Posted April 2014, EPRS, 2014)

This same narrative is adopted by the Organization for Economic Co-Operation and Development (OECD), and of particular interest in terms of the relationship between digitization and GEI is a 2016 Centre for Educational Research and Innovation (CERI) report, "Innovating Education and Educating Innovation: The Power of Digital Technologies and Skills." The importance of this report, a compilation of OECD expertise in this area, is evidenced by the fact that its author is CERI director Dirk van Damme. The report serves as background to the second GEI Summit held in September 2016 in Jerusalem, where the proper use of technology was said to promise that:

> Although they cannot transform education by themselves, digital technologies do have huge potential to transform teaching and learning practices in schools and open up new horizons. The challenge of achieving this transformation is more about integrating new types of instruction than overcoming technological barriers. (OECD, 2016, p. 10)

Note the caveat that, "although they [i.e. digital technologies, KA] cannot transform education by themselves digital technologies do have huge potential to transform teaching and learning practices in schools." This clearly adheres to the logic of innovative disruption, which I will explain in further detail below. Innovative disruption is related to Schumpeter's "creative destruction" of economic development and innovation. Innovative disruption similarly addresses issues of efficacy and efficiency, of channeling means to achieve best effects. An example in transportation would be Uber; in photography, digitization has wiped out analogue almost completely; with computing it was PCs. As these examples show, disruptive innovation does not start from the center of a given business practice, but unravels it from the fringes. In education digital technology is now peripheral; however, the shift to personalized learning, strongly supported by digital technologies, bodes profound changes. The message in the quote above is that systems do not merely need to be changed, but

transformed. To make this happen, an innovation-friendly environment is a prerequisite. This relies on the collaboration between traditional institutions and stakeholders in public education with those of the emerging education industry. Continuing from the quote above we learn that:

> understanding the education industries better, including their market structures and innovation processes, would help to create a more mature relationship with the education sector. Innovation in the industry – which develops the products and services that could drive innovation in schools – does not happen in isolation from what is happening in the education sector. Only when there is an innovation-friendly culture in education systems, supported by an innovation-friendly business environment and policies, will industries start to engage in risk-intensive research and development. Governments can support this by fostering a climate of entrepreneurship and innovation in education. (ibid.)

This alludes to countries like Estonia,[4] who were pioneers in overhauling their bureaucracies in government, education,[5] and other public sectors, and are posed as models others are encouraged to follow. The message of transformation and system overhaul is also driven home by chief evangelists such as Google's Jaime Casap, who played a key role in launching Google Apps at Arizona State (see Theo Priestly, 2015, on the role of chief evangelists). UNESCO also strongly emphasizes digitization, but does so with reference to democracy, participation, and human rights. As is the case for other international organizations and national policies as well, UNESCO places digitization in a knowledge society context. However, UNESCO's framework emphasizes not only quality of education and universal access to knowledge and information, but also respect for cultural and linguistic diversity—as well as freedom of expression.

These glimpses at the inter- or trans-national level of education policy emphasizing ICT and other forms of digitization illustrate that they are connected to a powerful narrative of progress, improvement, and modernization. They also have to do with redemption, and though this is more hidden it is expressed in the expectation that new technologies make the world more just and equitable by realizing the vision of universal access to education, and furthering industrial innovation to free

humans from the toil of labor—something I will discuss further at the end of this chapter. One example of how this transpires at a national level is the German Federal Ministry of Education and Research's strong emphasis on the role of digitization in society at large, as well as specific areas such as tertiary education, medicine, and vocational training. "Bildung digital" (BMBF, 2018) unites a wide range of activities and programs, from early childhood education to every level of formal schooling including tertiary education, to adult education and beyond. As one would expect in a society undergoing profound technological change, Science, Technology, Engineering and Mathematics (STEM) subjects are especially emphasized. Baden-Wuerttemberg, whose tradition in individual entrepreneurship provided many of the key players in today's automobile, turbine, and other industries, is pushing hard for digital transformation at the state level in Germany. Encouraging tinkerers and risk-takers is the spirit of the new century. The underlying rhetoric at all levels of educational policy and institutional settings is the Silicon Valley mission to make humans fit to survive in a high-tech environment.

Digitization and the GEI

As Antoni Verger emphasized in "The rise of the global education industry: Some concepts, facts and figures" (2016), education has become an important asset in the knowledge economy at every level. This market is inexhaustible, and facilitated by the emergence of a global education regime (Parreira do Amaral, 2011). This industry's market is both deep—for example, lifelong learning—and wide, in that it is easily adaptable to conditions almost anywhere in the world. As indicated in the previous section, governments, international organizations, corporations, education technology evangelists, and venture capitalists, all push this trend and speed its implementation. Commodification, privatization, and digitization are intricately linked.

Whether in the form of educational provision, administration, infrastructure, online degrees, virtual universities, student data processing or the machinery to provide it, GEI has transformed education.[6] The feedback loops of data collection and analysis ensure the datafication trend

does not end with how education is organized and carried out, but also affects how it is researched. A general observation illustrating this point is the notable decrease in education chairs specializing in philosophy, concurrent with the rise of empirical research and closely linked to quantitative methods (see also Parreira do Amaral, in this volume).

It is unsurprising that the most common paradigm of business and technology innovation—disruption—is a feature of GEI. Disruption, or more precisely, disruptive innovation, is a term coined by Clayton Christensen which, "describes a process by which a product or service takes root initially in simple applications at the bottom of a market and then relentlessly moves up market, eventually displacing established competitors." Christensen, a professor at the Business School of Harvard University, also founded the Christensen Institute for Disruptive Innovation,[7] as well as a number of other initiatives such as the Forum of Growth and Innovation. He is also heavily involved in pushing the application of the concept in education (Christensen, Horn, & Johnson, 2008). The title of his book, *Disrupting Class*, signals the project of unraveling organized education as age cohorts segregated by social class learning a set program of subjects. Disruption in education again takes its lead from Schumpeter and would, in theory, promote equity along the lines of the World Bank's OLE.

With this in mind, we will now look more closely at GEI. As indicated, the tenet of digitalization and algorithmization is personalized learning to help students to develop his or her potential to the fullest. It is decontextualized and can be broken down into bits and pieces that can be measured, tested, and assessed. So, while personalized learning combats the notion of homogeneity, it still must define some standard and pre-defined outcome so that learning, however personalized or individualized it may be, can be applied to league tables and other forms of comparison. While it looks as if modern digital technologies are just another means of instruction, their revolutionizing potential consists in the fact that instruction in the classical sense is no longer necessary, and may even be an impediment to technology. This is what makes digital technologies different from the blackboard or other "analogue" learning materials such as textbooks that require a teacher to explain, guide, check, and discuss content. As Christensen suggested, do not start at the core—unravel a

sector from the fringes to bring about disruptive innovation. Unlike traditional schooling with its limited flexibility to individual needs, this innovation promises to accommodate learning styles and habits of all types to cultivate individual potential to the fullest, while also stimulating collaboration. Whether GEI is more support and service-oriented to education as we know it, or whether it is intentionally disruptive, is often unclear, because while there is a digitization strategy within the traditional framework of education policy, federal or state governments are still key actors who primarily want to implement digitization as part of the development of the established public school system. Conversely, disruptive innovation is an integral part of digitization, and disruption by definition implies a skeptical stance toward established structures. Technology innovators, evangelists, and venture capitalists commonly regard education as they do government, finance, and health—overly bureaucratized, inflexible, inefficient structures that have to be radically changed.

Prominent protagonists who emphasize this view and credit it with authority are influential "movers" and "shakers" such as Peter Thiel, one of Silicon Valley's foremost entrepreneurs and venture capitalists; Sebastian Thrun, computer scientist, robotics specialist, high-ranked Google executive, proponent of Massive Open Online Courses (MOOCSs) (which he used for his own courses), and founder of Udacity; Ray Kurzweil, another prominent Google executive, futurist, and computer scientist mainly associated with the term Singularity, which he also used to name a Silicon Valley University; Elon Musk, another highly prominent entrepreneur (Tesla, SpaceX), who has been outspoken in his critique of the public education system and founded a private school, Ad Astra; and Tim Draper, Silicon Valley venture capitalist and founder of Draper University, a six week course in entrepreneurship and innovative business. Ayn Rand, Wilhelm Reich, Milton Friedman, and Friedrich August von Hayek are among the most frequently cited sources to give expression to the "Silicon Valley" philosophy of enlightened individualism, combined with community-based connectivity, faith in the market, and distrust of big government. The ingredients of this mixture are far from free of tension. Rand's concept of objectivism and her focus on individual interests illustrates that "connectivism" is far from uncontended.

The 2016 OECD report on innovation in education quoted above argues that education policy makers should pay attention to innovation in the education industry and overcome their reservations about the role of private interests. The "key messages for innovation policies in education" are as follows:

> Policy makers typically view education industries as providers of goods and services, often technology-based, to schools. They tend to dismiss the fact that innovation in education is also changing the environment in which schools are operating. Technology-based innovations tend to open up schools and learning environments in general to the outside world, both the digital world and the physical and social environment. At the same time they bring new actors and stakeholders into the educational system, not at least the education industries with their own ideas, views and dreams about what a brighter future for education could hold.
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> Convincing schools and education systems to treat industry as a valuable partner is still in many cases a very sensitive issue. Fears about or ideological objections to a perceived 'marketisation' or privatisation of education, or outright anxieties about the displacement of teachers by computers, often endanger a potentially fruitful dialogue. The fact that the global education industry is a largely unknown entity – in contrast to the medical or paramedical industries in the health sector, for example – further adds to the difficulty. (OECD, 2016, p. 123)

Digitization and GEI mean that large cutting-edge technology corporations such as Google, Apple, Amazon, and international organizations, such as the OECD, are all united along the belief in disruptive innovation. Of course, these are not the only actors, but they are the core that propels the industry. Despite their different outlooks, charismatic personae of the digital age such as Kurzweil and Thrun have clout when it comes to education even if they are not themselves experts.

In his book *The End of College*, Kevin Carey claims that in higher education alone, disruptive innovation is a 4.6 trillion-dollar industry. Some of the most successful startups, according to an April 14th, 2015, report by the INC Magazine, are listed below. I retain the numbers of the ranking, but

do not re-iterate the full list. The selection is to provide an overview of the spectrum of activities. Although many focus their activities primarily on the American market, their products can be easily adapted to fit other purposes or serve as models for similar enterprises in other contexts.

InsideTrack

InsideTrack markets its services to universities, providing highly personalized coaching to students and assessment of whether their technology and practices accurately measure student progress. It also helps schools manage their technology and boasts testimonials from institutions including Arizona State and the University of Virginia. In addition, InsideTrack recently announced a partnership with Chegg, through which it will provide its coaching services directly to students.

The UnCollege Movement

Thiel Fellow Dale Stephens accepted $100,000 from Peter Thiel to skip college and found The UnCollege Movement, which provides students with a 12-month Gap Year experience for $16,000. The program has four phases—residence in a Gap Year House, travel abroad, an internship, and completing a creative project. Enrollees experience some of what they would in college, such as dorm life and community, along traditional Gap Year benefits like travel and professional training.

Udacity

Founded by Stanford computer science professor Sebastian Thrun, Udacity runs online employee training for companies such as AT&T, who were willing to pay them $3 million according to *The Wall Street Journal*. Other corporate partners include Google, Facebook, and Salesforce.

Coursera

Coursera advertises "Free online courses from top universities," partnering with prestigious universities worldwide. With $8 to $12 million in annual revenues, according to an EdSurge estimate, it is very profitable.

All of these startups are just a fraction of what Carey describes as the larger thriving ecosystem of nonprofit and for-profit organizations for students.[8] They have to be considered not only in the context of profit and economization, but also in the more general context of schooling policies focusing on "enhanced" or "augmented" education (cf. Sheehy, Ferguson, & Clough, 2014). Along with established forms of blended learning and online formats, augmented education includes virtual reality experiences such as museum tours and lab simulations. As already mentioned, whether digitization will enhance or reduce equity in education is unclear. Access depends on investment in hardware and software, which make it easier to produce and disseminate up-to-date education materials more cheaply and easily than traditional printed publishing. Other concerns include real-time formative and skill-based assessments which allow teachers to monitor student learning as it happens, and adjust their teaching accordingly. It may also enable active participation for more students in classroom discussions. But, to take up another point raised earlier, the ethical concerns also have to be discussed. Because of the incredible headway made in storage capacity, data collection is literally insatiable, and with this information that links learning habits to all areas of personal conduct and circumstances comes the uncanny feeling that control over one's life is transferred to algorithms to make decisions which may be mistaken for sense-making.

The point is technology-supported assessment enables skill development to be monitored in a more comprehensive way than is possible without it (OECD, 2016, p. 10). These new vistas promise to monitor mistakes, but they may do much more than that. Not only are decisions delegated to non-human algorithms, but a trend is emerging that so far is rarely brought up in digitization-debates: the merging of advising and assisting systems along the lines of what Cortana, Alexa, and Siri provide in terms of digital assistance. In the next section, I will describe the

successful implementation of e-advising at a large public university, then turn to an example showing how far digital technologies have penetrated the lives of individuals and the ambivalences this entails.

e-Advising and Adaptive Learning

Digitization and algorithmization do not just result in commodification and profit when it comes to GEI. As the following example shows, they also provide services in large public institutions without the human resources to deliver these services on their own. With its current enrolment of around 72,000 students in the larger Phoenix metropolitan area, Arizona State University is one of the largest research schools in the USA. In 2016, Arizona State University (ASU) received the prestigious Phi Kappa Phi "Excellence in Innovation Award" for using two digital tools, eAdvisor and me3, to increase retention rates. eAdvisor and me3 have since become among the most widely implemented instruments in the world. How deeply they affect the learner's life depends on the regulations and laws effective in their respective countries. Generally speaking, the USA is far more deregulated in this area than countries belonging to the EU where data protection and the importance of the private sphere are emphasized. This notwithstanding, e-assistants and other forms of digital support quickly spread so that ASU's example is more a pars pro toto than an uncommon let alone "exotic" feature.

As for ASU's motivation for using technology to increase access and impact, the Phi Kappa Phi report states that, "ASU measures its success not by the number of students excluded from the university, but rather by those included and how they succeed" (Phi Kappa Phi, 2016, p. 2). As this is the report on the "Excellence in Education Award," it is laudatory and uncritical, but it does address a crucial point of public, that is, state-run universities worldwide: Although national university systems traditionally bear a variety of path-dependencies and specificities, public research universities are under similar pressures globally. Such schools must make do with stagnating or declining budgets combined with the expectation to serve an ever larger and more diverse student population. Decreasing the rate of university dropouts is expected as part of the

knowledge-economy narrative promising to introduce an increasingly larger population of students to tertiary education. In order to maintain much less increase in public funding, universities must prove they successfully graduate their students, providing a market for automated tracking systems like eAdvisor.

Arizona State University's Mission Statement expresses these globalized expectations:

> Arizona State University has developed a new model for the American Research University, creating an institution that is committed to access, excellence and impact. […] ASU takes fundamental responsibility for educating Arizonans for a better future and for the economic, social, cultural and overall health of the community it serves. As part of its charter, ASU has developed three key metrics designed to help our state succeed: a) 90% retention from freshman to sophomore year, b) 75% 6-year graduation rate and c) awarding 25,000 degrees annually by 2020. (Phi Kappa Phi, 2016, p. 2)

If an institution such as ASU commits itself to benchmarks like retention rate and number of degrees awarded, these figures will determine whether or not goals have been achieved. An algorithmic automated tracking system may be an excellent way to ensure students who may not have passed the required number of courses visit their human guidance counselors, because if they do not they are dropped from the course and not allowed to register. eAdvisor scans information pertaining to a particular student and looks for patterns such as not completing coursework on time, failing exams, or spending more hours in the gym than the library, which might signal they are at risk. If enough red flags are raised, their counselor is notified to contact the student to meet. The idea is to get students back on the right track before they stray too far. Close monitoring is justified as a money-saver for the student, who might otherwise waste money on a degree they will never complete. It also can save the student from wasting time on a major that is not engaging their interest. Indeed, eAdvisor's effectiveness seems proven by an increase in retention rates (see the appendices to the Phi Kappa Phi publication). University faculty and staff would agree that if "problem" students are recognized in time they can be helped. This may still underestimate the obstacles certain groups

of students face, but it is based on decades of experience and observation. The eAdvisor narrative presents an idealized version of events legitimized by successes such as receiving the prestigious Phi Kappa Phi award for using technology to help students make better choices, as well as its proven success lowering the dropout rate.

In addition to tracking student progress, eAdvisor can also enable them to audit their success throughout the semester. Students might drop a class, transfer credit, change majors, or any number of other things that will affect their grade—all of which can be monitored with eAdvisor. eAdvisor students also receive regular updates to their student email account which has the added benefit of encouraging them to monitor it daily.

eAdvisor also provides important reminders to students on their My ASU page provided by the university. If a student falls behind, an advising hold will be placed on their record. While they may drop or withdraw from a course, they will not be able to add courses in the current semester, or register for future semesters until they have contacted their advisor to discuss strategies for improvement.[9]

Upon closer observation, various levels of rationality and legitimation may be identified associated with the implementation of digital technologies such as eAdvisor or similar systems. Clearly, they address the individual, they become part of the experience of being socialized as a student in the twenty-first century. As a consequence, habits will be formed accordingly. Chances of falling through the cracks, of slipping by without being detected when late with exams, are close to zero. The algorithm will inevitably identify students who are behind. If someone should have been selected erroneously, the face-to-face talk with the human advisor will rectify the mistake. However, the introduction of such systems also serves another purpose. It signals not only to the outside world, to stakeholders, but also to the global university community, that top of the line technology is implemented to optimize processes and tasks, that the university fulfills its teaching and qualifying role. In addition, as already brought up, the question of data collection, storage, and transfer is also crucial in this context. As tempting and promising these new technologies are both individually and institutionally, the commercial use raises significant

issues especially as the growth of GEI in this sector is related to a strong interest in "big data."

This point is driven home by technology in the burgeoning field of adaptive learning. While e-advising systems keep the student on track by monitoring learning outcomes such as earned credits and exam grades, adaptive learning systems monitor progress by focusing on habits, strengths, and weaknesses to take the entire academic environment into account. The Knewton Company platforms for adaptive learning, used by ASU for their math courses, are a good example. Before detailing what the company is doing, let me emphasize that the dynamism of the field is also illustrated by the strategic moves linking Knewton with powerful corporations in the field. According to Wikipedia:

> The Knewton platform allows schools, publishers, and developers to provide adaptive learning for any student. In 2011, Knewton announced a partnership with Pearson Education to enhance the company's digital content, including the MyLab and Mastering series. Additional partners announced include Houghton Mifflin Harcourt, Macmillan Education, Triumph Learning, and over a dozen others. (Wikipedia without references)

Jörg Dräger and Ralph Müller-Eiselt published *Die Digitale Revolution* (The Digital Revolution) for a German audience in 2015. The authors mainly focus on the state of digital education in America to tell a tale of disruptive innovation. That a third edition came out in 2017, and the book was widely discussed in the media and in educational settings testifies to the attention the book received.

The Knewton business model is summarized as personalized education though data collection, a large amount of which is gathered daily. The rationale is that optimized personalized learning is possible if everything that can be known about the student is accounted for. What and how the student learns—every mouse-click, reaction, right and wrong answer—is registered (cf. Dräger & Müller-Eiselt, 2017, p. 24). The company claims the continually refined algorithm can even predict how students will perform (ibid., p. 25), rendering exams obsolete.

They acknowledge the dangers of this development in terms of access, and correctly point out that these data are more revealing and potentially

detrimental than photos posted on Facebook (ibid., p. 26). Nevertheless, big data is—as a highly traded resource—the oil of the twenty-first century, and data mining is big business.

The field of automated support is extensive, and entails the consensus of professionals dealing with students in large public higher education institutions dependent on limited resources due to declining state contributions worldwide. In order to accommodate the needs of tens of thousands of students, the professional counseling staff in many higher education institutions already uses or is on the verge of introducing e-advising systems to monitor academic progression and identify students in need who are reluctant to take the initiative. As the reduced dropout rate shows, being obligated to do something by an automated system has its advantages. However, the boundaries between strictly monitoring academic progression and more extensive data collection are fluid. Though adaptive learning and advising are separate, they are linked by adaptive learning systems such as Knewton whose appetite for data is insatiable. The more that is known about the social and cultural background of the student, his routines and habits, preferences and learning style, social networks, and so on, the more precise the advice that may be given. So, while simply acknowledging academic issues such as failed courses is the first step to initiating the counseling process, more information is conducive to identifying the appropriate measures to put the student back on track. Instead of asking students numerous background questions, which they may be more or less willing to provide, from the point of view of effective counseling, it is more desirable to have a system at hand that "objectively" provides information that may prove relevant, such as the amount of hours devoted to various activities on the scale of work per week and month.

So, the next step of e-advising could easily be a direct communication with the advisee. What if an e-advising system was linked to a personalized virtual personal advising system? What if a student could directly communicate with a personalized virtual advising system that offers options for him or her what to do next? These questions raise numerous others. For example, so-called non-traditional students

may find it easier to deal with a machine than with a human and his prejudices, pre-conceptions, and judgments. So, on a first glance, for some students dealing with a "machine" may be easier and less burdened by feelings of shame or inadequacy. On the other hand, what is known about the "learning" processes of algorithms is at best mixed: The result depends on which "thread" of communication and information is picked up, as machines are not value free. This danger is compounded by the fact that the development of intelligent systems is still dominated by primarily male scientists and technical personnel belonging to the privileged social classes representing dominant Western values.

Related to this is the question as to who makes the decision. This introduces the concept of algocracy or rule by algorithms (cf. Danaher, 2014). Algocracy designates a form of rulership but does not make a judgment whether the form of rule is positive or negative. Rule by algorithm takes on different forms in relation to humans. Humans can be "in-the-loop," making decisions based on information provided by the algorithm. But humans can also intervene or remain "outside" the loop, their subjective thoughts, and opinions unaccounted for. To be effective, pedagogical expert systems must penetrate deeply into the life of the individual, their relationships, and contexts in order to be effective. If the algorithm ultimately determines the student's educational success, we have entered in an area of ethical concern (for further critical discussions in this context see, for example, Hartong, 2016; Karcher, 2015; Radtke, 2009).

To sum up: With regard to GEI, e-advising and adaptive learning systems are an important sector of the industry. The OECD has already included them in their list and as the use of clouds becomes increasingly common and the technical difficulties are overcome, privacy laws and data protection will not likely prove to be obstacles. In addition, whoever develops systems that are widely used and successful in keeping young people on track will have a competitive edge and impact. Easy adaptation is among the features making these systems most attractive from an economic perspective.

Digitization: The Human Factor

The relationship between humans and the technology we create is ever evolving and made even more complex by profit and commercialization. Both issues are important in terms of e-advising, learner interacting, and adaptive learning systems. A useful comparison is the use of technology in medicine in areas such as cancer diagnosis, where oncologists work in close collaboration with machines whose "advice" they take into account and depend on. In some areas of diagnostics, the best artificial systems are at least as accurate as humans and sometimes more precise. Developing sophisticated artificial expert systems in pedagogy remains a challenge, particularly for merging e-advising with traditional guidance counseling.

The earliest example of such a system is ELIZA,[10] a counseling program developed by Joseph Weizenbaum in the 1960s modeled on Carl Rogers' principles of human psychology. ELIZA's primitive algorithms proved inflexible and incapable of modeling the complex ethical aspects of decision making. The merger of neuroscience and computer science, along with the rise of probability models and fuzzy logic—which does a better job of approximating human concepts by allowing for partial truths—can be sensitive enough to pick up on subtleties and cues they have "learned" to look out for. Although there still remains a gap between the formal language of computer science and the natural language used by humans, the combination of progress in bio-informatics and big data processing in computer sciences promises to help bridge it for routine counseling. The danger, that is, the system reproducing stereotypes and making discriminating judgments, has already been mentioned.

The other primary man-machine relation is between the learner and the artificial assistant. Here the affective bond is decisive, because learners are encouraged to identify with the machine, which is, by definition, more distant and objective. Designers and evangelists will work closely together to create a powerful narrative around these systems which will help sell them in the GEI market. This development is based on the confluence of two powerful anthropological facts: One, humans are storytell-

ers, and two, since Paleolithic times humans have bonded with inanimate objects (cf. Zarkadakis, 2016). In his illuminating account, *In Our Image*, George Zarkadakis traces a continuity from the appearance of the first art objects, to the awareness that others might think differently than ourselves, and therefore it is important to predict their actions (a.k.a., "theory of mind). Art serves as a common language which we use to create a symbolic universe, as evidenced by examples such as Lion Man of the Vogelherd, an ivory sculpture recognized as among the earliest examples of human artifice, as well as the famous cave paintings at Lascaux. As Zarkadakis writes:

> The realization of your inevitable death can only take place if you have a mind capable of self-awareness. In prehistoric art we discover the beginnings of religion and science, and importantly the cognitive roots of our hardwired belief that things can have minds, which also means that robots can ultimately become as intelligent as ourselves. (Zarkadakis, 2016, p. 16)

As machines become more "human," they become more able to "know" us. They help us function in our personal and professional lives, choose our partners, help with chores, and even console us when we are sad by suggesting books, films, and music. Moreover, they may actively respond and communicate with us. As they are fed with information about ourselves, our preferences, hobbies, habits, daily routines, desires, they are our "Doppelgänger."

The commercial (disruption) and relational dimensions intersect at the point of affective meaning that is not only a key trait of the corporate evangelists, but designers of technological systems as well. For example, Microsoft named its personal assistant system Cortana after a virtual heroine popular with many of its users. The disruption paradigm is facilitated, augmented, supported, and reinforced by the capacity to establish emotional bonds. Disruption does not mean everything changes; the core of the respective service or business—be it transportation, photography, health or education—remains the same. Education is learning, and learning is more than a cognitive process. It is holistic, and positive emotions and relationships play a key role. That GEI capitalizes upon this relationship is obvious. Why wouldn't it?

Digitization, Disruption, and the Society of Singularities

In the final decades of the twentieth century, a variety of terms—the Information Society, Post-Industrial Society, Network Society, Knowledge Society—were chosen to describe how technology has transformed our world. The latest descriptor, "Society of Singularities," specifically positions us in relation to late modernity. The very idea of late modernity, addressed and elaborated by Andreas Reckwitz (2017), implies continuity, reconfiguration, re-arrangement, and the creation of new relations and hierarchies as opposed to the simple substitution of the old with the new and different. In this regard, the "*Allgemeine*"—the general—does not disappear, but rather is replaced by the singular or the extraordinary. The concepts are reconfigured.

As a general sociological theory, society of singularities claims to explain major transformations and their effects on societal relations in practice. If the analysis is correct, it is only logical that no system or essential organizations are unaffected. Politics, education, economic relations, our ways of being in the world—that is, our understanding of subjectivity—all have to be reconsidered in the light of new orientations and a re-arrangement of established relations. This may seem too mono-causal, but Reckwitz distinguishes the principle of "singularity" from the use in AI (Kurzweil, 2005). Striving for the outstanding, the unique, special, or singular, becomes the distinguishing feature of cities, regions, corporations, and the individual. It deeply affects our lifestyles, employment relations, and impacts the social structure, which Reckwitz describes in painstaking detail. The arts as well as the creative economy more generally are the model for the major shifts currently taking place. "Projects," Reckwitz insists, are the singularistic form of the social par excellence" (ibid., p. 192). Formal certificates are no longer the direct path to a profession or career, but have taken on a secondary role. No doubt they are still relevant, but the importance of individual performance and originality has superseded them.

e-Advising systems exemplify the transformation from the general to the specific, unique, particular, singular. The "norm," and the "standard"

remain, but the emphasis is on individual guidance to further stimulate individual talent and potential. This is what is behind "new" paradigms such as individualized instruction and diversity. And this is why the boundaries between institutional advising and personal assistance are so easily blurred. The powerful narrative of innovation and creativity "nudges" the individual, as it were, allowing a wide variety of data to be collected and analyzed that goes far beyond being strictly course or class related.

Dave Eggers novel *The Circle* (2013) strictly speaking is not a dystopia, but an account of a present where the technological prerequisites are already almost completely in place to create full transparency. The novel tells the story of a complete synthesis of digitally available personal information, leading to the full transparency described above. At this stage, the user allows every digitally connected person to gain a full insight—total observation—into his or her life. This description lends itself to interpretation in light of the Foucauldian notion of governmentality, biopower, following Han's (2014) "psychopower," and "the society of singularities."

The GEI of new technologies adheres to the logic of disruption rather than to the traditional qualities of what we commonly associate with an industry. As I have shown, Reckwitz' diagnosis fits nicely with the key practices and ideas of many of the protagonists in the current digital transformation. Their critique of schooling resonates with what he describes at length as the importance of the performative and the strength of narrative in a "corporate evangelical" sense. This fits with his emphasis that it is the power to elicit strong emotions of identification, vision, and so on, that makes for success in the age of the singularities.

There is still much empirical work to be done; however, what I have described above shows the necessity of pursuing these questions further. It is important to view current trends in digitalization and algorithmization not as fashionable add-ons to education as we know it, but to take their disruptive potential seriously and discuss their implications. These include not only how education is embedded in notions of the public, democracy, participation, and human rights, but also how it is situated in the relationship between humans and machines. The question of the

essence of the human and the meaning of a human(e) education is raised with urgency.

Notes

1. See: World Bank (2018). *Technology & Innovation in Education*. Retrieved from: http://www.worldbank.org/en/topic/edutech [last Jul. 19, 2018].
2. See: Open Learning Exchange. Retrieved from: http://ole.org [last Jul. 19, 2018].
3. See: EC (2018). *Digital Learning & ICT in Education*. Retrieved from: https://ec.europa.eu/digital-single-market/en/ict-education [last Jul. 19, 2018].
4. See: e-Estonia (2018a). *We have built a digital society and so can you*. Retrieved from: https://e-estonia.com [last Jul. 19, 2018].
5. See: e-Estonia (2018b). *Education.* Retrieved from: https://e-estonia.com/solutions/education [last Jul. 19, 2018].
6. For example, Capterra.com lists hundreds of school-related products covering all aspects of student data administration to fund raising, including the per student costs. See: Capterra (2018). *School Administration Software*. Retrieved from: https://www.capterra.com/school-administration-software [last Jul. 19, 2018].
7. See: Christensen, C. (2018). *Disruptive Innovation*. Retrieved from: http://www.claytonchristensen.com/key-concepts/ [last Jul. 19, 2018].
8. See: Retrieved from: https://www.inc.com/ilan-mochari/16-startups-that-will-disrupt-the-education-market.html [last Jul. 19, 2018].
9. See: Retrieved from: https://eadvisor.asu.edu/students/tools [last Jul. 19, 2018].
10. ELIZA is the name of a computer program developed by Joseph Weizenbaum that simulates psychological counseling based on Carl Rogers. The name is an ironic quote of George Bernard Shaw's main character in Pygmalion.

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