Gone with the Internet – How the Old Education Was Lost

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Abstract

Despite its young history, Computer Science Education has seen a number of "revolutions". Being a veteran in the field, the author reflects on the many changes he has seen in computing and its teaching. The intent of this personal collection is to point out that most revolutions came unforeseen and that many of the new learning initiatives, despite high financial input, ultimately failed.

The author then considers the current revolution (MOOC, inverted lectures, peer instruction, game design) and, based on the lessons learned earlier, argues why video recording is so successful. Given the fact that this is the decade we lost print (papers, printed books, book shops, libraries), the author then conjectures that the impact of the Internet will make this revolution different from previous ones in that most of the changes are irreversible. As a consequence he warns against storming ahead blindly and suggests to conserve – while it is still possible – valuable components of what might soon be called the *antebellum age of education*.

1 Introduction

Computing has seen many "revolutions" and we will argue that most of them came unforeseen. With the changes came initiatives to improve teaching what is now termed and recognized as *computer science*. Consider Figure 1 which shows some basic general technologies along a time-line. Each influenced a new learning mode. The list is certainly not complete.

Some technologies replaced others. Course creation for proprietary delivery software shipped on CD-ROM ceased once the Internet became the new distribution channel and browsers the generic viewing tool. Other developments created totally new learning modes as in the case of mobile devices. Many did not live up to the expectations.

All of the previous teaching modes coexisted with traditional forms, some of which come with a history of more than thousand years. The next section will review – from a personal (and thus mostly German) perspective as a veteran – some of the battles which were fought to revolutionize teaching.
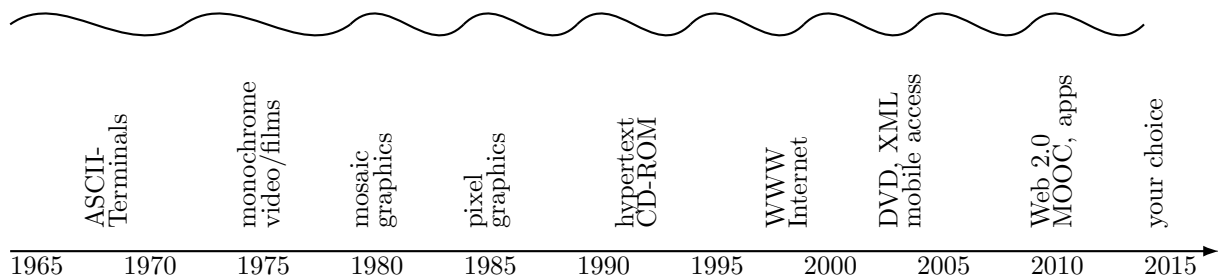

Figure 1: E-Learning trends then and now

In the section thereafter we look at what computing can do today to leverage education, in particular, why TV recordings are so popular. We will also argue that with regard to the coexistence with traditional teaching forms, print media can no longer be included. After a decline in health over the last five years, its imminent death was announced in 2013. While a discussion of the total impact of this revolution is beyond the scope of this paper [sic!], the argument is to draw on examples of revolutions and wars to fully understand what it means to lose the *Old Education.*

2   A Brief History of Pre-Internet Learning Modes

In case the introduction sounds like the all too familiar culture-pessimistic criticism of everything new delivered by an old fellow who won't give up teaching "'ex cathedra", hold on! This veteran has followed many drummers leading into all kinds of battle.

2.1   Programmed Instruction, Video Lectures – Seen it All

The author's earliest contact with computing was in 1968, taking a voluntary computer programming course as part of Math4H in his final high school year in the US. Of course it was FORTRAN, punched cards and it took place in the computing center of UMASS at Amherst. The topic itself entered and left his brain without any noticeable trace – it was all too complicated.

However, these men in white coats taking stacks of cards to be delivered to the card reader seemed like high-priests servicing some mean beast. Mean it was, as it mostly said "Nay!" to his begging for compilation and faultless execution. Programming meant punching your cards or tape, submitting your batch job, going for a coffee, returning to pick up your print-out. Was it conceivable that this cycle might ever be broken? Why should it be changed, you had a chance to talk to other folks waiting for your output. It kept you walking. Would there ever be a need for another programming language, something so foolish as not declaring all variables starting with `i` to `n` as integers? Don't be ridiculous!

In any case, those blinking lights behind glass walls impressed the author sufficiently to start studying Industrial Engineering with a major in computer science at the Universität Karlsruhe in Germany in 1969. One of his first lecturers in CS was a certain Prof. Hermann Maurer who had just joined the faculty from Canada. The year of his arrival was 1971. Maurer immediately started producing video lectures, filmed in black and white on a Sony CV-2000 reel-to-reel 1/2" tape in an office turned into a small improvised studio. Each lecture consisted of three 20-minute sequences, separated by a (more or less) humorous sketch.

The films were shown at multiple times per week in a medium-size lecture hall equipped with monitors attached to the ceiling. The topics were "'Introduction to Computer Science" and "'Programming". The motivation was to free professors from teaching tedious lectures with basic topics and to allow students to freely plan their time and to repeat a lecture, in case something wasn't fully understood.

Attendance by students was low and nobody ever watched anything twice, in particular as printed notes appeared soon afterwards. Although Maurer was a gifted actor, the effort to script, film and edit these lectures was high and additional personal was required to show the lectures since all reels had to be handled manually. However, the films were more or less in operation up to 1977, when Maurer left Karlsruhe for Graz.

Would producing video lectures in CS become a big thing? Highly unlikely then, because it wasn't for the inferior technology (color TV just became popular) that the scheme failed, it was the viewing mode which annoyed students, sitting in a half dark room, isolated, passively absorbing canned material. Watching the lessons at home, how should that work? Even if technically possible, why would you want that, given that students are on the campus anyway?

2.2   Raising the Level of Education

The years 1968 and 69 are known as the period of student unrest in the western world. Apart from radical ideological undercurrents, a crisis of academic education was generally felt and brought loudly to the streets. Indeed, in Germany only about 14 percent of all students leaving school had a graduation which entitled them to inscribe (free of tuition) at a university. Today, over 50 percent of an age-group, in towns even over

70 percent, graduate at this level, with girls being the majority, and almost all enter an academic education, unfortunately with high break off rates.

Indeed the academic system was stifled by tradition and silly regulations and a kind of leftist motivated demand for higher education for the masses initiated the production of educational material by radio- and TV-stations[1] Broadcasting was is those days all federated and public owned. Producing lectures at a (semi-)academic level was therefore seen as part of their charter and started in 1966 as "Funkkolleg". Various themes were treated by series of twenty lectures of 45 minutes each for the duration of a semester. The transmitted sessions were supplemented by written material which could be purchased for a nominal fee from the stations or through bookstores.

The author remembers taking one such lecture in the late Sixties on the radio and a certificate was granted after having taken an automated send-in exam. The offerings continued through the Seventies and Eighties, but interest declined due to a more and more diversified educational market and the program was officially closed in 1994 with a short revival after 2006 via podcast on the Internet.

One sustained effort from those day was the creation of Germany's only state university with distance education, *Fernuniversität Hagen*, founded in 1974 in the state of *North-Rhine Westphalia* (NRW) with substantial funding from all other states and the federal government. Measured in number of inscriptions (over 80.000 in 2013), it is Germany's largest university. However, NRW is one of the poorer federal states and the rest of the republic only reluctantly hands over their share of the financial burden. This has weakened the *FernUni* as witnessed by the 2012 closing of the Master Studies in Electrical and Information Technology. Even today, the distance teaching mode is heavily paper-based combined with numerous distributed study centers for seminars and exams.

Since 1920, hundreds of millions of people participated in broadcast educational programs and academic distance education with over-all one-digit success rates. Why is there so much optimism for the massive open online courses (MOOC) mentioned below (cf. Subsection 3.3)? Shouldn't we be a bit more cautious in our expectations?

2.3 Programmed Instruction at IBM

In the early Seventies, IBM Germany invited students with any computing background (very few "pure" Informatics faculties had been founded yet) to apply for an apprenticeship during the semester break. The selectivity was high, one in twenty was taken, and the author was one of the lucky few, mostly thanks to bragging about his FORTRAN-knowledge. Salaries were good and the pay increased substantially with every following work period. Little known, it later on turned out that among the newly hired Professors in *Informatics* in the early Eighties, an estimated 20 percent had undergone this program.

Each period of employment started with a course, in general data processing, OS/360 fundamentals or /360 assembler programming (cf. Figure 2), in the author's case also PL/I[2] for a fortnight in Berlin, for which IBM put the young apprentice on a paid flight from Stuttgart[3] to Berlin and back. Even though programmed instructions had a bad reputation already in those days for being pure drill learning, they were systematic and did the job well.

Could you imagine then that the same PI could be stored on a tablet computer which you could read while traveling? Not 40 years ago. Or that you could download the stuff while on the go or even talk to others on something like a mobile phone? Come on, be realistic, next thing you will predict is that the wall in Berlin is being torn down. Also, even if such things existed, they would not impress fellow travelers as much as these bright orange plastic binders with the IBM-logo on them.

2.4 Arrival of the PC

For the author, the Mid-Seventies were Algol-W on the IBM /370 running the Michigan Terminal System at UBC in Vancouver, Canada. When the terminal seemed stuck, all eyes went to the light over the entrance door of the terminal room. As long as the red light was flashing, there was hope, when it went to solid red,

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[1]Early forms of distance education and radio lectures started in the US much earlier. As reported in [10], "over 4 million US citizens – far more than attended traditional colleges – were enrolled in correspondence courses by the 1920s."

[2]A common mistake, which every user made, is to assume that the compiler directive is `PL/1`; it is `PL/I`.

[3]You can earn brownie points by naming the three major airlines operating in the corridors to and from Berlin-West right up to re-unification in 1990.

Figure 2: Insert cover of programmed instruction handed out to the author around 1972.

it meant a cold-start and you had lost your last hour of editing, if you didn't save your work. Sessions one day being auto-saved? Sure, keep on dreaming.

Lecturing was conventional with an emphasis on programming and term papers. Flip-out foils for the overhead projector were in high esteem. Much later panels appeared which were attached to a PC and were placed over the projector. Or you could order a three-lens RGB-beamer from the media center which required two people to carry and was always defect when you needed it most urgently. A beamer the size of a shoe-box in any seminar room? Highly unrealistic in the Eighties.

With the author having returned to Karlsruhe in 1977 and with a fresh Ph.D., Commodore came out with the PET, one of the first personal computers, in this case featuring a 6502 micro processor and built-in Basic 4.0. In Europe they were labeled as CBM 3000 series and, like earlier in the USA, had a big influence on the education market. With a partner five were bought for tertiary education and the author was allowed to take one home, fitting perfectly into the back of a Volkswagen Golf. He wrote a *Towers of Hanoi* program using recursive GOSUB-statements and PEEK and POKE for visualizing the disks. A width of 40 characters was just fine to show the three stubs with discs up to a size of 12 white block characters (3 * 12 + left and right blank + two middle gaps = 40 characters). The author started it around 11 pm, estimated the running time and went to bed, satisfied to see all discs had moved over in the morning. A recently written *ToH*-program as part of a Tcl/Tk-exam re-stacked twelve discs (including graphics) with 3072 moves in less than a second.

The PET (or any similar PC) had a long and lasting influence on everyone who ever got his hands on it. It was the feeling of total control over a machine, of possession, of programming against its obvious limits. With Basic as only choice of language, GOTO wasn't considered harmful for a while. The same feeling came back with the first true PC, in the author's case fairly late in 1985 with an IBM PC/AT (Intel 80286) running Microsoft Xenix 1.0 (still based on Unix System III) – and yes, who would ever want more than 640K?

2.5 On the Cruelty of Online Programming Exams

In Karlsruhe, programming education switched to PASCAL and the Apple II which was purchased in large quantities to furnish computing labs. The author's institute leader, Prof. Thomas Ottmann, also known for his later engagement in enhanced lecture recording (*Lecturnity* [6]) pushed the use and advocated online exams. Students were given a programming problem which they were to solve algorithmically and then code and run with given test data, ending up in a program stored on a floppy which must be handed in on time.

Anybody who ever programmed himself knows what kind of pressure this creates, in particular finding that *last bug*. The author supervised one such exam involving about 50 students. It ended after two hours with one student begging for one more compilation run after the other until we set an ultimatum. In handing us his floppy disk, he slipped off the chair loosing consciousness. After that this author refused to participate in any similar examination mode.

Would anybody today seriously discuss this form of exams other then individual 1:1-exams in front of a terminal, where one has (at least perceived) a good control over emotional stress of candidates? Your answer goes *here*.

2.6 The *COSTOC*-Project

Maybe the attitude towards use of computers in education in the Eighties was generally different, maybe less scrupulous. The reason might have been the excitement which the new tools created. The aforementioned Hermann Maurer certainly was "technologically inclined". Being the inventor and major force behind the marketing of a Videotext[4] computer named MUPID, he used his good connections (and Austrian charm) to collect an impressive number of authors for a project titled *Computer Supported Teaching of Computer Science (COSTOC)*.

Unlike his video lectures before, the motivation was not so much to alleviate the creator from having to teach the same topics over and over. Now, the idea was to create a market of excellent courses. Authors were promised and paid a certain (as it turned out too low) honorarium and universities were encouraged to create learning labs with five to ten MUPIDs connected to a PC which acted as BTX-Server. The intended learning mode was asynchronous, distributed learning (any time, any where). The success would have been measured by collecting the number of correctly answered questions in the lectures thus giving the student (and course operator!) an indication of his or her learning capability. This idea of monitoring the success was soon abandoned. Of course, nobody would do such a control thing behind the scenes today, would they?
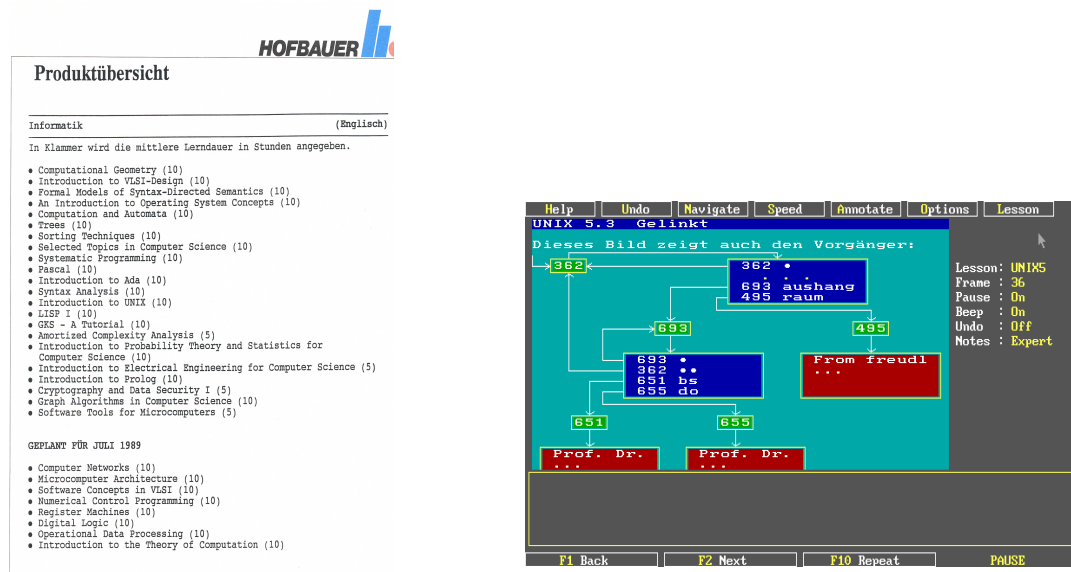

Figure 3: List of COSTOC-Courses and Screenshot from *Introduction to Unix*

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[4]In Germany Bildschirmtext (Btx)

The project was astonishing in many ways, mostly for the number of courses offered (cf. Figure 3). Given the restrictions under which the material was produced on the Mupid-computers (each file representing a lecture had to be at most 32K), an amazing high number of respected computer scientists agreed to contribute. Not all of them succeeded. Despite detailed recommendations from Maurer, many gave up early or delivered "filmed books" lacking illustrations, animation and sets of multiple choice questions. In the end the project failed for a number of reasons:

- the hardware, the content and the look&feel became obsolete.
- there was no market for the courses, nobody would use course material from others, not even for free.
- producing and later maintaining or porting the courses was prohibitively costly.
- the asynchronous learning mode never worked.

In a deal with the above mentioned *FernUni Hagen*, a subset of the courses were handed over to them for use in distance education under their label, but even that couldn't save the business model which made the project die around 1990.

2.7   Oldest Living E-learning Course Tells All

The author's share in this was "Introduction to Unix", a computer-based e-learning course in ten lectures, developed by the author around 1984 and still in use today[5]. The story of its porting over several generations of soft- and hardware can be found in [8]. The final version (so far) is HTML with embedded SVG and some Java for navigation and can be tested at `http://www.withheld.de/Help/PCWL/`.

The interesting question is then, why this particular course survived 30 years when the Costoc-Project itself folded long time ago. From today's point of view, *Introduction to Unix* survived for a number of reasons:

- the content remained surprisingly up-to-date since the basic ingredients in Unix (shell, file system, processes, security model) remained unchanged despite the fact it is now all Linux.
- the presentation used story-telling, a sufficient number of animations, a set of well posed multiple-choice questions, a bit of humor in the typical Unix-style of the old masters.
- the individual frames are so minimalistic by today's standards that they acquired a certain retro chic.
- the learning mode was always synchronous in a learning theater with practical exercises interspersed; the MC-questions were answered together by voting on the possible choices.
- nobody other than the author (or junior lecturers from the same institute) offered the course.
- being able to access the material from home over the Web was helpful, but not essential, a printed documentation (as PDF) existed as well and was used by students to prepare for the exams.

However, despite being online for free for more than ten years, we never received a comment on the course from outside. But then, we never added a *like button* to our pages.

2.8   Spending Your Money Wisely

The Mid-Eighties were still the years of big, central computing for what was called computing intensive applications. The author of this contribution raised his hand in 1987 at a meeting of faculty delegates at the Universität Gießen to vote for the purchase of one mega-word of core memory for the CDC Cyber 180 for a mere ONE MILLION Deutschmarks! Nobody in their wildest dreams could have imagined that in 2013, a thousand-fold of computer memory, say 4 GB DDR3, would be less than 50 $US. Was that money wisely spent?

Around the same time, in 1984, with the emergence of the personal computer, university presidents, faculties and computing centers created the idea of installing pools of PCs in supervised rooms on campus. The government provided funding by means of the so-called *Computer Investment Program*, short CIP, and all institutions could apply. The lure to have direct access to a computer of your own – and later to connect to the world outside via UUCP – was too great to resist. Thus, less attractive seminar rooms in basements and elsewhere were hastily converted to computer labs.

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[5]Disclaimer: Despite the catchy section title with a reference to Allen Gurganus' best-seller [4], the author will gladly concede that there are certainly other, even older computer-supported lectures which are still offered today – but likely not that many.

At the authors place, endless meetings and reviews of manufacturers' offers led to the decision that four dozens of Olivetti M24 PCs, an IBM clone with an Intel 8086 processor and equipped with a Hercules Graphics Card, were to be bought. Right for the last voting, IBM offered the PC/AT, featuring a clearly superior machine at about the same price. Anti-IBM agitation was strong, pointing out that European manufacturers were to be favored. In the end, as a compromise, the order was split, the pro-AT fraction argued that IBM produced parts of the system in Ireland. The Olivettis soon became obsolete, in part because their IBM-conformity wasn't so conform after all.

Computer pools turned out to be a hassle for those responsible. Theft and vandalism were high, so were re-investment costs as machines dated fast. Pools were accessed in-between lectures, so either they were completely empty or all occupied. When the internet arrived, their use in the late hours of the night was beyond any control. Was that money wisely spent?

Twenty years later, the federal government came up with another bright idea to promote computer usage in education. Now, with the advent of mobile computing, the program was termed "Notebook University" and encouraged universities to invest into the purchase of notebooks to be handed out to students for certain registered courses. In total, 25 million Euro were spend at 22 universities over a period of 18 month. The idea was successful to the extend that it got rid of the hated CIP-Pools at the expense of creating another bureaucratic monster: trying to regiment a swarm of notebooks available for rent. It also helped to finance the ubiquitous installation of WLAN on campus which these days allows students to follow up their social network connections in the lecture halls while not paying any attention to whatever happens up front.

This author participated in this project. As for the mobile aspects, he remarked (with co-author withheld) in a conference contribution titled "Paper title withheld" that the concept of *mobile learning*, i.e. learning while on the go, was rather silly.

> When Lewis Carroll talks in *Alice in Wonderland* about a Golden Key which opens hidden doors in a world of curiosity, had he meant a fairly expensive, clumsy 3 kg device with short battery life and a tendency to be stolen from cars? [...]
>
> Would, these days, a certain Charles Lutwidge Dodgson, aka. Lewis Carroll, carry his notebook with him while rowing with the Rev. Duckworth and the three Liddell sisters up the River Thames? According to Alice Liddell, the beginning of *Alice In Wonderland* was told "one summer afternoon when the sun was so burning that we had landed in the meadows down the river, deserting the boat to take refuge in the only bit of shade to be found, which was under a new-made hayrick" (July 4th, 1862).[1]

One government clerk supervising this program must have read the article and became so angry over this criticism of "his" program that he instructed the author's university to disallow funding of travel to this conference abroad. Now, with these pessimistic lines here . . .

2.9 Lecture Attendance in the Internet Age

This short, personal history of learning modes ends with a sad note. In step with us offering written lecture notes and sample exams (with solutions) on our Web-pages, the number of students attending lectures dwindles. Given the high pressure on the students today, who are required to hand-in exercise sheets and must attend labs for many courses, the students vote with their feet. Lectures without notes and unclear exam situations are attended, anything else is skipped and preparation starts a week or two before the exam date. On the positive side, attendance of the tutorials with exercises on the lab terminals remains fairly high. Other lecturers have responded to this attitude by withdrawing lecture material and samples of previous exams from the net. Does the revolution devour its own children (Pierre Victorien)?

3 The Internet and the Death of the Ancien Régime

3.1 Revolutions as we Knew Them

The world has witnessed various revolutions in all continents which overturned the old and brought about something new. In Europe the term revolution is often equated with the French Revolution of 1789 – 1799,

then there is of course the Russian Revolution of 1917 and many others, including technical revolutions. The term "ancien régime" is often used to describe the old, outdated system which was unwilling to adapt to changes, hanging on to privileges and injustices, as described by Alexis de Tocqueville [2].

On the other hand, the term was historically equated with "the good old times" and remains to carry a nostalgic undertone, as in Talleyrands quote:

> Celui qui n'a pas vécu au dix-huitième siècle avant la Révolution ne connaît pas la douceur de vivre:("Those who have not lived in the eighteenth century before the Revolution do not know the sweetness of living").[9]

In America, the end of the colonial history is termed the American Revolution starting in 1775. Secondly, the Civil War, fought from 1861 to 1865, meant the end of a political and social system as well. For the Southern United States it was the end of a lifestyle, also known as antebellum period. Again, today the term is connotative with nostalgia. The American Civil War was followed by a period known as *Reconstruction*, roughly covering the years 1863 to 1877.

3.2   When to Call a Change a Revolution

Does it make sense to compare the arrival of the Internet with a Revolution? If yes, why would the years 2013 and 2014 mark the death of the Ancien Régime, the end of the antebellum era? In all honesty, there is no sharp turning point, the king hasn't been arrested these days, nor has somebody attacked Fort Sumter. However, 2013 was the year print media underwent great changes.

In the US, the Washington Post was sold to Amazon' Jeff Bezos, a week later The New York Times Company parted from the Boston Globe, and in Germany one of the largest media houses, Springer-Verlag, sold most of its newspapers and magazines. For many, this marked the beginning of the end of print journalism. More precisely, it means that printed news, with the exception of a few Sunday papers, is dead as a *business model*. Most experts agree that this doesn't merely mean a change of distribution channels. Not only the consumption side is changing rapidly generating lower revenues, the content production side will see massive lay-offs of journalists and photo reporters as content is acquired on-demand, just in time, from whoever can deliver, i.e. mostly free-lancers and the public in general, posting their videos and comments on YouTube and Facebook. Why would educators fare a different fate, one may ask.

Ironically, 2013 will also go down in history as the year when, to a larger extend than before, people realized that entering the digital world most likely meant the end of privacy. Whatever we search in the big search engines, what we send through email, becomes part of *Big Data* and is analyzed either now or in the future for the good of some company or the security of some nations. Unlike the case of the end of print, the impact here is lower and consequences much less clear.

What exactly constituted the digital revolution? According to the well-known figures of Martin Hilbert and Priscila Lopéz [5], humanity stored more information digitally than in analog form by the year 2002. Overall, the almost complete digitization of information took less than ten years and happened around the change of the millennium. By 2007, 94 % of all information storage capacity was digital. As for the book market, Ebooks made up 20 % of the U.S. consumer book industry in 2012, up from 15 % in 2011. The analyst firm PwC (PricewaterhouseCoopers) estimates that the U.S. consumer Ebook market will be bigger than the print book market by 2017. This does not include educational books. If they are added, Ebooks will only constitute for 38 % of the market in 2017 [7]. In certain genres, nearly 20 % of the published Ebooks will be self-published. The tendency of the Internet to foster self-exploitation will reach education as well and will influence the educational book market severely.

3.3   Why Video Recording is Here to Stay

There are many trends in electronic learning modes. For shortness we name two:

- a social mode with multiple short contributions by many which we subsume under the term E-Learning 2.0 [3]
- a production mode with longer contributions by a selected few, including commercial offers, which we subsume under the term MOOC (Massive Open Online Courses) [10].

Both modes rely heavily on video recordings. However, ideally a topic should be taught by a carefully orchestrated mix of instructional techniques resulting in blended learning. If high quality programmed instructions are included with animations and graphics, combined with motivations, examples, question-and-answer sections, the production cost is astronomical. Based on previous experience (cf. Subsection 2.6), the business model, whereby others pay for the use of the copyrighted material, will most likely not work and obsolescence lurks in the back-ground.

Those parts based on video recordings seem different. The cost for recording, editing and distributing small films today is minimal. Secondly, the way people speak and move hasn't changed that much in the last hundred years. The conjecture is then that 3D and 4K video as well as any future TV standards will not constitute a major change comparable to, say, the change from CGA text mode to CGA graphics mode. Recorded lectures (tubes) are then here to stay – not for merit, but out of convenience.

3.4 Educational Art in an Unlimited Medium

It is generally accepted that teaching is most successful if it comes with an emotional undercurrent created by an artistic performance ("she is a genius the way she explains it"). The point is now that the Internet, which produces new, surprising visual and audio effects one after the other, has no natural limit against which to produce art. Whatever we produce today, could look clumsy tomorrow. Where artificial limits have been set, say in the Wikipedia context, where a minimalistic look&feel is prescribed, which actually resembles much the traditional print media, the feeling of perfection must come from openness, completeness and correctness, which is emotionally much weaker.

Similar approaches, like Wikiversity[6] or WikiEducator[7], will succeed if they can establish a standard (which in fact is an artificial limit) against which material is created. Most likely they will in the long run create the same limited excitement which visits to Wikipedia-pages evoke in us today. Thus, the social mode of open online education with read/write use, subsumed under the title *E-Learning 2.0* in Subsection 3.3, might create large, valuable collections of lessons which, however, will appear somewhat lackluster. It will be much like visiting most of our contemporary city halls, who offer office space conforming to all regulations, but lack the charm of the old oak-lined chambers.

4 Conclusions

The way revolutions go: we storm the palaces and castles to expel the nobility, the dictator, the evil. Walls are being torn down; here and there the splendor goes up in flames. Whoever worked for the old regime loses his or her job (or neck), servant and king are now citizens alike with (almost) the same rights.

Currently we tear down much of the old educational structure. The print industry for papers and books is undergoing a massive restructuring, the old business models don't work anymore, bookstores in smaller towns disappear in Germany and libraries are being closed (two public libraries out of four in withheld). Classical frontal lecturing is considered outdated, collaborative schemes are advocated. Students and teachers are contributors with (almost) the same rights.

Revolutions are unstoppable when their time has come. The old system, say print media, still creates examples of highest quality, much like the most beautiful buggy whips were produced shortly before the buggy-whip industry disappeared with the arrival of the automobile. But the truth is, the Old Education as a way of learning and teaching is lost and all we can do is to conserve as much as possible valuable creations and positive habits of the ancien régime for those who still know the sweetness of living offline.

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