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1   The Digital Transformation of Education

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The Internet has transformed many facets of knowledge production and distribution, from journalism to the music industry. Education is also in the early stages of a fundamental reconfiguration. This chapter considers how digital environments will likely shape the content, scope, and practice of education.

1.   The Reduction of Spatial and Temporal Limits on Education: Economies of Scale and Superbroadcasting

Traditionally, most education has been spatially fixed and geographically limited. People have gone to schools in buildings in fixed locations. Because students travel to a specific geographic location, they normally have to live within relatively close proximity to their schools or else they have to live within the school itself. In this traditional approach, the number of students is limited by the number of people who can fit into the buildings—and by the number of individual schoolrooms within the buildings. Space puts an upper limit on the number of students any single teacher can teach. Education under these conditions lacks economies of scale. As the student population increases, schools need to increase the number of teachers as well.

The same features of traditional school education make it temporally limited. Teachers cannot teach twenty-four hours per day, nor can students learn. The school day is temporally bounded, and normally is divided into distinct classes that last a certain amount of time. In most schools students attend different classes one after the other; they cannot attend different classes simultaneously. Hence classes must be scheduled so as not to conflict with each other in terms of either space or time. These features make traditional education a bit like a schedule for television networks, with different channels of information packaged into programs that follow one after another in time.

The digitally networked environment frees education from its traditional spatial and temporal limitations. As it does so, however, new constraints and limitations emerge that were always present in the traditional model but now become especially salient.

A traditional model of education is a broadcast model, in which an expert teacher provides instruction to a group of students. The mode of communication is one-to-many. As we shall see, digital networks offer alternatives to this model of one-to-many education; at the same time, they also extend and amplify it. That is because digital networks offer economies of scale for certain forms of education but not for others. When people exploit these economies of scale, the traditional broadcast model becomes a super-broadcast model.

First, using digital networks means that geography no longer places an upper limit on the number of students that a teacher can reach. Students and teachers do not have to be in the same location for the teacher to communicate with the students. Teachers can speak to an indefinite number of students. Conversely, an indefinite number of students can take the same class.

Second, educational institutions do not need to invest in buildings to house additional classes, or offices in which teachers work and plan lessons. Potentially, this lowers cost because fewer and fewer teachers can do the work that previously required many teachers. Moreover, educational institutions do not need to ration space and time as they do in traditional school buildings.

Third, educators do not need to schedule classes like programs on atelevision network. Students can play videos or access websites twenty-four hours a day. They can, at least in theory, experience education at any place and at any time, in any order.

Yet freeing education from traditional limitations of time and space makes other constraints and limitations on education increasingly important and salient. Students can view online materials and videos when their schedule permits but they will enjoy relatively limited direct connection with and feedback from their teachers. A superbroadcast model makes individual student-teacher interactions increasingly difficult if not impossible. Some, but not all, forms of learning may be well suited to such a model.

2.   Digital Networks and Peer-to-Peer Education

Problems of scale lead to a second basic model of digital education. Digital networks also facilitate many-to-many or peer-to-peer education. People

can learn through using social media such as Facebook, YouTube, and Flickr, and in multiplayer gaming environments. Social media, including gaming environments, provide platforms for intellectual exploration, the exchange of ideas, and the communal construction of projects. Students can get significant feedback from their peers using social media, and they can learn skills by building things together. These media do not require that participants be located in the same geographic space.

Using social media, students can educate themselves and each other. For example, gaming environments, properly designed, can give students opportunities to explore, build, and develop skills without constant input from or intervention by teachers.

To the extent that digital education adopts peer-to-peer methods, the role of the educational professional changes. Increasingly, the roles of teacher and textbook author are joined if not displaced by those of the moderator and the platform designer. The moderator facilitates peer-to-peer interactions, solves technical problems, and resolves conflicts. The platform designer is a sort of educational engineer who sets up the platform (whether a game environment or a social medium), adds appropriate educational content, and designs the space so that it facilitates group interaction and social cooperation and provides maximal educational benefit and exploratory potential. Indeed, there can be multiple levels of platform design, with some designers creating basic social media that can be adapted for educational purposes, some creating interactive tools specifically designed for education, and others adapting these tools to particular educational environments.

Just as some forms of education are more geographically bounded and labor-intensive than others, some forms of education may make better use of social media–based digital education than others. Online environments may be particularly useful in disciplines in which students can work together to solve problems and in situations in which education arises from a repeated process of teamwork, mutual influence, and collaboration. At the opposite end of the spectrum, online environments may be useful in areas where there are clearly defined right and wrong answers and students can mechanically check each other's work. Between these two polar opposites lie disciplines that do not offer clearly correct answers, that emphasize the mastery of a canon of materials and associations, and that require the gradual development of situational sense through professional training.

3.   Difficulties of Scale and Hybrid Models

Digital networks facilitate both one-to-many and many-to-many models of digital education. In theory, each of these models might scale well beyond the size of the traditional classroom or lecture hall. But each has its limitations.

What is suitable for some forms of education may prove deficient for others. Some forms of education benefit greatly from students and teachers being in close physical proximity, and from relatively small student-to-teacher ratios. Students may require close supervision in some subjects and interaction and exchange with their teachers. In such situations, teacher expertise and guidance are especially important. These forms of education are labor-intensive; they require relatively small teacher-to-pupil ratios. They do not scale well even when technology eliminates older geographic and temporal limits for education or enables peer-to-peer interactions.

Forms of education that require close supervision and considerable teacher-student interaction may continue to thrive in the digital age precisely because they cannot be effectively duplicated online—assuming, of course, that there is sufficient public and private financial support for them. But that is precisely the problem. One-to-many and many-to-many forms of digital education may crowd out more traditional labor-intensive approaches precisely because economies of scale make the former less expensive.

It is not, however, an either-or proposition. A great advantage of digital networks is that they offer the possibility of hybrid models, combining traditional labor-intensive models of teacher-pupil interaction with one-to-many and many-to-many digital models. Tasks formerly performed by a single teacher—lecturing, leading discussions, supervising work, answering questions, grading—can be broken down into separate tasks and performed by different actors. Those tasks that scale effectively—basic lectures and presentation of materials, and peer-to-peer interactions and projects that do not require much direct supervision—can be handled through online media, even as other elements of education continue to use labor-intensive student-pupil interactions. Both public and private institutions may turn to hybrid models to save costs even if important aspects of education do not scale well.

Long before the arrival of the Internet, research universities had adopted analogous cost-saving methods. Many courses feature lectures by a single professor, assisted by an army of adjuncts and graduate students to teach sections and grade papers and exams. Digital models might allow an even

greater extension of these cost-saving approaches. Institutions can pool lectures and lecturers through licensing arrangements, while adjuncts and advanced students can check work and facilitate discussions online.

Some of these hybrid models will improve the educational experience for many students and expand access at lower cost for people who could not otherwise afford an education. At the same time, these hybrid models may produce winner-take-all effects.

To see why, consider the aspects of education that scale most easily and are no longer geographically bounded—lecturing and providing educational materials. Teachers who offer lectures on a particular subject no longer compete solely with teachers in the same geographic area for audiences and employment; they compete in national and even international markets. Therefore fewer lecturers are necessary for any particular subject. This means that a comparatively small number of schools with recognizable brand names might be able to capture an increasingly large share of the market for digital education, with a relatively small group of well-known lecturers attaining higher salaries in the process. Other educators will have to work for less or move to less popular or niche subjects. In the alternative, they will participate in the more labor-intensive aspects of education. Thus, the move to hybrid models may significantly alter labor markets for educators. Fewer educators will be needed to broadcast lectures; more educators will be needed to perform the less well-paid, time-intensive work of grading papers and interacting with students online.

Newspapers offer a partial analogy. Before the Internet, newspaper distribution was geographically limited. People received national and international news from their local paper. Once people could get news from anywhere, however, local newspapers increasingly shed reporters and bureaus covering national and international news and relied increasingly on news services for coverage, while a handful of national newspapers, such as the *New York Times,* the *Wall Street Journal,* and the *Washington Post,* gained the lion's share of traffic for this news. Predictably, the number of well-paying jobs available for reporters covering national and international news has declined.

4. New Limitations

Although digital networks seem to remove limitations on access to education, new limitations on access to education emerge in the digital age, while other limitations, which already existed, become increasingly salient.

The first limitation is Internet access, a special case of the problem of the digital divide. Limited Internet access affects both the number of people who can gain access to digital education and the media that can be used. Cell phone use may be widespread, even in rural areas, but in many places broadband access is both rare and comparatively expensive. To the extent that digital education relies on bandwidth-intensive video and multimedia programming, many students around the world may not have effective access; if they have only low-bandwidth access, they must rely primarily on text-based systems.

A second limitation is language. Language replaces geography as a major barrier to educational access. Schools can reach students all over the world as long as these students understand the language in which instruction is offered. Online enterprises will have to offer versions in different languages to expand their reach in global markets. To lower costs, many enterprises will decide to focus on the most widely spoken languages, such as English, Chinese, Arabic, or Spanish. This may reinforce the dominance of these languages over time. Digital education might also strengthen a single national language at the expense of minority languages.

A third important limitation is control over architectures and standards. Especially when it involves multimedia, online education requires technological standards and platforms for producing and displaying content and facilitating communication and interaction among students and instructors. The design of these platforms and standards raises important questions: whether platforms and standards are freely open for use by others or are closed, whether they are proprietary and require licensing fees, and whether they are interoperable with other platforms and standards. Interoperable standards mean easy movement of students and materials from one platform to another. If educational platforms are not interoperable, it will be difficult to move educational materials or to exchange information (including homework, collaborative projects, grades, and evaluations) between platforms. This may prevent competitors from free-riding, but it will also promote lock-in. Open standards will encourage third-party applications; closed standards will give online enterprises greater control.

A fourth limitation, already mentioned, is scalability. As we have seen, only some aspects of education are successfully scalable online; other elements are likely to be labor-intensive and costly. The growth of digital educational enterprises will depend on the degree to which they can lower the cost of these labor-intensive elements or avoid responsibility for providing them. If digital enterprises do not have to provide the labor-intensive elements of education, they will shift the responsibility (and the expense) to other actors.

The fifth limitation is control over intellectual property. A vast amount of information is available for free on the Internet or is available for non-commercial purposes under a Creative Commons license. Incumbent institutions already use this material to supplement their courses; conversely, some colleges and universities allow the public access to lectures and teaching materials.

Some digital enterprises will rely extensively on freely available educational materials. But in the long run, intellectual property will be crucial, just as it is in many other areas of knowledge production. Many of the most valuable educational materials will be limited by licenses so that they cannot legally be used by for-profit or nonprofit competitors. In addition, for-profit enterprises will want to create proprietary materials to distinguish themselves and to justify charging tuition. Similarly, publishers of textbooks and other educational materials have developed and will continue to develop online and multimedia versions suitable for digital education. Each of these players will demand intellectual property protection and will use various versions of digital rights management to prevent their materials from being copied and used by competitors and unauthorized end users.

5. Competition with Incumbents, Accreditation, and Government Regulation

State accreditation and regulation will likely prove important factors in the growth and development of digital education. Because the one-to-many and many-to-many models of digital education lower costs, online educational enterprises have sprung up around the world, and more are likely to follow. Some are adjuncts of existing nonprofit educational institutions, while others are for-profit and nonprofit enterprises that offer courses of study tailored to online environments.

To the extent that online enterprises scale and can provide educational services at lower cost, they pose a competitive threat to existing forms of education. A degree or certificate provides not only valuable human capital but also credentials; yet education is often expensive, especially vocational and higher education. People who seek vocational or specialized education may choose less expensive forms of online education. This will put competitive pressure on the market for educational services offered by traditional institutions, which often require considerable investments in tuition and time and force students to assume large amounts of long-term debt. Many students will weigh quality of credentialing and quality of education against cost and debt obligations, just as they already do when choosing

among existing educational institutions. Market pressures may lead some incumbent institutions to adopt digital technologies in order to cut costs or provide low-cost alternatives.

Digital alternatives affect both the demand for and the supply of educational services. Traditional educational institutions have high fixed costs, including the costs of maintaining the physical plant and paying administrative and faculty salaries. By dispensing with most of these expenses, online educational enterprises can charge far less for their services per pupil, in return for reduced teacher-student interaction. These enterprises will attract students who would not otherwise have been willing or able to get an education. At the same time, lower costs will put pressure on traditional educational institutions. This pressure will be exacerbated if state governments begin to view online education as an easy way of cutting costs and begin to push state-supported schools to substitute lower-cost online technologies for traditional labor-intensive methods of education.

As we note below, much education in online environments is informal and is not directed to the production of state-approved credentials or degrees, even though internal systems for recognizing achievement may develop within them. Educational organizations that do not seek to issue credentialing degrees and certificates will face a very different path from that taken by for-profit enterprises that seek to issue officially recognized degrees and certificates. That is because the latter compete more directly with incumbent institutions.

For online educational alternatives to succeed, people will have to treat online degrees and certificates as valuable credentials in the same way that they treat degrees and certificates from incumbent institutions. The most obvious path to making these credentials valuable is to have them officially recognized by the state.

This is not the only path, to be sure: businesses can and do award certificates for vocational training, mastery of software, or the development of other skills. A wide range of vocational and technological training exists alongside the education offered by high schools, colleges, and universities. These educational systems offer alternative forms of recognition and credentialing, and in some cases they may be even more important for certain employers. Moreover, even without awarding state-approved diplomas and certificates, online enterprises can produce a wide range of credentials to indicate status and accomplishment. Depending on how these credentials are treated by society at large—and especially by employers—they might create a separate track of educational status and accreditation.

Nevertheless, state accreditation of online degrees and diplomas will greatly accelerate acceptance of online institutions as genuine rivals to incumbents. Therefore we are likely to see repeated controversies and struggles over state accreditation and state regulation of online enterprises.

Online education does more than compete with incumbent educational institutions. It also challenges existing systems of state accreditation, which shape and limit the institutions that participate in the market for educational services. State accreditation systems, like many professional licensing systems, operate simultaneously as a device for ensuring quality and as a means for limiting new entrants.

Because educational systems have traditionally been territorially based, they have fallen within the regulatory competence of territorial governments. Even governments with long-standing protections for freedom of speech have long traditions of regulating education. In the United States, for example, education is subject to regulation at the local, state, and federal levels. In many countries, only accredited educational institutions may satisfy elementary school requirements and grant high school diplomas and university degrees.

Governments generally justify regulation of education on the grounds that education has elements of a public good. The benefits of education do not merely benefit the individual recipient; they are dispersed throughout society. Conversely, a poorly educated population makes society as a whole worse off.

Because education benefits society, and because governments assume that most people who live in a nation will continue to remain there after they are educated, governments traditionally have both subsidized and regulated education. In the United States, most accredited educational institutions are either publicly maintained or receive significant public funding, through government grants or through the tax system. Direct control over public institutions and indirect control of private institutions through government funding and tax policy allows governments to regulate many different aspects of the educational experience. Even with respect to purely privately-funded educational institutions, governments often specify what level of education is required for students, regulate which institutions can be accredited, set requirements on who can teach, and specify the levels of competence that schools must provide. Governments regulate both for quality control and to ensure that appropriate knowledge and values are inculcated.

Online educational programs may fit awkwardly into the assumptions of traditional state educational regulation. Not only do online environments

challenge state-accredited educational institutions; in some cases, they may challenge the state's own educational policy goals.

Because online enterprises can provide education in many different jurisdictions simultaneously, they may not conform to the values and policies of territorial governments, including governments' language and cultural policies. Government officials may object that online institutions do not offer education that is adequate or appropriate for their populations. Moreover, in many jurisdictions, governments specify not only the credentials of teachers but also the educational materials used; Internet educators may not always respect these choices. Just as in the case of online speech, online education has the capacity to route around existing regulation and provide educational experiences that differ in content and form from what territorial governments (or incumbent institutions) would like.

Governments are not the only institutions troubled by these end runs. Traditionally, much education has been sponsored by religious institutions, not only for charitable purposes but also to inculcate orthodox views. Online religious education allows multiple perspectives—or heresies, depending on one's view—to be taught and perpetuated. In fact, one of the most likely uses of digital education is religious instruction, especially by groups that lack the resources of more established sects and seek to spread their message.

Some incumbent educational institutions will likely lobby governments to keep new online institutions from gaining official accreditation; failing that, they will try to prevent online institutions from obtaining accreditation on a par with that enjoyed by incumbents. Nevertheless, many incumbents will probably award their own online degrees and certificates in order to expand their influence and market share. In doing so, they will naturally have to consider whether they are undermining their own competitive position or their existing reputation. However, incumbents may reason that if someone is going to offer online education (and especially for a fee), they are the best equipped to do so because of their long experience, professionally trained faculty, and high professional standards.

Incumbents object to accreditation of new online enterprises out of mixed motives. On the one hand, they are concerned about preserving educational quality, maintaining professional values, and preventing newcomers from taking advantage of prospective students, who may be inadequately informed about their choices. On the other hand, incumbents also seek to prevent unwelcome competition that undermines their existing models for financing and providing educational services.

6.   The Changing Role of Amateurs and Professionals in Digital Education

Two characteristic features of digital speech—and digital networks generally—are routing around and glomming on. Routing around means that end users do not need to rely on traditional gatekeepers of knowledge production and distribution; instead, they can use digital media to address fellow audiences (and end users) directly. Glomming on means using existing available content—some created by professionals, some by amateurs—and appropriating, combining, modifying, and sharing it. Digital education features its own characteristic versions of routing around and glomming on, just as we have seen in the cases of journalism, video, and music.

Partly because of these phenomena, digital networks alter the nature of professionalism, as well as the relationships between professionals and nonprofessionals.

First, professional educators reach new audiences. The digitally networked environment offers traditional educational institutions the possibility of reaching large numbers of people outside the academy. Many educational institutions have begun to place lectures, lecture notes, and outlines online for consumption by the general public. This blurs the traditional boundaries between teaching, public service, and community relations.

Universities and scholars may post educational materials online for an undifferentiated audience rather than exclusively for their students and for fellow academics. This creates the possibility of new conversations between professionals and nonprofessionals, as well as between nonprofessionals. The distinction between teaching enrolled students and engaging in public commentary and public service tends to blur. Interactive media allow knowledge professionals—including professional educators—to be more than merely broadcasters. Professionals may receive increasing amounts of feedback and other information—whether welcome or unwelcome—from their expanded audiences.

Second, and conversely, professional educators face new competition for the attention of and influence over their students. Some of this competition comes from other professionals, whose views and opinions are now more easily accessible to students. Equally important, however, is competition from nonprofessionals for audience attention and influence.

Third, professionalism, generally speaking, involves a form of hierarchy justified by professional conceptions of merit. Competition from nonprofessionals for audience attention tends to either flatten or challenge this hierarchy, both for good and for ill. As noted before, accreditation systems

are an important means of preserving and enforcing educational standards and thus educational hierarchies. Routing around and glomming on by nonprofessionals undermines these systems.

Fourth, given expanded audience participation, some professional educators and educational organizations will take on a different mix of tasks and functions. One example is more time spent on the curation of knowledge: assembling and organizing materials that others—both professionals and nonprofessionals—can use. Another is the creation and maintenance of platforms for creativity and participation by nonprofessionals. To be sure, professional educators have always performed these functions to some extent. Curating and organizing educational materials have always been parts of teachers' jobs, and good teachers attempt to create opportunities to encourage their students' participation and creativity. Digital education merely places new emphasis on these functions and makes them more important and salient.

Fifth, education and entertainment will tend to merge and become more like each other. There are several different reasons for this convergence: (1) the expanded use of multimedia and visual media, which work best when they are entertaining; (2) the expansion of audiences seeking education; (3) competition from nonprofessionals and for-profit organizations; (4) increasingly scarce audience attention; (5) the widespread diffusion of online gaming and role-playing technologies; and (6) long-term changes spawned by digital networks that tend to merge leisure activity and work. Successful educators have often been good rhetoricians and entertainers, but the merger of digital education and entertainment nevertheless challenges professional values because it changes expectations about how educators should present educational material to their audiences.

Sixth, increased competition will place pressure on professional norms. For-profit enterprises can offer cheaper education using a superbroadcast model, while nonprofessionals can reach (and influence) other people as easily if not more easily than educational professionals can. Indeed, not only must educational professionals compete with nonprofessionals and new online enterprises for audience attention, but the latter can also offer competing educational materials and instruction. Nonprofessionals can also use the wide range of freely available online content create their own versions of educational materials and compete with materials created by professional educators.

These aspects of digital education challenge the professional control—and limits to competition—that traditional educational institutions have enjoyed. Even more than journalism or the music industry, education relies

heavily on the authority of professional judgments and professional exper-
tise. The authority of professional educators has been premised on the idea
that educational professionals, because of their training and vocation, can
be trusted to produce knowledge and convey valuable and truthful infor-
mation. Digital networks put pressure on these assumptions and allow
more people to challenge professional educational hierarchies. Students
can seek nontraditional organizations for education. Nontraditional pro-
ducers of educational materials can compete with traditional textbook
companies, and with school boards' choice of educational materials. Threats
to professionalism, both real and perceived, will exacerbate political strug-
gles over the recognition and accreditation of online digital enterprises,
especially for-profit enterprises.

7.   Informal Education, Cultural Memory, and Archives

Digital networks also make increasingly salient informal aspects of educa-
tion that were always present before the development of the Internet. Pro-
fessional educators have never been the only source of education. Students
have always learned from their peers, relatives, friends, and co-workers. Stu-
dents and their teachers also influence and educate each other.

Moreover, education does not need to take place in traditional classroom
settings or in online universities. It does not need to seek the acquisition of
a degree or a professional credential. Instead, much education, perhaps
most, is informal. Throughout human history vast amounts of education
have occurred outside of schoolrooms and universities. Apprentices and
younger workers learn skills from their employers and senior employees.
Consumers share information about products and services. Individuals and
groups share information and skills over a wide range of practical, moral,
and social topics.

Social media make informal peer-to-peer and amateur-to-amateur educa-
tion increasingly salient. Using social media, everyone—and not merely
enrolled students—can share content and identify ideas, information, and
skills they believe are particularly relevant and valuable. Just as many
people increasingly get their news from Twitter and Facebook, they may get
information about every other aspect of their lives from digital platforms.
Once again, this is not a new phenomenon. Before digital networks, friends
and neighbors educated each other through gossip and ordinary con-
versations, recommended books and magazines, and offered advice. Digital
environments expand these opportunities, allowing new and different
groups of digital friends and neighbors to become a source of educational

information. And, just as in the predigital era, peers can also be sources of misinformation and miseducation, leading to predictable calls for renewed educational standards, oversight, and accreditation. Efforts at improving schools, however, will not prevent the emergence of these informal methods of education (and miseducation).

Digital environments increase opportunities for informal and peer-to-peer education for four reasons. First, they greatly lower costs. Anyone can put materials online (or link to materials) that might be educational to others. Second, digital technologies increase the number of daily encounters and acts of sharing information. Third, the Internet greatly increases the number of people that individuals can encounter, and thus can learn from. Freed from geographic limitations, and assisted by online platforms and search engines, individuals can learn from virtually anyone in the world with an Internet connection. People thus have access to all of the knowledge, opinion, gossip, and misinformation produced by individuals and groups with a wide range of different interests. Fourth, digital environments tend to mesh education with entertainment and community participation. Platforms like Facebook and Twitter combine social connection with information sharing; platforms like YouTube educate through entertainment.

Facebook, Twitter, and YouTube are examples of platforms that encourage lay expression, and thus enable amateur-to-amateur education. Once again, journalism offers a useful comparison. Compare a traditional twentieth-century newspaper like the *New York Times* with a search engine like Google or a social media platform like Facebook. The *New York Times* hires professionals to decide what content is worth covering and carefully edits it for presentation to its audiences; as its familiar slogan testifies, it offers professional judgments about "All the News That's Fit to Print." Google and Facebook make no such representations. They serve their audiences—now called end users—quite differently. Instead of carefully gathering and editing content, they rely on content from undifferentiated audiences, collate it, arrange it, and make it available to others.

Just as much education is informal, much educational material exists outside educational institutions. Education also occurs through encounters with institutions of social and cultural memory, such as libraries, museums, and archives. Some of these cultural institutions, to be sure, are associated with educational institutions, but many more are not. Just as digital networks challenge professional norms of education, they also challenge professional accumulation of and control over archives, and thus, control over cultural memory itself.

The Internet itself is the world's largest archive, meaning that it is also a crucial repository for social and cultural memory. The Internet greatly lowers the costs of preserving memory and cultural artifacts. It therefore creates new questions about cultural preservation, which are beyond the scope of this chapter. Two issues, however, are worth noting here.

First, on the Internet, cultural memory depends heavily on digital intermediaries—examples are search engines like Google or digital sharing platforms like Flickr, Instagram, and YouTube. Second, most of these platforms, unlike most museums and libraries, are not nonprofits subsidized by the government. Rather, they are part of privately owned, profit-making enterprises. The Internet Archive is the most obvious exception, but as a matter of practice, most people access for-profit platforms.

By itself, the fact of private ownership does not raise problems, as long as companies' business models continue to be premised on providing reliable access for the public. Google, for example, tries to design its search engine to give end users the quickest and most efficient access to what they are looking for. Nevertheless, the business models of for-profit enterprises can change over time. Moreover, history shows that most businesses eventually go bankrupt, are sold to other enterprises, or sell off valuable assets in order to raise capital. When cultural memory and access to information are privatized, they are subject to the same possibilities. If social media and search engines significantly change their business models to limit access, go bankrupt, or attempt to sell off their holdings, the question of ownership and control over archives becomes quite important.

Conclusion

In this chapter, we have noted the rise of new models of education, challenges to and changes in the nature of professionalism, competition between professional-to-student and amateur-to-amateur education, the flattening of professional hierarchies, the proliferation of informal education, and the blurring of boundaries between formal and informal education. Each of these examples points to a more general issue. Before the Internet, it was easier to talk unselfconsciously of an educational system and educational institutions that were more or less distinct from other systems in society. That is because formal education normally occurred in distinct physical spaces and was conducted by a self-policing and self-reproducing profession with distinctive norms and practices that justified its control and hierarchical ordering based on conceptions of professional standards and professional merit. Digital networks, however, put into

question the boundaries between the educational system and other aspects of the public sphere. This does not mean that professional educational standards will disappear, or that traditional grammar schools and universities will vanish overnight. Nevertheless, digital models of education will inevitably place strong market pressures on the traditional models; they will also encourage cost-cutting pressures from governments that traditionally fund education. Moreover, the boundaries between social practices that we call education and other social practices of knowledge production and communication will increasingly become blurred.

Once again, this does not mean that it becomes impossible to speak of a separate sphere of education; rather, it means that its boundaries will become increasingly permeable, and its end points uncertain. Digital networks merge the social practices of education into other forms of information and knowledge production and distribution, including journalism, political opinion, and entertainment. As these lines continue to blur, we will see ripple effects in professional norms, in the structure of educational institutions, in evolving business models for education, in the hiring and accreditation of educators, and in government regulation and funding of education.

Digital networks do more than alter the practices of educational institutions; they do more than put incumbent institutions into competition with for-profit online enterprises and informal peer-to-peer education; and they do more than blur the boundaries between education and entertainment. Digital networks disaggregate the practices of education into multiple tasks that might be performed by many different actors. They transform professional assumptions and ideals about knowledge production and acquisition, and they reintegrate education into the public sphere. Digital networks, in short, cause us to rethink what education is, how we perform it, who participates in it, and what we want from it.