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Excerpt

The New Technologies and the Future of Residential Undergraduate Education

by Gregory C. Farrington

Computers and inexpensive telecommunications have sparked a revolution in communications that is comparable to the impact of radio and television earlier in this century. The new information technologies make it possible to disseminate information faster than ever before, but their truly revolutionary aspect is that they allow each user to be a publisher of information as well as a consumer and to interact with vast numbers of people around the globe, simply, quickly, and inexpensively. With the Internet, commercial publishers are no longer the arbiters of what information is made available and by whom. It would be hard to find any industry whose vision of the future has not been changed radically by the dawn of the Internet Age.

Digital media are now challenging those most venerable information organizations -- colleges and universities -- to rethink the ways in which they serve society. Colleges and universities specialize in creating new knowledge, sifting and storing it, and then sharing it with the next generation. The new communications technologies offer higher education the opportunity to carry out its traditional missions with powerful new tools. Education has never been more important, and access to affordable higher education is increasingly a necessity rather than a privilege. The most imaginative colleges and universities will not hesitate to use the new technologies to make education more effective, more affordable, and more accessible as well.

Some of the most promising new applications of information technology are in programs of postgraduate education designed to provide lifelong learning for mature students. Digital media have liberated traditional educational institutions from the constraints of their real estate and now allow them to deliver courses and programs to new and often untraditional groups of students wherever they may be in the world. Many of the more innovative institutions are already exploring these new educational opportunities or, to use a very unacademic word that is destined to be heard more and more, their new markets.

What, then, in this new world of high-speed communication lines, compressed video, laptops, and distance education, is the future of the undergraduate experience, particularly residential undergraduate education? What of

the freshman year, all-night study sessions, cramming for finals, and calls home for money? What of the football team? Will the world of undergraduate education that most of us recall so fondly disappear, transformed into a virtual experience on a glowing screen?

One certainly hopes not, but surely the new technologies can be used to make residential undergraduate education more effective. Doing so will take a great deal of experimentation, the goal of which should be to improve what can be made better, leave alone what is working just fine, and have the good sense to know the difference. This chapter explores some of the opportunities digital technologies offer for improving residential undergraduate education and suggests, as well, aspects that would be better left alone. . . .

Learning Is Not Entertainment, and Education Is Not Baseball

In this dizzying rush into the future, it is important to keep in mind that the challenge for education in ten or twenty years will be the same as it is today: to educate real people, not computers, and to stimulate them to learn, not to entertain them. It is easy to be dizzied by techno-enthusiasm and imagine that computers will change people and how human minds learn. However, for a long time to come, learning will remain hard work, requiring not only information but also interaction, practice, and discipline. Yes, it is fun to frolic with the new media tools, but it's important to keep in mind that human heads are not filled with computer chips (not yet, at least). Learning is

not the same as downloading.

One often hears that the new tools of communication will make it possible for one master professor, presumably one sitting under a palm tree on a warm island in the Caribbean, to educate thousands of students at a time. The implication is that hundreds of faculty with lesser minds will be put out of work and replaced by a small international cadre of superstars. This vision is analogous to many of the changes that did, in fact, occur in sports when radio and then television made it possible for fans everywhere to follow only a few professional sports teams instead of cheering the hundreds and thousands of local teams whose playing was not quite so good. As a result, interest in local teams faded and was replaced by national professional sports mania. Recordings and radio had much the same effect on local orchestras.

But education is not baseball. Learning requires engagement and interaction. If one master teacher could replace dozens of local hitters, then videotapes would have put hundreds of faculty out of business long ago. Videotapes didn't because they do not provide any way for students to interact with one another and with the teacher. The big star on the tape does not hold office hours, grade homework assignments, give exams, and provide the discipline that forces students to convert information into learning. Armchair baseball fans do not need to learn to hit, but students do. Learning is not a spectator sport.

Nevertheless, the new media do present

provocative opportunities for improving education and possibly making it less expensive. To explore them, it is important to keep in mind that the way we teach today is neither the only nor the best way. New is not necessarily better, but neither is old. The current model of teaching at the college level is widely taken as the "right way" not because it is, but because it has worked for a long time and the forces for change have not been too great. Lectures and discussion, combined with practice in the form of homework, laboratory experiments, and similar exercises, all integrated by the discipline of a regular schedule, grading, and examinations, have been and still are a very effective method of educating large numbers of students at a reasonable cost.

Traditionally, teaching has been largely a cottage industry. Each faculty member has selected the information he or she plans to teach, produced it in the form needed for instruction (notes, overhead transparencies, homework problems), delivered it in person, devised all sorts of methods for encouraging students to engage and learn, and then assessed each student's performance. The process has involved far more than just the delivery of information, which is a relatively simple task and could well be replaced by a video clip. The expensive part has been the interaction, engagement, and assessment; one might say that what students pay for is not so much the batting theory but the practice time at bat.

With the new digital technologies, students no

longer need to sit in a classroom all together at the same time to access a professor's lecture. Similarly, the powerful visualization capabilities of computers can be used to present information in ways that are often more effective than print. Increasingly powerful software enables computers to interact with students more and more as humans do, to help them learn skills in subjects as diverse as foreign languages, mathematics, and music. Most importantly, the digital technologies connect students and faculty so that they can discuss and debate with one another without being present in the same place at the same time.

Certainly, student-teacher interaction via e-mail is different from in-person interaction. On the one hand, those who have experienced Web-based teaching will attest that in many instances e-mail interaction is more personal and intimate than live interaction. It gives the students and teacher more time for thoughtful reflection and can help lower the natural barriers that exist between expert and novice. On the other hand, e-mail interaction is slow; it is hard to imagine a Web-based discussion breaking into the lively and infectious debate possible in a live setting. Of course, for most students and faculty e-mail and Web interaction are simply one additional method of communicating and certainly not the only means by which they interact. Web-based discussion will most likely only increase the participant's interest in meeting and talking "for real."

In fact, it will take quite some time and a great

deal more research before the best uses of the new technologies in education are sorted out. What is clear, however, is that change will happen -- and at a rate not seen in education for a long time. In most colleges and universities, innovation has traditionally been a term associated with research and scholarship, not teaching methods. The new digital technologies now make bold and creative educational experimentation possible, and some colleges and universities will take advantage of the opportunities to innovate and become more attractive for students as a result.

Will the University of Phoenix Replace the Ivy League?

It is hard to find a college or university that does not have some faculty, generally the zealous pioneers, who are experimenting with the use of computers and the Internet in teaching. For the most part, their experiments are evolutionary in that they are using the new tools to teach the way they have always taught, just more efficiently and effectively. What they are doing is important but so far poses little threat to the football team.

However, truly bold and revolutionary experiments using telecommunications to create programs of distance education also are under way. The University of Phoenix is one of the most provocative. A private, for-profit corporation organized to serve working adults, the University of Phoenix takes a very student-oriented approach (they surely call it a customer-oriented approach). Phoenix holds

classes in the evening, at times and locations convenient for working students. Faculty primarily are practitioners who actually work during the day in the fields that they teach at night. Tenure does not exist, and faculty who do not teach well presumably do not teach for long. Today, most University of Phoenix classes are "real" in that they are based on real-time, synchronous classroom education at distributed sites in locations across the United States. However, it is clear that the University of Phoenix is shifting quickly to develop asynchronous distance education programs delivered via the Internet.

Many faculty and administrators at traditional colleges may be tempted to dismiss the University of Phoenix as being just one step from a mail-order degree mill and therefore not to be taken seriously, but to do so is risky. Certainly, a major challenge for organizations like the University of Phoenix is that of achieving a high quality of education for their students. The University of Phoenix states that it carries out a rigorous program of quality assessment, and it certainly is in their interest to do so. Some critics may assert that the interaction that occurs between teacher and student in a University of Phoenix-type context may in fact produce training, but surely not education. In fact, the process by which study leads to true education and not simply the learning of skills is elusive in any setting and very much influenced by the motivations of the student and teacher and the style of the program of learning. Assuming that a different medium of interaction necessarily dooms the

quality of learning to that of skill acquisition would seem to be a somewhat hasty response of the traditionalist to the new. Regardless, a key challenge for distance education, just as for traditional residential education, is to stimulate students to go beyond facts and skills and create in themselves the deeper intellectual structures that define, however imprecisely, the goal of a true education.

Despite these concerns, the University of Phoenix is proving to be quite popular. It claims to have more than forty thousand students enrolled, many of whom are earning accredited bachelor's degrees in fields such as business, nursing, and education, as well as MBA degrees. The credit-hour cost brings the total for an undergraduate degree to approximately $20,000, much lower than most residential institutions. In addition, the University of Phoenix students can earn while they learn: they do not spend four years away from real jobs while preparing to find one.

The University of Phoenix model is quite challenging, even threatening, to traditional institutions. The goal of the University of Phoenix is to deliver good-quality education to students who need it and are willing to pay for it, wherever they live or work and at a price they can afford. The University of Phoenix will ultimately succeed or fail based on its ability to do just that.

Granted, few would suggest that an MBA from the University of Phoenix will open the door to the executive suite as quickly as one from Wharton or Harvard will, and few would

imagine that the most capable and talented students will soon choose the University of Phoenix over more traditional programs. However, the University of Phoenix is still young, and the competition has just begun. Clearly, the University of Phoenix is going for the market in which it can succeed at this stage of its development. Competing with high-end programs aimed at the country's top students would be a bad business strategy, at least at the start; but what of the future? Might a University of Phoenix find a way to deliver a program of undergraduate education in, for example, business, mathematics, or engineering that is comparable to those available at the finest traditional universities?

If the University of Phoenix or an organization like it were to decide to compete for the top students, its first step would be to choose a degree with a high value. Then it would assemble the finest faculty, establish high standards for admissions, produce an exceptionally fine program, and deliver it to students wherever they live and work and charge them a fair price for it. It would be critical to ensure that the faculty, the students, and the educational program itself were truly outstanding by conventional measures. If these steps were followed and the program prospered, it would soon establish its own reputation for excellence. In fact, at least one major corporation has already begun exploring how to create an MBA program of this sort.

Among more traditional institutions, the Fuqua School of Business at Duke University appears to have taken steps in designing their new

Global Executive MBA program that is delivered via a combination of on-site and distance education techniques. Though some traditionalists may sniff that it is not the equivalent of a residential program, its success will ultimately be determined by the marketplace. If it is intellectually excellent, attracts outstanding students, and is perceived to be a good value for the price, then it is likely to succeed and, in doing so, challenge traditional programs that require students to live away from their homes and jobs for twelve to twenty-four months. Its success will be the direct result of harnessing the power of the new digital media technologies to deliver education and facilitate interaction among students and faculty who are widely separated in distance.

A half dozen or more initiatives like the University of Phoenix have already been started. One is the Western Governors University, in which several states in the western United States are cooperating in using the new digital technologies to bring undergraduate education to off-campus students throughout the region and beyond, again through the power of telecommunications. Others include University-On-Line (UOL), caliber Learning Systems, and Real Education. These are all for-profit corporations whose goal is to make money by delivering high-quality education to students who need it and are motivated to pursue and pay for it. In each of these cases, the main impact of the new digital and telecommunications technologies is to make

educational experimentationand innovation possible and therefore to make competition with traditional institutions inevitable.

One reason these new programs are promising is that their style tends to attract students who are highly motivated to learn. Presumably most of their students have full-time jobs, are paying for their own education, and thus are keenly aware of its cost both in terms of money and time. These students provide their own discipline to do the hard work that learning requires.

Can this approach work with the average eighteen-year-old undergraduate? So much depends on discipline and motivation. The years between the ages of about eighteen and twenty-five are a time in which young men and women sort out their options. Some do it in the Marines, many more do it in community colleges, and a few do it in the Ivy League; but whichever way they spend their time, it is the capstone of an extended adolescence. Not many first-year college students -- even the smartest and most capable ones -- are mature enough to succeed outside of a structured learning environment (particularly those from more affluent backgrounds). A large part of what traditional colleges and universities provide is the structure and discipline young college students need to thrive. So the University of Phoenix and similar organizations are unlikely to put the Ivy League out of business anytime soon. Most traditional undergraduates are simply not sufficiently self-directed to manage this kind of educational program.

However, the University of Phoenix may prove to be a very attractive alternative for students who would otherwise enroll in a local community college part-time while working to support themselves. Another important role for the University of Phoenix is in providing a second chance at a degree for students who have taken a bit more time to recognize the importance of earning one. Traditional four-year colleges and universities design their undergraduate programs almost exclusively for fresh high school graduates, not for returning adult students. Again, older students are largely served today by community colleges. One suspects that University-On-Line, the Western Governors University, and similar distance education undergraduate programs also will tend to attract students who are somewhat older than is traditional, students who have come to understand that education matters a great deal to their future and thus are highly motivated to study.

It seems likely, therefore, that the University of Phoenix and other programs like it will provide the stiffest competition to many of the community colleges and smaller private colleges that survive on tuition income from students of many ages. Some of these institutions, particularly those that are private, are financially fragile. One would hope that they recognize the growing competition and are working very hard to compete in such a way that their residential programs offer far more than can ever be delivered over a telecommunications line.

New Media and Traditional Education

Fortunately, many fresh high school graduates will still choose to invest in a traditional residential undergraduate experience and will be able to find the means to do so. For them, undergraduate life at a residential college is as much about learning to live as it is about learning from books. What is most impressive about the residential college experience is that it works so well and achieves both goals so effectively. Eighteen-year-old students nervously tiptoe onto campus at the start of their first year, and four years later they march out -- sometimes after a bit of prodding, to be sure, but generally with the motivation, education, and confidence needed to take on the world. The transformation is remarkable and is as much the product of the general intellectual and social experience on campus as the result of what goes on formally in the classroom. For these students, late-night discussions are much of what college is about, and the role of the football team is truly important. It is hard to imagine distance education, howevereffective, being an equivalent.

What, then, might be the reasons to use the new digital media in traditional residential undergraduate programs? There really are two: one is to make residential education better, and the other is to reduce its cost. Imagining ways to use the media to make residential education better is easy; making it less expensive will be more challenging.

Experiments in the use of the new technologies

in undergraduate education are going on in most institutions of higher education. A good example is the use of campus networks to broadcast course information, class notes, and homework assignments. Another is the growing use of chat groups to supplement in-class discussion. Still other uses exploit the powerful ability of multimedia to enhance learning.

At the University of Pennsylvania, where I was previously dean of the School of Engineering and Applied Science, such uses of multimedia and telecommunications are already common. In some departments it is hard to find a course that does not have a Web page, and increasingly the Net is being used as a medium for class discussion. For example, intense conversations about language and meaning go on at all hours in a listserv run by Professor Al Filreis of the English Department to support his class in poetry. He has found that students often will talk to a screen more candidly than to one another in class, particularly those students who have missed class. On a keyboard, the thoughtful have time to think and the shy have courage to speak, and the tedious can be deleted by the merciful stroke of a key or two.

The Web has liberated many faculty in Penn's History of Art Department from old-fashioned slide projectors. Their students can now access the rich collection of visual materials needed to study art by using the campus network, which makes a big difference the night before an exam.

Many other applications of the new media to

make education better can be conceived. Few of them are likely to make it significantly more efficient or less expensive. If anything, they increase the cost of running a campus, what with the demand for fast networks, wired dormitories, computers that regularly need fixing and upgrading, and a staff of highly paid professionals to keep all the technological systems humming.

Another characteristic of these first-generation experiments is that they are mostly variations on the traditional model of teaching, which assumes that faculty deliver information to students through the medium of the lecture and that students and faculty interact mostly in the formal classroom.

Of course, the traditional combination of lecture, recitation, and homework can be extraordinarily effective and efficient. Some universities -- very fine universities, in fact -- have lecture classes of five hundred to eight hundred students, each featuring a true faculty star. The lectures are then augmented by extensive recitation sessions handled by graduate students. The large lecture may not be a very personal experience, but it certainly can be powerful in the hands of a real master of both substance and technique. Certainly, from an educational standpoint, it would be more interesting to have the same lecturer stand in front of only fifty students and actually engage them in conversation and debate. However, an institution that chooses to offer a course with one star and five hundred to eight hundred students is making a decision that is both economical and intellectual. What is lost

in terms of the personal touch is, one hopes, gained by exposing a larger number of students to the exceptional professor. The total educational impact, as we all know, can be very effective, if the star is really a star, the recitation leaders know their stuff, and the students are smart. It is hard indeed to imagine doing better with multimedia.

However, not all faculty are stars, not all recitation leaders know their stuff, and not all students thrive in such big classes. In addition, relatively few subjects can attract five hundred to eight hundred students at one time.At many private institutions, classes tend to be relatively small, each enrolling between ten and forty students. In addition, the idea that "one size fits all" -- that is, that one method of instruction, the lecture-recitation model, is best for all subjects -- seems intuitively illogical. Yet few, if any, classes are ever designed by first posing the question of how students might best learn. It somehow is assumed that, whatever the topic, a professor should stand in front of a class and deliver information, students should feverishly take inaccurate and incomplete notes, and teaching should be done as it always has been done.

Some subjects invite far more radical experiments in learning using the new media. Beginning science and math are good examples. It takes an optimistic professor indeed to believe that first-year students learn much physics by sitting through a set of introductory physics lectures. In fact, most students actually learn beginning physics (and more advanced versions as well) when they sit

down and grapple with the course content, either in the form of a text or notes, and the problems that accompany it. The lecture may actually be mostly a waste of everyone's time, but it is a ritual that is followed out of habit (on the part of faculty) or out of fear of missing something that might be on the exam (on the part of students). Possibly a better approach might be to convert the entire course content in introductory physics into a Web-based format, in a Web site that includes text, illustrations, and even an audio lecture broken into five- to ten-minute segments. Students could then access the core information on their own schedule, repeating sections as much as they choose, and then devote classroom time to discussions of recent research results, problem sets, questions, and all the topics that only humans can address. In other words, use the Web to do what it can do well, which is to present information in a variety of formats twenty-four hours a day, and save live class time for the intellectual interactions that only humans can provide.

Professor Keith Ross of Penn's School of Engineering has already created a very interesting course designed around these principles. He produced a complete one-semester course that uses Internet-based instruction, appropriately on the topic of telecommunications and designed for upper-level undergraduates and master's students. His goal was to eliminate the classroom as the focus of teaching and to make it possible for a heterogeneous group of students, including some who live on campus and others who are

employed full-time, to participate on their own schedules, while maintaining a lively intellectual interaction between the students and the professor.

Professor Ross began by recording his regular class lectures, editing them, and rerecording them in more polished form. Each lecture was then divided into audio segments, each approximately ten minutes long, and then supplemented by appropriate simulations and illustrations. Each student accessed all of this material over the World Wide Web and could listen to the lecture clips and review the material as many times as he or she wished. The Web also served as a medium for discussion. The professor and students posted discussion topics and questions, and all participants joined in an asynchronous discussion of the class material. Papers and homework exercises were also dealt with over the Web.

This class was offered for the first time in complete form during the regular fall semester of 1997, and more than forty students chose it over a conventional live version presented at the same time. The class met once at the start of the semester and then twice more for final examinations. At the end, most students were quite enthusiastic about the experience, in particular about the freedom they had had to study on their own schedules and to interact closely with the professor, albeit online. In addition, there was no indication from student performance that the online students were at any intellectual disadvantage because of their nontraditional experience. The course is

unquestionably a provocative model for making education in appropriate subjects more effective.

What this approach did not do was to save the professor . the university, or the students any time or money. Professor Ross estimated that he spent about 50 percent more time than usual in teaching, mostly in direct interactions with the students through Web-based discussion. In fact, the course was more interactive and more personal than it would have been had it been presented traditionally, a point that is actually not so surprising, even if some find it counter-intuitive. It would be virtually impossible for one professor to deal with more than forty or fifty students in this way, simply because of the intensity of the discussions that go on. However, larger classes could be accommodated through the use of online teaching fellows or through more careful organization of the online discussion.

From a pedagogical standpoint, there are many advantages to this type of Web-based teaching. One is that a course can be improved steadily, screen by screen and lecture by lecture, and thus grow in effectiveness and quality each year in a way that simply does not happen in the traditional format. In addition, guest lecturers can be easily incorporated, so that a truly superb version of a course can be built up over several cycles and then still be available for students even if the originating professor goes on sabbatical or needs a break. Another key advantage is the high intensity of the student-student and student-professor interaction. This approach also lends itself quite

nicely to the sharing of a faculty member from one institution among several others -- certainly more easily than does the more sophisticated technology of live distance video production.

Perhaps the most successful use of this teaching style could be in a hybrid form, in which the Web is used to deliver fundamental information that would otherwise be the subject of a lecture and as a medium for extended discussion. Class time would not be eliminated but would be replaced by more informal meetings of a seminar type and devoted to more free-ranging discussion. As mentioned earlier, this model might be particularly appropriate for teaching introductory math and science courses to large numbers of students who may have quite different backgrounds. It would allow those with more experience to move ahead quickly and those who need more time to take it.

Another reason for exploring the use of the Web as a medium of instruction is the rapid growth of simulation software for education. Software for teaching foreign languages is just one example. These programs are already so sophisticated that it is hard to imagine learning a new language without one. They virtually compel the redesign of traditional foreign language instruction. This ability of the computer to interact with a user as if the computer were a real person makes it possible to develop increasingly powerful learning programs for many other subjects as well, including science, math, and medicine. It is inevitable that such programs will become

more and more sophisticated; the market is so large that the investment required to create them is justified. It remains for educators to determine how to use them in traditional programs of instruction.

The fact is that educators already have at their disposal a great variety of new software tools for teaching, and the number will only grow. Using them effectively requires fresh thinking. Truly improving education with the new media will require faculty to start with a blank page, to explore how best to teach each course, and to listen closely to students as they comment on whether it really works.

Taking advantage of the new media to improve education in this fundamental way is not a casual business. Exploiting the power of the World Wide Web in teaching is not necessarily simple or inexpensive. Faculty will need substantial help in terms of staff support and equipment. Most importantly, faculty will have to payfar more attention to innovation in teaching than has been common in the past, and administrations will have to reward them for it.

The overall goal should be to make residential undergraduate education more effective by using computers to do what they do best and freeing faculty to devote more time to students on an individual basis. The goal should be a more personal educational experience, not a dehumanized system of learning by machine. Ultimately it is human interaction, discussion, debate, experimentation, and inspiration that are truly worth four years of time and tuition.

If multimedia can be used to make undergraduate education more personally interactive and more effective, then faculty should lead the way in redesigning undergraduate programs to achieve these goals. . . .

Innovative Institutions Must Change

Arguably the most important consequence of the new digital media for higher education is that they make major innovations in education possible. In the past, traditional educational methods and institutions have had a monopoly on higher education. Even if the capstone intellectual and social experience provided by residential undergraduate education is indeed one of the finest preparations a student can receive for the rest of his or her life, it is clear that current models of that experience are expensive. High cost invites innovation and competition, and the new media provide tools that make both possible.

Of course, traditional faculty are generally very creative individuals. Campuses bubble with innovation, but its focus is more on scholarship than pedagogy. Outstanding faculty scholarship is essential for high-quality education, but so is faculty and administration commitment to innovation and excellence in teaching. Too often, faculty are paid for teaching but rewarded for scholarship. Their creative energy is therefore primarily focused on the latter. This asymmetry in creativity, in which the activities that pay the bills receive the least creative energy, should be brought into greater balance.

The new media invite a thoughtful rethinking of how students are taught, not simply a nudging and tweaking of the established curricula. The marketplace will help make this happen. Traditional institutions, driven to demonstrate that their educational programs are better than the competition's and enticed by the use of digital media to do so, are likely to invest more resources in pedagogical innovation than they have in the past.

Through all of these changes, residential undergraduate campuses will be challenged to truly be what they generally claim to be -- rich and lively intellectual communities in which students and faculty collaborate to discover, understand, and apply new knowledge. Scholarly and learning communities of this sort thrive on live, personal interaction. A network of high-speed telecommunications lines can never replace that interaction. Colleges and universities that understand that outstanding personal education is arguably their principal mission in society have little to fear from the Internet Age.

Will some institutions be at risk? Yes, particularly those that fail to understand that students will increasingly have alternatives and that the comfortable and rather monopolistic world that educational institutions have enjoyed for so long is shifting and changing. The market for education is large and growing. For-profit corporations will enter it aggressively and give traditional institutions real competition. Heightened competition will force educational institutions to be much more aware of the niche each fills or chooses to fill in the

educational marketplace. Strategic decisions that may have been made by default in the past will have to be made far more deliberately. It is likely that colleges and universities will become more differentiated and have more distinct strategic missions in terms of the type of students they work to attract, the programs they offer, and the role of research and scholarship in their academic life.

Although the directions that change will take are not so certain, it is clear that the coming several decades will be times of major innovation in education at all levels. Traditional institutions can be leaders or spectators. The smart ones will choose to be the former.

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