

A pedagogical and economic critique of student charges for Internet access

Duncan Greaves
Tertiary Education Network, South Africa

ABSTRACT

In this article I argue that charging students for Internet access is both destructive of fundamental objectives of the educational process and is unnecessary as a mechanism for solving the public goods problems that are typical of Internet provisioning.

Keywords: *Internet, students, universities, teaching, learning, public goods.*

INTRODUCTION

Consider:

- 1) "When I hear the word culture I want to reach for my revolver." This rather awful comment was made by Hermann Goering. Or was it? A quick Google search will show Goering as the originator. A more careful search will suggest Goebbels. But only a fairly exhaustive search will reveal that the source is in fact Hanns Johst, a leading playwright in the Nazi era.
- 2) In late 2000 a macabre web hoax suggested that kittens were being subjected to horrific mistreatment to shape their bodies, much as trees are shaped into bonsai. The "bonsai kitten" hoax was widely believed and provoked a storm of outrage, and the hoax is still occasionally seen circulating in email. The site (www.bonsaikitten.com) still exists, and a Google search for "bonsai kitten" still returns that site at the top of the list.
- 3) The word 'research' comes to us from the Old French *cercher* (to search), with the "re" denoting intensive force.

This article is about bandwidth, and in particular about why some ways of controlling its use militate catastrophically against objectives that universities regard as central to their mission. I do not dispute that control is necessary. The reader in an economically advanced context might find this last proposition surprising: why should there be control in the first place? The answer is that my primary interest is in addressing myself to low-bandwidth environments such as are typical throughout Africa and much of the developing world. It should be added that even in bandwidth-rich environments there is often the need to manage access: a recent *Chronicle of Higher Education* link (<http://chronicle.com/temp/rd.php?id=20050329d>) highlights this vividly. But the problem in the developing world is not just quantitatively but qualitatively different. The sheer scale of the difference in the cost of bandwidth between these two contexts is breathtaking. Probably the simplest way to illustrate it is by reference to a traffic graph (Figure 1), taken from a South African university:

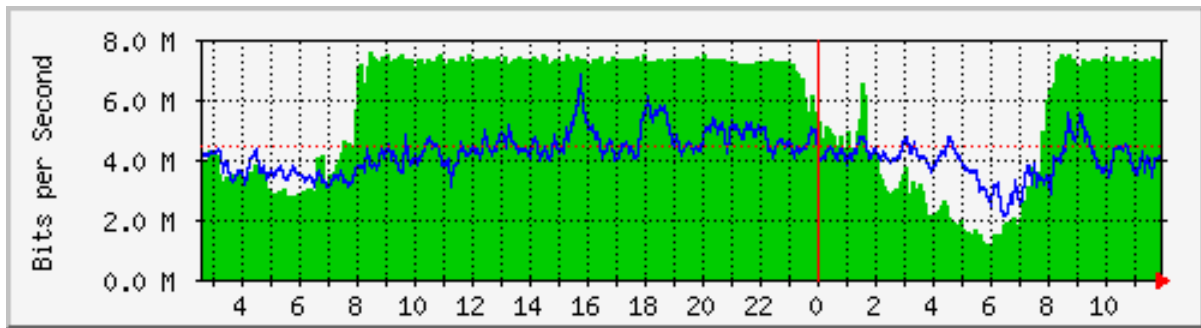


Figure 1: Internet traffic graph (Figure 1), taken from a South African university
Inbound traffic - green; Outbound - blue

This graph shows the volume of both inbound traffic (green) and outbound (blue). The capacity of the circuit is a little under 8 megabits per second, which is large by African standards. It services more than 5 000 client computers. The distinctive table-top effect on the inbound traffic denotes circuit saturation: far more packets are trying to enter this circuit than can be serviced. Some are discarded, causing broken TCP sessions, which typically means broken web browsing. The end-user experience in this environment is dreadful: pages present extremely slowly or not at all. Circuits of comparable size are often used to carry Internet access to the home in Europe and North America. They can be had for 40 pounds a month in the UK. A circuit of this size in many parts of Africa costs \$100 000 a month.

The appallingly high cost of bandwidth in many developing countries creates management imperatives that are quite foreign to bandwidth-rich environments. This article is about the range of possible responses to those imperatives and about the educational consequences of choices.

ARGUMENT

The microchip revolution has fundamentally and permanently altered the way in which information is produced and consumed. The consequences of this revolution are so pervasive that they amount to a societal revolution – a basic shift in the class composition of society and the manner in which surplus value is extracted and distributed. Universities have historically played a central role in sustaining class formations and in the maintenance and elaboration of the systems of knowledge that underpin economic activity. The information revolution has rendered this historical role much more ambiguous than in the past. Some have argued that universities are now basically irrelevant; others, that they have a continuing role to play, not in disseminating information but in navigating it. Everyone is agreed that universities are no longer the custodians of specialist knowledge in the way that they were a generation ago. I have argued elsewhere (Greaves 2002) in favour of the continued role of universities in the information age, and I will not replicate that argument here; suffice it to say that the information feast requires workers – who may even be ‘knowledge workers’ – who are skilled in locating, sifting, sorting, analysing and judging information, and that universities are better at imparting these skills than other institutions. If this is true, then it is not *obviously* true; and universities have had to work hard to defend their place in the new economy. They face numerous challenges: competition from non-traditional providers, declining state funding, demands for greater accountability, and public indifference to their plight, to name only a few. In short, money is short. Financial crisis has led higher education administrators into systematic reflection on the cost structure of their institutions, and it has commended to them the merits of shifting funding burdens, wherever possible, to the locus of consumption. The merits are (said to be) manifold: they reveal potential inefficiencies in the

system, expose those who consume disproportionate shares, compel greater self-funding, and dampen discretionary demand. They also distract researchers and educators from their mission and destabilise the delicate economies of cross-subsidisation on which universities are built, but those are separate issues. Suffice it to note that chargeback systems are, increasingly, a part of the administrative landscape of higher education.

What of the Web? Universities are under pressure to provide their students with Internet access. Students and parents expect it, academics demand it; it takes very little mental effort to see that a university which does not prepare its students to function in a web-centric world is failing badly in its duty to prepare the young for the world of work. But the Web is expensive. In the northern hemisphere the real cost is not bandwidth but personal computers and the associated staffing costs. In contexts where bandwidth is either scarce or delivered through an effective monopoly, the real cost is both machines and circuits. And the circuits can be very costly indeed: anything up to a hundred times more expensive than in bandwidth-rich environments. A university in such a context could easily spend 5% of its revenue on provisioning the campus with 5% of the bandwidth that a northern hemisphere counterpart enjoys. The bandwidth budget is thus highly visible, made more visible still by seemingly limitless demand. The consumption of bandwidth, moreover, is quite different from the way that other large expensive resources are consumed. How does one attribute per capita consumption of an item such as a building? Large, 'lumpy' or entirely indivisible goods are not easily brought into chargeback regimes. But bandwidth consumption can be attributed in a completely granular fashion – in principle, down to the level of quantities of both inbound and outbound datagrams per individual user. Is this not an ideal candidate for a chargeback regime?

If university administrators have an interest in charging for bandwidth, so does the Information Technology (IT) department – though not always for the same reasons. Cost recovery will indeed be an important objective for many IT directors, but an even more important objective is that of dampening discretionary demand. Bandwidth is, generally speaking, a public good in the strict technical sense, in that the individual can consume an arbitrarily large quantity of it, irrespective of how much they contribute to funding it. Public goods are notoriously overconsumed, for reasons that are well documented in the standard literature on the subject. In this context, the result tends to be circuit saturation. And throughput on a saturated circuit tends to be poor, because individual processes (whether they be Transmission Control Protocol (TCP) segment retransmissions, mail delivery retries, or repeatedly frustrated requests to servers for file downloads), are flooding an already overburdened circuit with spurious traffic. Worse still, this kind of problem is not corrected by the ordinary feedback loops that one might expect to cut in, because for some users even a saturated circuit presents useful possibilities – if they have the time on their hands and the right tools, neither precondition being entirely unknown in a university environment. For most members of the university community, this set of conditions is summed up as "the network is slow" or "the network is down" – and of course this message is transmitted constantly to the IT department, who see charging as an obvious means of reducing circuit load, and sometimes also of balancing their budgets. IT departments have another reason to be enthusiastic about charging: it deflects demands for the analysis of web usage. Vice-Chancellors, under pressure from frustrated academics, are given to asking difficult questions like "What are people actually doing on the Web?" That question is almost impossible to answer. Log files typically run to millions of lines a day, and at that level they defy analysis, except in the crudest possible terms. But this is not an easy fact to explain. Charging makes it all go away.

Administrators and IT departments, in short, tend to like charging. What of the academic community? There are really two separate constituencies here: academics themselves, and librarians and affiliated information professionals. I want to begin the next part of this argument with the latter group, by posing the question: Is the Web a library? Many IT practitioners would answer yes, on the grounds that it is a searchable collection of documents. Many library

professionals would answer no, on the grounds that it is not managed, defies cataloguing, is subject to acute volatility, and above all lacks the coherence that attends the notion of a 'collection' – a critical notion which carries the idea of human intention. A collection is selected and conserved and reflects an overarching intellectual purpose that is entirely absent in the Web as a collective entity. This last point is vital, because there is a tremendous difference in sending students to the library and sending them to the Web. In the library they can call upon trained experts whose sphere of specialisation spans the domains of traditional academic disciplines and information theory. They have an ordered and managed catalogue at their disposal; above all, they have access to collection of documents that was shaped and crafted over time and reflects the intellectual cast of mind of those who created it. Nothing like this is true of the Web at large, and those parts of it where there is organisation, management, and selection are invariably in the 'deep Web' – in databases that are less readily accessible and the volume of which massively exceeds the 'common Web'. Most of this 'deep Web' will not be transparently visible to the student embarking upon a Web search, and to the extent that it is, the skills required to manipulate it are closer to ordinary library skills than to a Google search. (For a fascinating conversation on whether the Web is a library see Lynch, Battin, Lucier, Mandel, Marcum and Webster 2000).

Many academic libraries charge their patrons. Membership fees, inter-library loan costs, specialist database charges and the like are all common. If libraries can charge, why not IT departments? The analogy seems straightforward to some. But it fails almost immediately it is examined, because the public goods problem faced by the library is quite unlike that faced by the IT department. The difference resides in the physical facticity of the library – one or more buildings with physical tables, chairs, terminals and documents. While the library's public goods can in principle be overconsumed, overconsumption is limited in practice by this physical facticity. By contrast, once there is sufficient hardware in place, the IT department's public goods are readily overconsumed. The library, moreover, distributes its goods in relatively lumpy form: typically, books or journals. If the Web-charging model were to be successfully applied to the library, then the patron would pay not only for each book borrowed or consulted, but each time a page is turned.

Sending students to the Web, in addition to the library, is something that academics increasingly do. Students will of course go there anyway: the wired generation, accustomed to fast digital access to all kinds of services, will take the Web as a point of departure. In the minds of some, the real victory would be to get them to go to the library as well. But there are more than negative reasons for wanting to direct students to the Web. The key issue here is the significance of information in the process of knowledge formation. The volume of available information is growing at a geometric rate – doubling somewhere between every nine months to every seven years, depending on what estimate you want to use. And what counts as 'information' is of course subject to contestation. If we distinguish variously between high-grade information, low-grade information, misinformation and disinformation (which can themselves be delivered in different grades), then the result is an information landscape that is simply bewildering. The skills and capacities requisite to navigate it successfully are not insignificant. They are the skills of analysis and judgement and the capacities of insight and argument. They matter in any context, but in this one more than any other, for without them the traveller in this landscape is hopelessly lost. As Newman puts it:

That only is true enlargement of mind which is the power of viewing many things at once as one whole, of referring them severally to their true place in the universal system, of understanding their respective values, and determining their mutual dependence. But the intellect, which has been disciplined to the perfection of its powers, which knows, and thinks while it knows, which has learned to leaven the dense mass of facts and events with the elastic force of reason, such an intellect cannot be partial, cannot be

exclusive, cannot be impetuous, cannot be at a loss, cannot but be patient, collected, and majestically calm, because it discerns the end in every beginning, the origin in every end, the law in every interruption, the limit in each delay; because it ever knows where it stands, and how its path lies from one point to another. (Cited in Greaves 2002, p. 2)

In other words, the foundations of understanding lie in the powers of abstraction, generalisation and analysis. Now, these are the things (among others) that universities set out to teach. In sending students to the Web, one hopes that they will come back with useful information, but also – and more importantly – with augmented powers of analysis. This is true of the library as well; but there is a key difference. The Web is a truly amazing source of information, and also misinformation, rumour, sloppy thinking and lies. The last four are certainly to be found in libraries as well, but in significantly smaller quantities – that, after all, is the whole point of engaging professional librarians in roles of custodianship.

We are now at the point where the argument knits together. Charging students for Internet access does several damaging things. First, it introduces artificial search costs into the process of information review. The student must evaluate, at every step, the value of information before having access to it. To be sure, this is a genuine skill – given that one cannot go down every road, the ability to judge which are likely to be valuable and which are not is very important. But that skill is built up from the experience of going down many roads, good and bad. Having to travel the bad roads is unpleasant enough; paying for the privilege means that less travel takes place, less experience is laid down, and less insight emerges. The student fails to acquire fully the habit of testing and retesting the value of information and the quality of argument; instead, he or she is more likely to be contented with a ‘first pass’ search. If there is a cost in clicking the ‘next’ button, it is more likely to go unclicked.

Two kinds of students will be undeterred by charging: first, those who have already acquired the habits of full and thorough searching and review, who understand the likely value of information that can be evolved from the Web; and second, those who are financially better off and who can readily afford to pay for Internet access. An immediate and deeply disturbing consequence of charging, therefore, is that it amplifies digital divides within the student body and augments the advantages of wealthy students while underscoring the disadvantages of the poor.

It will be readily objected that these remarks amount to a licence for abuse, and that a student body given unfettered access to a circuit of any size at all will readily fill it with music and video content. This is perfectly true. It does not follow from this, however, that the choice is between charging and unbridled abuse; there are alternatives, which I discuss below. What I want to draw attention to here is the intrinsically ludic nature of the Web. More than any other medium, it collapses the distinctions between ‘work’ and ‘play’. Its playful side is not an undesirable side-effect, but an intrinsic part of its very nature. Expecting students – or anybody else – not to use it for play, or to segregate their ‘playful’ activity from their ‘serious’ activity, is to miss the character of the medium. Play is in fact a very serious business, and educational psychologists have long drawn attention to the significance of play in learning. Viewed from this angle, the information landscape is an inviting rather than a forbidding space. There is a case to be made for inviting students to play within this space rather than forbidding them from doing so. And of course they will abuse it; breaking the rules is a part of the rules themselves. The philosophy that underlies charging assumes, at some level, that students are rational self-interested utility maximisers with transitively structured preferences and that they make choices all the time on this basis. But students are in fact not like that. (Probably nobody is actually like that, and the rational self-interested utility maximiser as a chimerical creature that exists nowhere outside classical economic theory – but that is a different story.) This is not to argue that students are *in statu pupillari* and universities *in loco parentis*; it is simply to suggest that the rich, complex and mad tapestry of the Web has to be engaged in all its forms, because it is only through an active and practical engagement that one learns its nature, understands its opportunities, becomes sensible of its threats, and acquires the ability to use it for one’s own purposes, whatever they might be.

Many will object that this vision is still too permissive, too tolerant of abuse, and that there is an urgent problem that needs to be solved: circuit congestion that makes the Internet unusable during the day and much of the night. This is indeed an urgent problem for many. But charging is too blunt an instrument, too destructive of academic purposes, to be a first resort. Long before it appears on the campus agenda, the following things need to be considered:

- 1) Does the institution have a clear vision of the importance of the Internet to its educational and research objectives? If the answer is no, it's probably spending too little on bandwidth in relation to the size of the user base.
- 2) Are there structures and channels to align what the IT department does with institutional vision, to ensure that they are active partners and enablers in realising the institutional mission rather than passive service providers?
- 3) Does the institution have a clear and appropriate policy framework governing the way that bandwidth can be used? If the answer is no then there are few mechanisms of control available apart from charging.
- 4) Does the institution have a budgetary framework that makes it possible to fund technology costs, including Internet access, as an ongoing operational cost? If the answer is no then there are too many incentives to use charging to solve a financial problem rather than a public goods problem.

Charging certainly solves the public goods problem, but at the cost of damage to educational objectives. Can the problem be solved in other, less damaging ways? I think it can, by the following means:

- 1) *Right-sizing the bandwidth:* Given a basic workstation count there has to be a commensurate level of supply. An easy thing to do is to benchmark against comparable institutions.
- 2) *Having appropriate policy frameworks:* As a general rule, 5% of the user community will account for 50% of the traffic. There have to be mechanisms to inform students that it is not acceptable to generate disproportionate demands for bandwidth by transferring music and video content.
- 3) *Capitalising on community mores and sensibility:* It's much easier to persuade people to refrain from abuse if they have a sense of being part of a community, an understanding of how their behaviour affects the rest of the community, and confidence that that understanding is shared (and acted upon) sufficiently widely for the community to manage its public goods problem. (Of course, in large institutions the notion of the 'community' is often weak or entirely absent.)
- 4) *Using technology smartly:* Traffic shaping, for example, can minimise the impact of file-sharing while also permitting it during off-peak hours. Delay pools can prevent individual users from consuming disproportionate amounts of bandwidth. (For a useful commentary on these and other options see Venter 2003).

CONCLUSION

The defenders of charging regimes commonly justify their standpoint by insisting that universities are businesses and need to apply business logic in order to survive. I readily agree that universities are indeed businesses, in the sense that they are enterprises with purpose. Those purposes remain what they have always been: to expand the store of human knowledge, to place their skills at the disposal of the wider community, and to train the minds of aspirants to knowledge. The information revolution does not fundamentally diminish the relevance of

universities and indeed enhances it, because the information landscape is effectively un-navigable without the skills in analysis and judgement that universities impart particularly well. Preparing students to survive in that landscape, and equipping them with skills in searching, sorting, ordering and analysing, means exposing them extensively to the Web in all its forms. Charging them for access to it impairs the learning process, and the public goods problem that gives rise to charging imperatives can be solved in ways that are not destructive of educational purposes.

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