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Escaping the TRIPs' Trap: The Political Economy of Free and Open Source Software in Africa

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Across sub-Saharan Africa, the promise of 'informational development' is proclaimed. The global governance of intellectual property rights (IPRs), however, currently structured through the Trade-Related Aspects of Intellectual Property Rights (TRIPs) agreement and overseen by the World Trade Organisation (WTO), makes much software expensive to deploy. There is an alternative: open-source and/or free software ameliorates many of the cost problems countries in Africa have anticipated as they have changed their laws to protect IPRs; using non-proprietary software will enable them to deploy extensive computerisation without making large payments to suppliers from the developed countries. By escaping the TRIPs' trap, many Africans will be better able to enjoy the potential benefits of 'informational development'.

Across the developing world, the promise of 'informational development' is proclaimed. Multilateral aid agencies fund programmes to ensure that developing countries are connected to the (globalising) information society. Computer software is expensive, however, because much of it is subject to intellectual property rights (IPRs). Fortunately, there is a cheaper alternative: the open-source software and/or free software movement is already growing fast in sub-Saharan Africa. This may allow 'transitional' members of the World Trade Organisation (WTO) to deploy powerful computing *and* to remain compliant with their international legal obligations as regards the protection of IPRs, by avoiding propietary software. This paper examines this strategy for 'informational development'.

The most obvious reason for Africans to consider the option of open-source software is cost: countries in sub-Saharan Africa currently pay around US$24 billion each year to (mainly US-based) software companies to secure the use of proprietary products (Free and Open Source Software for Africa [FOSSFA], 2004, p. 7). If dependence on these software products continues, and IPRs are increasingly protected and enforced through the Trade-Related Aspects of Intellectual Property Rights (TRIPs) agreement as part of the WTO's rules, then these transfers will likely rise rather than fall. This is not a technical problem, nor a question merely of adopting the 'right' laws; rather, the choice between proprietary software and free or open source software is a policy problem that requires urgent attention. In the next section, I set out the idea of informational

development and relate this to 'development' as more usually understood. I then briefly discuss the global governance structures relating to IPRs to establish the international context for policy choices in this issue area before I examine the development and deployment of free and open source software (FOSS) in sub-Saharan Africa. I conclude that this strategy is an important political response to the problems encountered by many African countries as regards the protection of IPRs in software; it is not merely a technical problem for computing specialists.

Informational Development and the 'Problem' of Costly Computers

Part of the common sense of internationalism is that enhanced global communications serve some wider (developmental) purpose. In 1980, the MacBride report, *Many Voices One World*, noted that

> communication functions are linked to all people's needs, both material and non-material. Man does not live by bread alone; the need for communication is evidence of an inner urge toward a life enriched by co-operation with others. People want to add aspirations towards human growth to the satisfaction of material needs. Self-reliance, cultural identity, freedom, independence, respect for human dignity, mutual aid, participation in the reshaping of the environment – these are some of the non-material aspirations which all seek through communication. But higher productivity, better crops, enhanced efficiency and competition, improved health, appropriate marketing conditions, proper use of irrigation facilities are also objectives – among many others – which cannot be achieved without adequate communication and the provisions of needed data (MacBride *et al.*, 1980, p. 15).

This summation of the benefits of communication for development has hardly been bettered since. Although the MacBride report was hardly uninterested in new technologies, in the subsequent 25 years the role of new information and communication technologies (ICTs) has moved centre stage.

Many multilateral institutions now stress that improved communications (using new ICTs and, specifically, the Internet) are a key aspect of development. The World Bank's 1998/99 Development Report, *Knowledge for Development*, laid great emphasis on the role of the Internet and linked digital technologies (World Bank, 1999), as did the United Nations Conference on Trade and Development (UNCTAD) report, *Knowledge Societies* (Mansell and Wehn, 1998), and the Group of 8 (G8)'s Digital Opportunities Task Force report (DOT Force, 2001). In one sense, we might say that *all* development is informationalised development: development is the application of (new) knowledge (and information) to existing or historical social, political and economic problems.

'Development' is usually understood as the move from a subsistence, traditional agriculturally based society, to a society where human endeavour is organised through scientific knowledge, and technology is deployed to enhance produc-

tivity, where the use of markets for economic organisation is expanded, and political organisation approaches a form of participatory democracy, supporting social welfare.[1] For each element, information flows are vital: the deployment of science builds on widened availability of knowledge resources, while the deployment of technology in production requires knowledge of, and information about, available techniques or new technologies; expanding market organisation depends on information about demand and supply of products and services (especially where markets are distant); moves towards democratic organisation are underpinned by communication between political groupings and governments, while welfare advances often stem from the state's deployment of science (in health systems, for instance). Thus, flows of information arguably support development, especially where 'development' includes not only economic growth or industrialisation, but also expanded human welfare. Heightened information flows may not be sufficient, but they are certainly a necessary element of any developmental strategy.

The link between development and the deployment of ICTs finds its roots in modernisation theory. While focused on economic effects (and often lapsing into a teleological assumption about the fruits of technical advances) (Pieterse, 2001, pp. 22–5), modernisation theory, nevertheless, remains a strong influence on the policy discourse around ICTs and their use in developing countries. Furthermore, while other technological advances have been often directly related to production and to trade in goods, using ICTs has at least the potential to support a more people-centred development practice based on empowerment and emancipation.[2] Although the move to non-proprietary software is to some extent a practice borrowed from already developed countries, groups like the FOSSFA have been working to establish a specifically African perspective on its use.

Indeed, while many development agencies seem unaware of the advantages of FOSS, and in some cases are privileging the products of western software companies, the developmental advantages are being stressed by sub-Saharan African user groups rather than merely being externally imposed (in direct contrast to some previous developmental strategies). In this sense, open source may partly reflect a post-development perspective that suggests economic and social change must flow from the communities themselves, not from some external source. This is not to say, however, that external agencies have played no role in the promotion of 'informational development' and in the exploration of alternatives to proprietary software products.

The *Knowledge for Development* report argues that new ICTs 'hold great potential for broadly disseminating knowledge at low cost, and for reducing knowledge gaps both within countries and between industrial and developing countries' (World Bank, 1999, p. 57). This has led the Internet to be identified as a crucial contemporary global public good that supports the dissemination of valuable knowledge and information for development (Adamson, 2002; Lessig, 2001; Spar, 1999). For Jerome Reichman,

> electronic publication via the Internet already allows even the latest-comers to access the most advanced thinking and methods in certain fields. These information networks thus become critical tools for breaking through the neo-mercantilistic fences that increasingly surround innovative products and processes in the technology-exporting countries (Reichman, 1997, p. 85 [footnote deleted]).

Although the 'sustainable development' community have been less enthused by ICTs' role in development, as Ruth Okediji notes, even here, there is a growing recognition that

> the ubiquitousness of information technologies provides a universal context to examine the backward looking question of how to rethink approaches to existing impediments to economic growth, and the forward looking question of how new technology can be deployed to generate new revenue streams and stimulate entrepreneurial activity in developing countries (Okediji, 2003, p. 49).

These themes are being taken forward through the World Summit on the Information Society process, which is establishing action plans for countries in Africa, and elsewhere to encourage their entry into the increasingly global 'information society'.

Responding to this developmental focus on ICTs, the G8 governments set up the DOT Force at their Okinawa meeting in July 2000 to examine the potential of ICTs and to explicitly address the emergence of the (so-called) 'digital divide'. Its report stressed that 'the basic right of access to knowledge and information is a prerequisite for modern human development' (DOT Force, 2001, p. 5). The report went on to argue that 'Creating digital opportunities is not something that happens *after* addressing the "core" developmental challenges; it is a key component of addressing those challenges in the 21st century' (p. 7). Although few would argue that ICTs and the information flows they facilitate are worthless, however, considerable differences about the appropriate weight that should be accorded to them within developmental programmes exist.

Following Amartya Sen's definition of 'development as freedom', where freedom is concerned with the processes of decision-making in social, economic and political realms (Sen, 1999), communication and access to information would seem to be central elements of development. Indeed, Sen argues at length that the developmental focus on growth of output needs to be allied to a clear concern for the manner in which political decisions are made and the scope of provision of information about such decision-making processes. Development is not merely a question of economic advance, but rather also encompasses informed democratic deliberation if it is to become more people-centred. However, only better, not merely more, information can contribute to the empowerment of individuals; here, the Internet's claimed ability to undermine state censorship is a key attribute. Existing power structures and other social limitations may restrict people's ability to intervene in political processes, but

supporters of the political promise of ICTs stress that the enhanced availability of a range of information over the Internet, at the very least, can contribute to heightened political awareness (May, 2002a, pp. 82–5). Moreover, new ICTs may allow local campaigners to establish contacts with international political groupings that can support their work and may provide them with avenues to publicise their concerns more widely. Thus, informationalised development does not necessarily entail the roll-out of the latest powerful computers; it may more importantly be interpreted as a call for the freedom to communicate and to be communicated with.

Unfortunately, and crucially for Internet connectivity, sub-Saharan Africa even now falls well below the one-telephone-per-household standard of service achieved in the developed countries. This technology gap has prompted Robert Wade to argue that the 'informational development' paradigm is just the latest in a long line of development strategies promoted by aid agencies, multilateral agencies and others (Wade, 2002). It fails to account for the socio-economic context in many countries, and as such may offer little to communities with serious and immediate welfare problems. Although the deployment of ICTs may have specific advantages in certain areas, this is different from the general panacea sometimes presented. Computerisation is seldom, if ever, the most pressing developmental priority: health, welfare and education are much more serious problems. Indeed, in many cases, failure to address these more basic issues undermines the potential of 'informational development' to achieve its purported aims (Alden, 2003). This is not to say that ICTs can play no role in reducing the gross inequalities within the global system, but 'informational development' cannot replace a concern for all other developmental goals or priorities.

Bill Gates has admitted that providing computers might not be the best way to improve living conditions. He asked:

> Do people have a clear view of what it means to live on a $1 a day? ... There's no electricity in that house. None ... The mothers are going to walk right up to that computer and say 'My children are dying, what can you do?' They're not going to sit there and browse eBay (quoted in Martinson, 2000).

Gates now concentrates his philanthropic giving on health care, pointing out that 'computers are amazing in what they can do, but they *have to be put into the perspective of human values*' (quoted in Helmore and McKie, 2000, emphasis added). Although criticised by other industry figures who maintain a transformative vision of the information society, Gates recognises that ICTs, which Microsoft has done much to promote, can only be regarded as *part* of the support for (human) development. Although ICTs may contribute to development as part of a wider package, calls for informational development that privilege expenditure on hardware and software may divert funds from more worthwhile programmes.

The central question, then, is whether expenditure on ICTs and the software to run them represent good value as regards development (understood as combining economic, political and human welfare issues). The provision of access to informational resources might merely enhance the ability of the already adept to take further advantage of these resources and, thus, might reinforce social inequalities. Certainly, this is a possibility and is part of a wider set of problems linked with education and literacy. Thus, it is crucial that the move to informational development is not seen merely as a technological strategy; it must encompass more basic local educational programmes. That said, the provision of access to the resources available on the Internet has some social value, as does the ability to store and process locally derived knowledge and information, alongside the facility to communicate easily beyond the immediate locale. If this investment is likely to crowd out other more immediately appropriate technological advances (for instance, upgrading farming equipment or the sinking of new fresh water wells), however, then other priorities will (and should) preclude major investments in ICTs. The question of balancing immediate needs with the potential advantages of enhanced informational flows might change though, if the cost profile of computer deployment was different. Here, the question of IPRs in software becomes a key consideration for assessing the prospects for informational development.

Computer Software and the Global Governance of Intellectual Property

As the call for the adoption of informational development strategies have focused on the deployment of ICTs (and therefore have emphasised software as a key developmental resource), it is important to appreciate the governance mechanisms for intellectual property that have shaped the global software market in recent years. Since 1995, IPRs have been subject to the TRIPs agreement overseen by the WTO. The agreement represents an undertaking by members of the WTO to uphold certain minimum standards of protection for IPRs and to provide legal mechanisms for their enforcement. Most importantly, the WTO's stringent dispute settlement mechanism encompasses international disputes about IPRs. Before 1995, long-standing multilateral treaties for the international recognition and protection of IPRs were overseen by the World Intellectual Property Organisation (WIPO). The governments of the US and various members of the European Union (EU), however, as well as many multinational corporations (MNCs) based in these countries, regarded these agreements as toothless in the face of 'piracy' and infringement. This prompted a number of MNCs to play a major role in the negotiations that resulted in the TRIPs agreement, drafting most of the document that became the broadly successful position advocated by the office of the US Trade Representative during the Uruguay Round (Sell, 2003, pp. 96–120). These companies therefore had a significant impact on the rights constituted by the TRIPs agreement.[3]

For developed countries, TRIPs compliance has involved some legislative reorientation and occasionally new laws (or judicial reinterpretations of existing laws); for many developing countries, often with little or no tradition of IPRs, the implementation of the agreement's requirements is considerably more difficult and expensive to achieve. In recognition of these difficulties, most developing country members of the WTO are currently covered by a transitional arrangement (recently extended to 2016 for pharmaceutical patents); many have received extensive technical support (under article 67 of the agreement) to enable them to build the legal capacity to establish TRIPs compliance when they emerge from this transitional period (May, 2004). This assistance aims to reproduce global 'best practice' in the legal framework that underpins IPRs and is intended to ensure that the models of IPR law favoured by the US and the EU are established in countries that have had different systems (or no systems) for the protection of IPRs in the past.

The TRIPs agreement builds on principles central to the WTO: national treatment, most-favoured-nation treatment (MFN) and reciprocity. Although reciprocity does little to change the intellectual property regime (because of a long history of bilateral arrangements), the introduction of MFN (under article 4 of TRIPs) has transformed the international governance of IPRs. MFN treatment ensures that any agreement in favour of a specific country must be extended to *all* other trading partners. Previously, under the auspices of WIPO, a diverse group of conventions with a different set of signatories shaped the international relations of intellectual property, alongside a complex pattern of bilateral treaties. Now, under TRIPs, and because of MFN, all undertakings apply to all members of the WTO. Furthermore, favouritism accorded domestic inventors or prospective owners of IPRs relative to non-nationals is halted; national treatment (article 3 of TRIPs) stipulates that foreign individuals and companies must be treated no worse than domestic companies. This is an important shift as many national IPR systems had previously favoured domestic 'owners' either through legislative or procedural means.

The TRIPs agreement is therefore significant in its international extension of the rights of the owners of intellectual property. This may not immediately benefit all WTO member countries as most are net importers of IPRs, producing large flows of fees to corporations based in the US, EU and Japan. In the past, net importers have frequently foregone protection for non-nationals' IPRs, facilitating free use (now often called 'piracy'), with US publishers' 'piracy' of foreign authors' works in the nineteenth century as an often-cited example. The TRIPs agreement halted this policy instrument despite its historic success for countries ranging from Britain and the US in the nineteenth century to the newly industrialised countries (South Korea, especially) in the second half of the twentieth century (Kumar, 2003). Few developing country members of the WTO, however, can withstand the political pressure deployed by the US and the EU at the WTO (and bilaterally), and

IPR systems across the world are converging on the TRIPs standard. While TRIPs is a complex and wide-ranging multilateral instrument, I shall only focus on computer software here, as this has a direct impact on 'informational development'.

When the TRIPs agreement was being negotiated, many of the issues central to the informational development agenda were relatively under-recognised by developing countries' trade negotiators. Despite calls for a 'new world information and communication order' in the 1980s, the full potential of the Internet had not yet been fully appreciated during the Uruguay Round. For many negotiating teams, this aspect of TRIPs was seen more as an item for cross-sectoral bargaining rather than as anything that would have an immediate impact on their developmental potential. Since the establishment of the WTO, however, with TRIPs as one of the key elements of the 'single undertaking' required by all members, software control through IPRs has become a much more evident concern for developing countries seeking to use new ICTs.

Like other elements of the TRIPs agreement, the spur towards a multilateral governance settlement for the protection of IPRs in software was initiated by US corporations. In 1980, the US Congress passed the Copyright Act that defined software programmes as literary works and brought them under the purview of copyright. Protection was extended to operating programmes, including their object and source code. This entrenched a view of software as an individualised creative process (amenable to commodification) and wilfully ignored the collective processes of software development that, until then, had been prevalent in the industry (Halbert, 1999, pp. 52–4). The difficulty of fitting software into traditional modes of copyright subsequently suggested to some companies that patent protection might better serve their needs. Thus, in the last decade, there has been a rise in attempts to secure patents for specific software tools. However, at the time of the Uruguay Round negotiations, the Japanese government managed to secure a limitation of the protection for software under TRIPs to copyright, with (software's) ideas, procedures or methods of operation and mathematical concepts excluded from the agreement (Sell, 2003, p. 114). Thus, the TRIPs agreement extended international copyright protection to cover software, as the US Congress had similarly extended the scope of US copyright 15 years earlier.

Under article 10.1 of the TRIPs agreement, 'Computer programmes, whether in source code or object code shall be protected as literary works under the Berne Convention (1971)'. The question of patents for software was left unsettled, although recent discussions at WIPO suggest that a future multilateral agreement extending the global protection of IPRs is likely to include patent protection for software. By protecting software under copyright, its form (as language) was given precedence over its use as tools. This allowed the longest protection period possible and did not require registration for protection. Conversely, the advantage of patents for software companies is that it is the func-

tion of the software that is protected, even if the actual code has been modified sufficiently to avoid copyright infringement. For the time being, however, although there may be industry pressures to recognise software patents in specific jurisdictions, this is not currently *required* by any countries' multilateral commitments.

Therefore, in the last decade, the international market for software has enjoyed the increasingly robust protection available through copyright, and as countries have become TRIPs compliant, so the ability of software companies to protect their IPRs internationally has been enhanced. This may not go as far as many would like, but, nevertheless, the market for software is one now largely patterned by IPRs. However, because 'informational development' has emphasised the rewards of using powerful ICTs driven by the latest software, the costs of deploying tools protected by IPRs has increasingly become politically contentious.

FOSS in Sub-Saharan Africa

Although the question of 'informational development' and IPRs in software certainly has a global significance, here I shall focus on sub-Saharan Africa as there has been significant recent interest in 'free software' or 'open source' software development in many African countries. For example, the FOSSFA project has been expanding its membership and international reach at a swift rate with the help of various aid agencies.[4] As Wade (2002) has noted, the key question for the uptake of any new technology is whether capacity exists to support its deployment. As one would expect, across sub-Saharan Africa, the ability to take advantage of any sort of computing is unevenly distributed (both on the basis of wealth and education). The continuing spread of community computing centres and access via mobile telephony, however, has ensured that while still very uneven, connectivity is no longer clustered completely in a few major urban centres. Nonetheless, even if new non-proprietary forms of software change the cost profile of access, they do not remove other wealth effects (linked to hardware, telephone connection charges and the cost of reliable electricity supply) or problems of literacy (as the Internet is essentially a text-based medium). Nevertheless, there has been widespread interest across the continent in an alternative to the current IPR-based modes of software use.

Despite the philosophical differences between free software (drawing its inspiration from Richard Stallman) and open source (typified by Linus Torvalds' LINUX operating system), like United Nations Educational, Scientific and Cultural Organization (UNESCO) and a number of non-government organizations (NGOs), many people in Africa use the combination phrase free and open source software, or FOSS, to encapsulate the distinctiveness of non-proprietary approaches to software development and deployment.[5] In the US, however, the free software movement proclaims that they are not the same thing.

For Richard Stallman, free software is not 'free' as in 'free beer', but rather 'free' as in 'free speech' (Himanen, 2001, p. 59).[6] The key issue is the liberty to access the source code of the software (its underlying architecture) with the associated freedom to copy, modify and distribute/share the software with others without the limitations that constrain such activities for proprietary software. Stallman sees the free software approach as a total philosophy, arguing that 'open source' is merely a practical solution to specific problems in software development. The free software movement aims to liberate all software and to undermine the proprietary model of ownership, but, Stallman argues, open source developers are merely carving out their own space and are happy to use proprietary programmes when it suits them.[7] The open source model focuses on the developmental community and is presented as a better way of organising the development and use of software. The free software approach is a politicised critique of software ownership based on its utility; software should not be owned because like language, it is foundational to the society that uses it. Despite these differences, the organisational logic of both approaches is remarkably similar.[8]

Note that neither approach is anticapitalist; rather, they are *differently* capitalist: the free software community sees the role of property and markets as being acceptable and even desirable outside the core realm of the software code, but not within it. For open source developers, property/market methods are acceptable if chosen by developers, but not when imposed from outside (by MNCs, for instance). The free software community emphasises the role of the heroic individual, while open source developers share the expectation of a spontaneous order at the heart of many theories of capitalism (Perkins, 1999, p. 84). Open source has fostered an extensive service industry in the US and in Europe, typified by Red Hat and others offering supported versions of the LINUX operating system (that itself is freely available to download, but without support) (Lendon, 2001, p. 194). While this may challenge Microsoft, it is hardly a manifestation of anticapitalism through the software medium, despite sometimes being presented as such.

The uptake of LINUX by some major industry players (IBM, HP and Sun) suggests that there is little in the character of open source software that precludes its incorporation into capitalist economic relations. Certainly, the central resource being deployed may not be subject to property rights; however, other resources (from computing time to hardware, from the supply of peripheral supplies to the wages of service staff) remain organised on the basis of the standard logic of exclusive property rights. Indeed, much about the FOSS business model is directly comparable to the 'giving away the razor to sell blades' strategy that has a long pedigree in contemporary capitalism (Isaac and Park, 2004, p. 404). Although the basic forms of FOSS are free, technical support and customisation (much of which is beyond even relatively adept users) remains a commercial proposition.

While here is not the place to conduct a detailed analysis of the character of capitalism as a socio-economic system, only the complete rejection of property

rights themselves could be said to challenge the overall 'logic' of capitalism. Rather, the FOSS movement's general focused critique of the reach of property rights into software is a reformist position that merely seeks to limit the scope of property as regards one specific resource. On the one hand, there may be anticapitalists working on FOSS, but nothing is *necessarily* anticapitalist in arguing that the scope of property rights should be constrained. Few supporters of capitalism would call for comprehensive commodification, and thus carving out an exception for software does not suggest all property is illegitimate or socially unjustified.

This non-proprietary model of software development is not a recent occurrence; rather, in the early years of computing, source code was shared, with development work collaborative and essentially unowned. After the US Department of Justice prosecuted IBM for antitrust violations in the 1970s, however, software and hardware provision was split, allowing a separate software industry to develop that sought to 'own' code so as to profit from it. As a response to the widening scope of this model of 'ownership', Stallman and others established the Free Software Foundation to support a new (positive and explicit) movement to keep software free from ownership.

Stallman, with some legal advice, then produced what he regards as his 'greatest hack'; the General Public License (GPL) sometimes referred to as 'copyleft'. The GPL permits the user to run, copy or modify the software programme's source code, and if they so wish, to distribute versions of the programme. This, however, does not allow them to add restrictions of their own. Often termed the 'viral clause' of the GPL, the licence compels programmes using aspects of GPL-licenced software to be fully compatible with the GPL themselves.[9] Crucially, the licence uses copyright law to ensure that it is both included in any derivative works and that the GPL itself remains unchanged. While this guarantees that the GPL-protected programmes are never commodified, it has also undermined the development of hybrid free/proprietary software tools. Although the GPL is one of the central and founding elements of both free software and open source, there is currently little case law to support the GPL, or other similar free licences, and their legal strength remains relatively untested.

The difference between free software and open source, therefore, is philosophical. This has been made much of by the free software followers of Richard Stallman, but, perhaps reflecting his accusation of pragmatism, is regarded as less important among open source developers. Indeed, Steven Weber's recent discussion of open source presents Stallman's political project as an inhibiting factor for free software, allowing open source to emerge as the dominant strand in non-proprietary software programming (Weber, 2004). These differences have been widely discussed in the US, but the key issue in sub-Saharan Africa has been *both* approaches' avoidance of proprietary, IPRs-based control and distribution of software. Thus, accepting that clear philosophical differences exist, I will nevertheless use the joint term FOSS in the following discussion to stress the centrality

of the non-proprietary issue for African programmers and groups interested in furthering informational development.

FOSS and Access to the Internet

The character of the Internet allows owners of operating systems, protected as proprietary software, to enjoy monopoly rents when these technologies become the standard interfaces used for connectivity. As the domination by Microsoft demonstrates, the considerable network effects of a communications infrastructure have allowed a near monopoly to be established in some software products. Across Africa, this problem has often been sidestepped by the pirated software widely available in urban centres, but such savings remain dwarfed by the vast financial transfers established by the current IPR system. As *The Economist* has noted, 'governments of poor countries are being asked to co-operate in a redistribution of global income that will cost them hundreds of millions of dollars' (*The Economist*, 2001). Although the gains and benefits Africans might expect from the global information society are in the future, the costs of protecting IPRs are immediate.

The trade in software in sub-Saharan Africa can be characterised as rent taking by companies that have already fully recovered their costs of development and have made significant profits in developed country markets. Under previous national legislation, high social costs (and the need to ensure wide social use) might have prompted the legitimate recourse to some form of fair use or fair dealing provisions, with copyright being ignored in specific circumstances that served a wider social good. However, not only have such strategies been severely constrained under TRIPs; the move to digital rights management limits this avenue of unauthorised distribution by technological means. Furthermore, when the source code of software is protected, reverse engineering of specific programmes for local modification is inhibited by TRIPs-compliant law. This further restrains development as reverse engineering in the past allowed local innovators to improve off-the-shelf technologies to reflect local conditions, and by doing so, to familiarise themselves with new technologies. Not only are the tools central to 'informational development' expensive; previous (now illegal) methods for taking advantage of them are being withdrawn under immense political pressure from the US and the EU.

However, unlike the developed countries where a vast base of Windows-installed machines (with billions of stored files) already exists, across sub-Saharan Africa, ICTs are only now starting to be deployed in growing numbers: for many users, the choice between FOSS and proprietary products remains unencumbered by issues of backward compatibility. To promote FOSS, UNESCO has an extensive web site which provides access to information about FOSS and to developer tools or software, and extensive background materials.[10] UNESCO's support for

FOSS recognises that its use can play a 'key role to extend and disseminate human knowledge'. Therefore, UNESCO has worked with the New Zealand *Digital Library Project* and *Human Info* from Antwerp to develop the Greenstone Digital Library software package that enables the development of open source digital libraries of scientific, educational and cultural resources predicated on open access and public domain information. UNESCO also supports the Regional Information Society Network for Africa (aiding the migration to low cost/FOSS hardware and software by public sector and civil society organisations), as well as a consortium of FOSS developers and users elsewhere.[11]

The Practical Advantages of FOSS

Before examining the political issues around the adoption of FOSS in Africa, it is as well to be clear about the practical advantages it offers. Three key reasons might benefit both the public sector and commercial operators from using FOSS: the total cost of ownership (TCO), the performance and flexibility for localisation, and the development of a knowledge base in programming and other skills. In each of these areas, the deployment of FOSS complements other advantages that might stem more generally from the deployment of ICTs across sub-Saharan Africa.

First, as Rishab Aiyer Ghosh (2003) notes, in developed countries, the costs of deployment not covered by the licence fee for software are a large proportion of the TCO. Where labour costs are high (as they are – relatively speaking – in developed countries), the labour-intensive components of the TCO, that is, those that stem from actual use, including user support and maintenance (everything apart from the actual licence, communication and hardware costs), far outweigh the costs of the software licence itself. Here, the saving that might be made from shifting from proprietary software to FOSS would be small (or given the costs of changing software platforms, perhaps even a positive cost). When labour costs are lower, however, this calculation looks somewhat different.

Using gross domestic product (GDP) per capita figures from the World Bank, Ghosh calculates the effective cost in dollars for software licences. He computes the GDP per capita (as a proxy for average incomes) and divides this by 12 to give a per capita GDP/month figure for various countries. This is then linked to the current price of licences for Microsoft XP. Thus, in the US, Microsoft XP costs around US$560 for a licence, about one fifth of the figure for per capita GDP per month; thus, the average US citizen needs to work about four days to buy a new copy of XP. As aggregate GDP per capita in Africa is much less, however, Africans need to work much longer to buy their copy. The average African, Ghosh calculates, would need to work over 10 months to buy a copy of XP. Comparing this figure with US GDP per capita and with the amount of work required by US purchasers produces a dollar equivalent for African licences of US$30,297.

Therefore, given respective levels of GDP per capita, Microsoft's XP is, on average, over 50 times more expensive in sub-Saharan Africa than it is in America (Ghosh, 2003). Even with steep discounting (say a two-thirds price reduction from US retail), it would still take the average African user three months earnings to purchase XP. Certainly, this hides considerable disparities: at the non-discounted price, a South African *only* needs to work around two and a half months for a copy of XP, whereas a computer user in Burundi would need to work over five years to buy one.[12] Thus, while FOSS may incur exactly the same (or even more) labour costs as proprietary software, the absence of licence costs makes a profound difference to the TCO where labour costs, income and purchasing power are considerably lower.

Second, because FOSS can be adapted without recourse to negotiations with the owner, and source code is immediately available for adaptation, it is much more flexible than proprietary products. Modifications to respond to specific local demands can be engineered into the software locally, with language-based localisation being one of the key strengths often emphasised by Africans (Bridges, 2004, pp. 8–10). For instance, the Open Source Software Translation Project in South Africa has produced Xhosa-language packages for LINUX, while local-language versions of Windows' products remain unavailable (Kshetri, 2004, p. 77). Furthermore, the deployment of FOSS frees programmers from dependency on foreign (often US-based) MNCs for technical support. Support can be localised and is not dependent on training (and authorisation) from foreign providers (or their agents). This also responds to a wider recognition that local communities need to 'own' their developmental strategies if they are to benefit from these economic changes.

Third, and linked to the previously mentioned reasons, FOSS also encourages the development of computer programming, maintenance and developmental skills within the local user community. While all software requires specific skills (which, of course, can be gained through accredited training), FOSS allows local engineers to develop skills related to their local needs. This can also allow a form of ongoing apprenticeship in programming communities, with more experienced programmers helping newer practitioners through email discussion lists and bulletin boards. As V. Vinay (of the Indian Institute of Science) puts it: 'Free software encourages ... learning to understand large complex programmes, without inducing any guilt of being a "pirate". Dexterity in creation and not in usage is crucial ... [or] else we will merely be followers' (quoted in Noronha, 1999). This can be seen as a form of technological transfer from organisations that have funded the initial acquisition of programming skills by individuals, who then spread those skills through the user community of any particular FOSS project.

These practical advantages are likely to benefit users in both the private and public sectors in sub-Saharan Africa. The development of co-operative developer communities has been one of the central strategies of FOSSFA and UNESCO, supporting the development of ICT-related skills and the development of a set of

localised technologies intended to underpin informational development. Already this is having an impact in local computer centres and on the proliferation of Internet access points (Chonia, 2003). Although the developmental impact of these moves towards 'connectivity' has yet to be assessed, even if 'informational development' exaggerates the benefits of the information society, there is still likely to be some positive effects. Although matters of software choice and ownership practices may seem largely technical issues, the deployment of FOSS is a political issue of some importance to many sub-Saharan African governments.

The Political Economy of FOSS in Africa

The clearest political advantage of FOSS for African countries is in the potential to establish independent national capacity in one of the key strategic technologies of today. Indeed, for some commentators, the adoption of FOSS (specifically LINUX) is a counter-hegemonic strategy against the domination of the Microsoft-based mode of informational development (for example, Sum, 2003). Late entrants face significant challenges, as they do in all industrial sectors, but FOSS offers a strategy for sidestepping the most significant monopoly in the sector, the domination of operating systems by Microsoft Windows. Certainly, the software industry remains remarkably concentrated, dominated by the developed countries' companies, but as the recent emergence of both Indian and Chinese software development sectors has amply demonstrated, this is not necessarily fixed.[13] Therefore, although one should not underestimate the locational path dependency in software development and deployment, Silicon Valley remains a major centre of software development; neither are the opportunities for breaking into these markets as narrow as Microsoft's domination of operating systems might suggest.

In the private sector, the deployment of FOSS allows local operators to develop significant cost advantages against foreign service providers, enhancing the possibility of developing a domestically based ICT sector. As Internet usage expands across the continent,[14] the promotion of FOSS could be used as an infant industry support strategy for ICT-related services. The danger is that this may also ghettoise African software companies, if export markets do not also shift significantly to FOSS programmes. In the US and in Europe, the adoption of non-proprietary software tools and programmes also seems to be spreading swiftly, but, as yet, has not impacted significantly on the home-user market. This is why both proprietary companies and FOSS developers are trying to capture the next generation of users, and as more users come online across the African continent, so their choices as regards the programmes they use will become crucial to African countries' domestic software sectors.

Governments suspicious of the involvement of US companies in public-sector procurement have begun to promote the use of LINUX and FOSS products to establish greater technological independence (Ashurst, 2004). Across the world,

many national and regional governments are at various stages of establishing a major role for FOSS in the public sector.[15] Policy makers have become concerned about ceding too much control over their central communicative functions to a single (foreign) ICT/software supplier. As Peruvian Congressman Edgar Villanueva stressed in a widely publicised exchange of letters with Microsoft Peru; 'to guarantee free access by citizens to public information, it is indispensable that the encoding and processing of data not be tied to any single provider ... the usability and maintenance of software should not depend on the goodwill of suppliers or on conditions imposed by them in a monopoly market' (quoted in UNCTAD, 2003, p. 111). This issue has been recognised in Europe as well; for example, the Munich city government recently moved over to FOSS, despite heavy lobbying, and offers of discounts from Microsoft (Azhar, 2004, p. 54).

Some African governments are less aware of the possibilities of local FOSS-based software development, however, and even if they are aware of the availability of locally produced solutions, they sometimes prefer to deploy 'name' software partly because of the perception of the dependability of established programmes, and partly following companies' heavy lobbying efforts (Bridges, 2004, pp. 6–7). Different interest groups may have very different priorities in this regard: users of government services will likely focus on cost, but also usability, while programmers and software companies will be concerned about the impact of government procurement on their business plans. Local agents for proprietary software (having already paid for their licences) will likely seek to ensure their products are used, while others will likely use FOSS to attempt to cut out companies that have links with proprietary-based companies. Thus, one of the key battlegrounds between the FOSS movement and the proprietary-based software sector is the provision of public-sector software packages and services.

The costs of switching, once expertise has been gained and files have been generated and archived, are very high and may deter even those who assume that FOSS programmes might be a better option for other reasons (Bärwolff, 2002). This has been compounded in the past by development agencies configuring tendering requests for aid project contracts around proprietary software. Thus, the ability to access sought-after funds and support has often required the adoption of specific software platforms for the convenience of the donor/supporting agency. Many NGOs and other agencies seem unaware, or do not give priority to, developments in computing and software, seeing their prime interests lying elsewhere. Equally, as developers in Africa admit, the FOSS community has been slow to bridge this gap, either by actually developing programmes responding to NGO needs or even by starting to investigate those needs (Bridges, 2004, pp. 10–12). As in many ways the underlying political perspectives of many NGOs fit quite snugly with the social developmental aims at the centre of the FOSS movement (Yee, 1999), there is at least significant potential for collaboration.

At the local level, FOSSFA and other groups have campaigned to limit the use of Microsoft products in African community computer centres, but Microsoft also recognises the need to establish usage patterns so that the network effects can 'lock-in' new users. As FOSS can be less user-friendly than proprietary software, often using typed 'command line' instructions, encouraging use of FOSS outside the specialist community of ICT-adepts is not easy. Thus, which software new users are initially introduced to is a crucial issue for the FOSS 'community' as much as it is for Microsoft. Backward compatibility certainly matters to many non-technical users, but the software chosen by central governments will also shape the choices at local computer centres and agencies. Hence, lobbying efforts have focused on the provision of entry-level computing for local computer centres alongside public procurement contracts, in a battle to shape Africans' first contacts with the information society.

Microsoft and other major suppliers also have been very active in supporting their products' position within informational development programmes. In January 2004, at the annual World Economic Forum, Microsoft announced a US$1 billion grant (cash and software) to fund a programme with the United Nations Development Programme (UNDP) to bring computers to local communities in developing countries (*Financial Times*, 2004). Microsoft has also signed agreements with the New Partnership for African Development and with the United Nations High Commissioner for Refugees. The involvement of Microsoft in these projects prompted a largely negative reaction from FOSSFA, with one discussion list correspondent suggesting that the UNDP was promoting 'technological slavery' through the use of Microsoft products rather than supporting the development of local programming skills.[16] However, even with steep discounting and free giveaways, the longer-term cost issue retains its political salience.

Reducing the costs to public-sector organisations of obtaining and using software frees up considerable resources for investment elsewhere. Within government, informational development may prompt efficiencies and costs savings, although this is often predicated on models of e-government that have promised more than they have yet delivered (Chadwick and May, 2003; Wade, 2002, pp. 446–7). More importantly, whatever the benefits of the deployment of ICTs, FOSS reduces the investment required for any specified deployment (where FOSS alternatives are available). Initial grants and free licences last only as long as the next upgrade, while the cost profile of FOSS remains low long after initial deployment. In government departments and across the public sector, the deployment of FOSS therefore allows either a more widespread roll-out of new ICT-related practices or reduces the budget share required for any specific projects, reducing the need to trade off informational development against other ongoing public-sector policies.

Despite these advantages, one of the key problems with any FOSS strategy for public and private sectors is the vicious circle of low penetration, too few users

with FOSS programmes and thus, less network gains to be had in relation to proprietary products often already running on donated machines. Thus, incompatibility remains a barrier to further deployment; this is especially the case where business partners (in trade and exports) use proprietary platforms, and expect their suppliers and contractors to do so as well (Kshetri, 2004, p. 78). The central issue is whether a critical mass of FOSS users that can act as an alternative gravitational pole for users about to enter the world of the internet will be established.

For African governments seeking to establish an informational development strategy, as part of a wider development policy agenda, two issues therefore stand out at the national level: first is the question of dependence on non-national companies and its political implications, especially when procurement decisions can help further develop an indigenous industry; second, even as the indigenous industry grows, it is not clear that all software enterprises will move to a FOSS model, and hence even supporting local industry may involve balancing contending industry interests. Weak governments may be captured by industry groups who will either steer procurement decisions towards proprietary software to lock out local FOSS-related competitors or establish FOSS platforms that may then potentially separate African countries from some aspects of the information economy. As elsewhere, sub-Saharan African governments are required to bet on which way software will develop in the next decade.

Although Windows is still used on around 50 percent of all servers worldwide, by mid-2001 (the last year for which reliable figures are available), GNU/LINUX (the key FOSS operating system) was approaching 30 percent market share, and with a couple of other FOSS programmes also with small shares, the overall FOSS market share was around a third of all servers. In Japan, over half of all corporations are using forms of FOSS, especially as regards small-scale projects. Looking to the future, a large number of surveys of expected ICT/software deployment identified a broad expectation that the software market will have a significant and growing element of FOSS software used across many private and public organisations.[17] If technical issues were the limit of the problem, then African governments could investigate the reports of reliability and flexibility of both sides and could make their decisions accordingly.

However, as countries across sub-Saharan Africa are required to become TRIPs-compliant when they seek to accede to the WTO, they will have to address the 'problem' of counterfeit software. This will make the advantages of FOSS more immediately apparent. Whereas currently, many countries' governments may look at propriety software as almost free because of widespread counterfeiting (Weerawarana and Weeratunga, 2004, p. 35), once IPRs in software are more stringently protected, then the cost of Microsoft and other products will rise to the relative cost levels noted by Ghosh. In this sense, the desire of proprietary software's IPR holders to ensure their rights are robust may be the mechanism that will lead to an expanding interest in FOSS. By reducing the possibility of

counterfeit copies, African governments will discover the real costs of informational development through proprietary software.

Using FOSS should enable African countries that are WTO members to continue to benefit from the deployment of ICTs, at the same time as they establish a more effective set of IPR-enforcement mechanisms. In this area at least, the problems of TRIPs compliance may be escaped, and indeed, documentation from UNDP stresses this aspect of FOSS as one of its main advantages. For FOSS to work as intended, the GPL needs copyright law to be enforced because otherwise, the open character of FOSS cannot be easily maintained. Recognising that FOSS's licence structure is supported by TRIPs-compliant IPRs legislation, FOSSFA supports the formalisation and clarification of IPRs legislation across sub-Saharan Africa. While this may put them at odds with other political campaigns, the promise of escaping TRIPs' effects on software deployment has driven FOSSFA's swift expansion from its origins at the ICT Policy and Civil Society workshop in Addis Ababa, Ethiopia in November 2002 (FOSSFA, 2004). Thus, FOSSFA is keen to see governments, donor agencies and the private sector in Africa adopt IPR laws *and* deploy FOSS products.

If the TRIPs agreement has often seemed a mechanism for consolidating developed countries' corporations' hold over high-technology markets exemplified by the financial transfers of the last decade, a developmental strategy that stresses FOSS programmes may be a more suitable strategy for countries that are technological 'followers'. This has the clear advantage of allowing countries in sub-Saharan Africa to fully comply with their multilateral obligations under TRIPs while also supporting the development of a potentially competitive industry in one of the key technologies of this new century. Thus, if African countries can enhance their software development communities and, specifically, the scope of FOSS-related skills in the labour force, then they will also have started to develop sales opportunities for customised software to these and other (potential) users (UNCTAD, 2003, p. 120). That non-US, non-EU software companies can become competitive globally has already been adequately demonstrated by the software sector based in Bangalore, India. Non-proprietary software may offer opportunities for Africans to develop an African (regional) software sector attuned to African problems.

Furthermore, given the current suspicion of proprietary software and the continuing problems Microsoft is encountering from viruses and security breaches, the demand for FOSS programmes seems likely to expand. This may produce new markets for software in developed countries for companies based in Africa offering FOSS-based programmes. If informational development is a plausible governmental strategy, then it is in the area of FOSS that some of the claimed advantages and possibilities of ICTs might relatively quickly come to fruition. Using FOSS could enable developing countries to establish new forms of valuable expertise and market opportunities, while at the same time freeing themselves (at least partly) from dependence on developed countries for ICT-

related manufacturing and services. Moreover, this can be achieved while complying with their multilateral commitments under the TRIPs agreement.

Conclusion

At the very least, the FOSS strategy encourages an explicit social embeddedness in local communities rather than an importation from societies where technologies have been developed with different problems in mind. This dovetails with the 'appropriate technology' and 'people-centred development' agendas that have become a significant element in recent development priorities.[18] The use of FOSS also lessens dependence on non-domestic suppliers and reduces financial transfers from sub-Saharan Africa to the US and EU. Although this may not transform state finances across the continent, a reduction in transfers must be welcome. Furthermore, supporting the development of a sector using FOSS may, depending on shifts in the global software market, allow African companies to develop more vibrant local software markets. Inasmuch as many problems are shared across the continent, local software markets may develop a more regional dimension.

African governments have a key role to play in these developments. The relative weight of public procurement in the ICT sector shapes the software deployed across society. Certainly, the proprietary companies realise this, as does FOSSFA and other groups campaigning for the take-up of non-proprietary solutions. The difficulty is that significant pressure is being brought to bear in favour of proprietary software, explicitly through lobbying and the provision of software without initial charge, and implicitly through tendering requirements and the network effects of continuing uptake of ICTs across the continent. States in sub-Saharan Africa will play a significant role in how the continent's software sector develops: the advantage of the FOSS solution is that it allows local development in a competitive market dominated by global companies at the same time that the multilateral requirements of TRIPs are acceded to.

Furthermore, if the move towards non-proprietary software continues in the US, EU and Japan, then it is also possible that African developers' experience will become a significant competitive advantage in global software trade. However, without this shift, unless the problem of inter-operability is addressed, then a clear danger is that while Africans may enjoy the benefits of increased informational development, there will be a largely impenetrable wall between the FOSS world and networks running proprietary software. Conversely, given the vast untapped potential of Africa and its relative disconnection from global markets, an intra-regional market based on FOSS nevertheless might have significant potential to invigorate 'informational development', especially as other developing countries (most importantly, China) are also seriously exploring FOSS programmes in public procurement.

While FOSS is hardly *the* answer, the difficulty of avoiding the demands of TRIPs compliance suggests a FOSS strategy may be the only viable policy that allows developing countries to maintain a measure of technological independence in ICTs. Although informational development needs to be set in the context of the wider political economy of development in sub-Saharan Africa, the deployment and development of FOSS offers an alternative that may appeal both to governments seeking to avoid overt dependence on foreign suppliers and to users seeking a set of software solutions tailored to their local needs. As FOSS can easily flourish in capitalistic organised societies (and indeed does in the US), no tension exists between this developmental strategy and multilateral development programmes. Nevertheless, significant interest-group pressure is being brought to bear on the procurement decisions of African governments and local organisations. While a combination of local software developer communities, NGOs and multilateral organisations (such as UNDP) can mobilise to resist such pressure, the network effects of the ever-expanding installed base of ICTs across the continent suggest that the window of opportunity for this alternative will not remain open indefinitely.

Appendix: Internet/ICT Usage in Africa 2001 and 2003

	Internet hosts	*Hosts per 10,000 population*	*Internet users (000s)*	*Users per 10,000 population*	*Total PCs (000)*	*PCs per 100 population*
2001	273,836	3.47	6,118.7	77.58	7,849	1.10
2003	348,699	4.22	12,122.6	147.93	10,305	1.38

Adapted from the International Telecommunication Union figures available at http://www.itu.int/ITU-D/ict/statistics/at_glance/Internet03.pdf; http://www.itu.int/ITU-D/ict/statistics/at_glance/Internet01.pdf (both accessed 13 September 2004)

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Notes

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1 The discourse of development itself is hardly unproblematic and often returns to older themes of improvement and the destruction of previous modes of practice. The attempt to construct an immanent approach to develop-

ment must always contend with the need to move beyond previously accepted practice. Thus, while there are many doctrines of development, as M. P. Cowen and R. W. Shenton argue, these, in one way or another, are always external (by virtue of their generality) to the community concerned (Cowen and Shenton, 1996, pp. 472–6). Informational development is no less problematic in this respect than any other developmental prescription.

2 See the Fancourt Commonwealth Declaration on Globalisation and People-Centred Development, available at http://www.dfait-maeci.ca/foreign_policy/commonwealth/fancourt-en.asp (accessed 8 June 2005).

3 Extended discussions of the negotiations that led to TRIPs can be found in Matthews (2002, pp. 29–45) and Stewart (1993, pp. 2245–333). Space precludes a detailed treatment of TRIPs, but surveys of the agreement can be found in Matthews (2002) and May (2000).

4 The project's web site can be found at http://www.fossfa.org.

5 For instance, see Barry and Dauphin (2003) and FOSSFA (2004).

6 Discussions of Richard Stallman's central role in the development of free software can be found in Brate (2002, pp. 240–68) and Moody (2001).

7 This depiction of Stallman's argument regarding the difference between free software and open source is based on his keynote presentation at *Idlelo 2004: First African Conference on the Digital Commons*, University of the Western Cape, Cape Town, South Africa, in January 2004.

8 Indeed, in a recent survey of developers in Asia and Europe, only around a third of respondents agreed with the proposition that the two approaches were 'not only a different way of thinking, [they] are a different way of living' (see Shimizu *et al.*, 2004).

9 The full text of the GPL is available from the Free Software Foundation, http://www.gnu.org/licenses/gpl.txt, and is reproduced in Annex 1 of UNCTAD (2003).

10 The portal can be found at http://www.unesco.org/webworld/portal_freesoft.

11 This paragraph summarises the overview of UNESCO's FOSS-related activities in Barry and Dauphin (2003).

12 Ghosh (2003) also provides figures for the EU (as well as accession and applicant countries), the Caribbean, Latin America, the Middle East, Asia and Oceania, alongside individual figures for 178 countries.

13 I have discussed the changing global division of labour in information work elsewhere (see May, 2002b).

14 See Appendix for figures on expanding Internet/ICT in Africa.

15 This includes Australia, Brazil, China, Denmark, India, Malaysia, Pakistan, Peru, Philippines, South Korea, South Africa, Spain, Sweden, Thailand and Vietnam. Links to various national reports and strategies can be accessed at http://www.unctad.org/ecommerce/ecommerce_en/freeopen_en.htm (accessed 13 February 2004) and from the 2003 E-commerce and Development Report (UNCTAD, 2003, pp. 118–9). Further research is included in Paul Dravis' report for the Information for Development Programme at the World Bank (Dravis, 2003, pp. 7–11) and Martin Bruggink's report on Open Source Software in Africa (Bruggink, 2003).

16 The remarks are by Edwin Okugbo, circulated on the Idlelo discussion list on 12 February 2004.

17 All these figures are drawn from David Wheeler's long research digest on FOSS 'numbers' (Wheeler, 2003, section two).

18 See for instance the work of the Intermediate Technology Development Group in the realm of ICTs, see http://www.itdg.org/?id=icts.

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