Re-pointing the IST Triangle.

Tom Kirkham[1], Kevin Donnely[2], Julian Gallop[3], James Kirkham[4], Thomas Varsamidis[1]
[1] *Bangor University, Informatics, Dean Street Bangor UK*
Email: t.d.kirkham@rl.ac.uk
[3] *http://www.kyfieithu.co.uk Email: Kevin@dotmon.com*
[3]*STFC RAL, eScience, Fermi Ave, Didcot, Oxon*
[4]*Derby University, Kedleston Road, Derby*

Abstract: Developing ICT in Africa should not follow in the footsteps of the developed world. Efforts to encourage Africa to do so will lock the content into another period of economic colonialization. Instead lessons from ICT development in the developed world should be applied to Africa through initiatives like IST Africa. However initiatives such as the IST programme needs to be readjusted to support Free and Open Source Software (FOSS) and open standards as the basis for education and business development. If this is achieved Africa can become a beacon for the future of computing and in turn develop and support some of the more advanced ICT economies. Using research and case studies from North Wales, Bangor University and beyond this paper presents justification as to why this approach must be adopted.

Keywords: Open Source, IST, eBusiness, development.

1. Introduction

It is widely recognized that without embracing information and communications technologies (ICT), the development gap between Africa and the rest of the world will continue to expand [1]. To address this there are many initiatives aimed at stimulating ICT development in Africa. The IST Africa and IST initiative in general is one of these and has a three pronged attack of business, government and academia; in this paper we redefine this model. In addition to the IST projects other projects range from locally sourced and funded whilst others originate and are funded outside the continent. The impact that these projects have on the economies and societies in which they are applied differ. Maximising the impact of ICT research and development projects on a region must be the key motivation and purpose of these projects. This paper argues this can be only achieved in Africa by leapfrogging proprietary software and encouraging the growth of FOSS.

The impact of ICT development projects can be measured in various ways, but the main criteria can be seen as number of jobs/businesses created and people skilled as a result of the project. Typical ICT projects in Africa involve initiatives to develop infrastructure and software in areas such as eGovernment[2]. The legacy of these projects in the short term for general industrial competitiveness may be encouraging. However in computing terms the percentage of African ownership of the infrastructure left behind paints a different picture. As following the footprints of the developed world would lead the African economy to the same destination, but no more efficiently and the discoveries along the way are limited to the original pioneer. Thus the implementation of these types of development initiatives often leave the African economy using hardware and software developed and maintained outside of the content. Thus the investment is really in Africa as a future revenue scheme rather than provider of its own services.

It would be better for Africa to learn from the developed world. In addition to the challenges faced in Africa, the digital divide still exists in certain socio economic demographics in the developed world. For example, in 15 "Western European" countries females, manual workers, elderly, and the less educated have less internet access than males, professionals, the young, and the well educated[3]. ICT adoption both in society and business is far from perfect. In terms of business ICT the larger better resourced businesses

tend to benefit from the ICT development pattern of the developed world often to the detriment of the smaller companies [4]. In North Wales compared to many other parts of the UK ICT development came later, many areas in North Wales are remote and have received faster speeds of internet late or not at all.

The region was and still is subject to investment to stimulate ICT growth and the development of a knowledge economy. However along side this to combat the disadvantage sporadic community organisations have evolved to support the development ICT in the region, and have formed a strong base in the area, fuelled by the Welsh Language and FOSS. Within these organisations in terms of software development, internet access and education the impact is significant. The many government grant based schemes to promote ICT in the area are yet to be fully assessed as they are long term. But the FOSS based community development has made real impacts in the short to medium term.

2. Objective

The key objective in this paper is to make the case that ICT in Africa must above all factors be focused on African ownership and localisation. This paper makes the case for the realisation of this ownership through the use of FOSS. In computing ownership does not necessarily take on the same legal terms as property rights etc, but extends to the knowledge over a piece of software and the freedom to customise and change it. In the developed world ICT development has split between the open and closed camps of software development. This presents Africans with a real opportunity to blaze a trail forward in terms of the continents ICT development and create FOSS based ICT economies and expertise. Bangor University through research outlined in this paper is aiming to partner African organisations to achieve this.

3. ICT Development

3.1– Open Source

Power control is a term given to the control of larger business influence particularly within eBusiness partnerships [5]. The phenomenon is emerging to challenge the perceived development of ICT in the developed world, as businesses in the developed world struggle to come to terms with the difficulties they face in trading with one and other due to the use of proprietary software. As an initial starting point it is a good example of why ICT development in Africa in the developing world should leap frog the proprietary ways of the developed world.

Intrinsically linked to globalisation and the automation of the global supply chain, smaller suppliers to larger corporations are often faced with huge ICT challenges outside of their resources and skills in order to maintain the larger partner's supply chain and keep their business. Within these scenarios the larger businesses are able to exert pressure for the smaller business to integrate using the ICT technology that they prefer. This presents the smaller businesses with the dilemma of losing business or investing in costly (and often proprietary) software that is only used to maintain a business partnership often to the detriment of their own internal workflow.

Therefore funding to aid the development of ICT in Africa to aid business integration on these terms can be seen as wasted money, leaving little or no technological footprint on the continent. However there is a way forward, the emergence of vast amount of open

standards around the area of web services has the potential to change this control, as justification to use proprietary standards for transfer and data expression becomes less easy. Furthermore the emergence of frameworks such as the Business Data Integration Framework for Small to Medium Enterprises (SME) a FOSS project to aid business integration will aid SME's to integrate using open standards. As a case study the BDIFS project at Bangor University illustrated both the need and potential for a FOSS based integration system for Small to Medium Enterprises using open web service based standards [6]. A gauge to the potential and the pressure that these standards are placing on proprietary vendors such as SAP has also seen them also adopt WS standards in their emerging Enterprise Software, thus making FOSS integration easier.

3.2 Localisation

Many larger businesses can be seen to show their commitment to Africa in the lack of localisation present in their products for the African market. Whilst many larger companies from the developed world have offices present in African countries many of them fail to localise their software to the language of the country they are present in. It also can be argued that many larger businesses engage in research into Africa to either receive tax benefits or in order to exploit other resources on offer, the slow diffusion of technology from abroad to Africa is a key issue in the poverty of the continent [7,8]. Therefore is it right to base a great deal of emphasis on ICT development initiatives in Africa on external proprietary software suppliers when so far foreign business has failed to share its innovations with Africa effectively.

Alternatively the FOSS movement is driven by user communities and development. The localisation of FOSS software is an easy process as the open source code is made available for customisation. Many examples exist where popular Open Source software has been changed by users to support specific localisation [9,10]. The provision of applications in local languages may be important in ensuring that ebusiness reaches all parts of the community. It is true that in many places in Africa English or French is a lingua franca, but it is still important to be able to access IT in local languages, from the point of view of culture, local-scale business, education, and language support. South Africa has a funded project to localise FOSS in its 11 official languages [9], and it is probably fair to say that it is easier and more cost-effective to do this in FOSS than in proprietary software.

A sign of the influence of this technique is often how proprietary vendors often follow suit in order to prevent possible losses of user community to the FOSS software [10]. Within North Wales the http://www.kyfieithu.co.uk/ group has constantly promoted and developed Welsh language software using the FOSS model. Arguments against FOSS are based around this customisation, but proprietary software has to be customised too and also siphons money out of economies in licensing costs.

3.3. Access

In terms of access to the emerging ICT infrastructure in North Wales community wireless networks are popular in remote areas. Central to these networks is the use of FOSS powered routing equipment that can be reconfigured and modified to support this usage. In Africa similar models exist and are central hubs for ICT development in terms of education and training as opposed to more standard implementations. These could be expanded to also support products such as Moodle[11], Joomla ([12] Open Journal Systems [13] Linux

Terminal Server Project [14]etc. Moreover, local power users may be able to create some elements themselves (eg for PHP webapps, or mashups using weather forecasts and Google maps), which in turn develops and strengthens the local IT capability - we then have a situation where IT solutions are being home-grown instead of being bought in from abroad.

In areas outside of these networks an emerging trend in Africa has been the adoption of the internet via mobile hand held devices which when coupled with other wireless usage as the type just mentioned could bypass the wired provision of a network. This use of wireless can be seen to have a direct impact on the way the Africans interface with computing devices and the internet. For instance a common developed world means of support is the sending out of old PCs, that may or may not be a good thing (hard to maintain, use a lot of energy, etc). Instead the growth of mobile devices is a sign that Africans can potentially be reached through handheld computers that can access usually the main network infrastructure through telecom network. Also the OLPC (aka $100 laptop) [15] may be a better bet here, or Asus's EEE [16] or Nokia's N810[17] that runs Linux. Either way this is an example of access via mobile devices being a seamless access to FOSS.

Overall in terms of access it is fair to say that Government based top-down initiatives can be useful in setting the environment, but they are expensive and take a long time to set up - and in IT that condemns them to obsolescence (for example as users move mobile, will they need the new wired infrastructures?). Community groups to provide access such like Aptivate [18], with initiatives like Enclusion [19] are demonstrating a more practical approach in Africa. For example Aptivate is using mobile phone connectivity to deliver the Internet to places in Kenya that didn't have Internet access. Such innovation could be backed up by African organisations such as Grameen[20] or Kiva [21] and the worldwide co-operative movement in infrastructure development. People already make good livings in Nigeria by hiring out their mobile phones so that people without them can make one-off calls.

4. Justification

The argument presented for African adoption of FOSS is based around the cornerstones of local collaboration around open standards, software and infrastructure. In implementing these solutions Africa is at a development advantage in that it has little legacy ICT infrastructure to build from and can therefore start to embrace open and emerging standards often from a clean starting point. The business computing infrastructure, office applications, operating systems and other business software is present in many freely available FOSS applications. A key issue in the restriction of the placed on the developing world by proprietary software is the challenge of the customisation of business computing infrastructures to adapt to new and emerging web service based distributed frameworks. A key part of which is the wrapping of legacy applications and data as standards based services. In Africa these standards can be adopted immediately.

As discussed due to the lack of physical infrastructure in Africa the means of access to computing lends itself to community based activity. This can be situated around existing centres of community such as village halls and schools as is the case in many parts of Wales. Using this model to work with the existing infrastructure instead of parachuting it in is a model that can fit well in distributing ICT aid within traditional aid distribution channels. The significance of this is the visualisation of a framework illustrated below.

5. Re-Pointing IST

When taking into account the ICT needs and ICT environment in Africa, initiatives like IST from Europe have to adapt when applied to Africa. Although the IST framework in the EU has pioneered research projects and stimulated ICT development in some sectors, the program is backed by the triangle of government, industry and academia. The projects have enhanced the EU economy by delivering in these three key areas. In Africa it is unlikely that the industrial power can be present on the content to represent such a model . Instead the model is likely to be applied in schemes such as IST-Africa by using EU companies to complete the triangle. This does little to encourage innovation in the regions business's despite increasing the skills in the regions workforce it is likely these skills will be linked to specific EU products. In fact for Africa the main benefits of the IST Africa program are listed as [22]:

- Training to reduce the Digital Divide

- Skills Transfer to support research capacity building & awareness

- Community building to support EU-African Research Cooperation

Noticeably there is no real mention of direct industrial benefit of the program in Africa. In the EU it is stated that the three main policy areas are Regulating Markets, Stimulating the IS, Exploiting the Benefits.
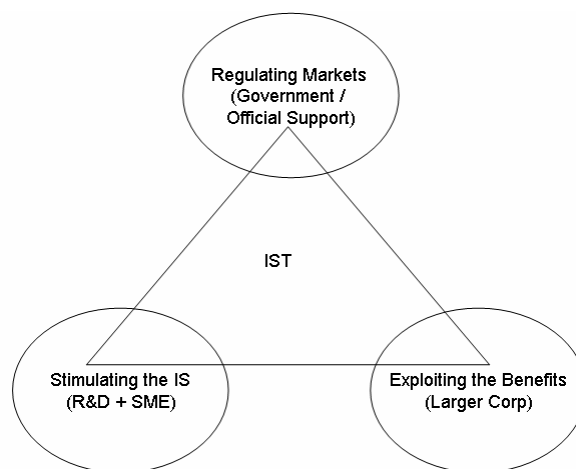
Figure 1: Typical IST Triangle

As discussed the exploitation in particular is made more possible in the EU by the existence of a more developed economy and established infrastructure of large businesses. As a solution to complete this triangle the industrial participants should be replaced by FOSS organisations. A focus on FOSS research and development in Africa could form a revolutionary approach to ICT that Africa could become the leader within.

5.1 The Bangor Model

The BDIFS project was the first project from the university aimed at stimulating ICT in the local North Wales economy using a supported FOSS approach. BDIFS addressed a specific issue facing small companies related to the management of data between different

customers. This management involved the transfer of data in an automated sense from the SMEs local legacy system to the enterprise system of the larger customer. Investigation by the university revealed that this integration was being done on an ad-hoc basis throughout the region's SMEs and often to the detriment of the SME's financial and personnel resources. For example EDI orders were often received then keyed into the local legacy system, or customers were given control of the SME's legacy system via a direct dial into the server.

To address these issues the Bangor Data Integration Grid model was formed to handle the translation and transfer of data from the SMEs to their partners. The SMEs were issued with clients that would interact with translation and transfer web services at the university. Integration was achieved locally by basic integration scripts to extract and upload new data into the specific legacy systems. This model has used the open web service standards and the resources of the university to present the community with a viable ICT resource.

In order to build upon this framework in Africa a similar FOSS based organisation can be applied, with local community organisations replacing the University in the model in the link to SMEs. Externally the FOSS tools, skills and training would come from more experienced organisations like Bangor University. Here the partnership would benefit both parties equally as the FOSS would be developed to a wider audience and have more developer time benefiting the European users. Whilst the African users would benefit from gaining skills in the FOSS and its use. The top of the model would involve some form of official support and guidance in order to establish the project in the target country and locality. The experiences of the project could also influence government policy and how they view future software investments.
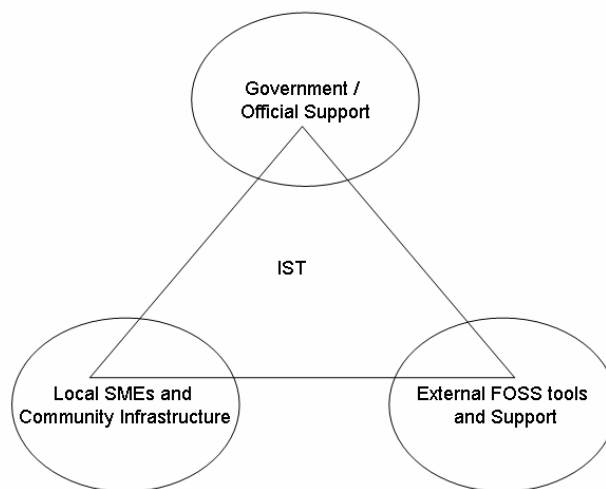
Figure 2: The re-pointed IST triangle

Therefore the re-pointed IST triangle in figure 2 builds on the experience of the BDIFS project in North Wales and analysis of the impact of ICT on emerging SME's in this economy. The adoption of the model depends on a catalyst to encourage government to make the bold decision to develop a FOSS model. As discussed this is no mean feat and many large multinational businesses have it in their interest to discourage such moves. However until this occurs it is unlikely the IST-Triangle, and the larger balance of power in the emerging knowledge economy will not be addressed.

6. Future

Increasingly skilled developing economies are attempting to break away from the current computing environments they are developing into. For example China is investing its own DVD format, thus breaking some of the developed worlds hold over standards [23]. Investment in Africa to invest in new and emerging open standards will help it do the same and stand upon its own feet. Examples exist where this is occurring for example in South Africa that has recently mandated Open Document Format as an official standard [24].

But adherence to open standards in regard to protocols etc is equally important. If a company or university adds some tweaks to an open standard which means that only their products will work with it, everyone suffers and the standard becomes fragmented. In turn, this may contribute to the IT market in African countries failing to reach a critical mass. Also the challenge to proprietary standards may bring the type of interest in African ICT development from the larger corporations that is now lacking in order offer incentives for government adoption of products such as Windows [25]. These challenges must be resisted and Africa would need to stand strong.

7. Summary

The continued shift to open standards and avoidance of proprietary software is key to Africans ICT development. It will prevent the industry of Africa becoming locked to developing world software vendors in terms of product development, licenses fees and also control of data.

In order to give Africa this chance of radical change and development initiatives such as IST should change their focus to suit African needs. The re-pointed IST triangle is a means to achieve this and will benefit both the local economy and the supporting EU partners. The testing so far has been done by the University of Wales Bangor in local projects within North Wales. This paper is aimed at raising this as a new approach, to provoke the conscience of any decision makers reading this who can aid this change, and to appeal and offer help as an organisation and set of researchers willing to help Africans in the development and promotion of FOSS skills and software.

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