

Bandwidth Management and Optimisation Strategic Planning Workshop

29-30 April 2008, Nairobi, Kenya

Outcomes and recommendations

Final report for circulation includes comments and review from workshop participants.

Document Notes

Author: Martin Belcher [mbelcher@inasp.info], Alan Jackson [alan@aptivate.org],
Liz Fearon [liz@aptivate.org]

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1. Executive summary

This document outlines the discussions and recommendations made during the recent "Bandwidth management and optimisation strategic planning workshop" that was held 29-30 April 2008, Nairobi, Kenya. The workshop was jointly organised by INASP, Aptivate and KENET. The key recommendations and outcomes from the workshop are:

1. Bandwidth management and optimisation is still a major issue for African universities. Capacity development in this area is required in order to allow the full potential of ICTs to be realised in terms of impact on and use in education, teaching and research. The current general situation of low capacity in this area is a major hindrance in the effective access and use of ICTs. It also has significant resource implications.
2. Bandwidth management and optimisation is an urgent requirement in all of the university sectors and countries represented at the workshop.
3. Capacity development activities that have been undertaken in this area by a range of organisations have had a positive impact but there is still an enormous demand and requirement for more capacity in this area.
4. Capacity development activities require the right enabling environment if they are to be effective.
5. (National) Research and education networks (NRENs or RENS) could be well placed, have the appropriate remit, stakeholder base and interest from which to effectively build capacity in bandwidth management and optimisation. However, many RENS are not in a position to immediately begin supplying services and supporting activities themselves and so would benefit from support in this regard. Strengthening RENS is therefore an important requirement in itself.

6. The key areas of capacity development to enable effective bandwidth management and optimisation are:
 - a. Strengthened policy and management environments at institutional and national levels.
 - b. Technical skills capacity building at all levels.
 - c. Improved ICT Leadership at institutional level.
 - d. Strengthened RENs and their services.
7. Strengthening policy and management environments at institutional and national levels is the critical issue on which successful bandwidth management and optimisation is based. Without changes in these areas, technical developments and effective and sustainable capacity enhancement in bandwidth management and optimisation is unlikely. Capacity development in this area is critical.
8. RENs need to act as key enablers and drivers of change in the areas of ICTs in general and bandwidth management and optimisation in particular. They should organise and undertake capacity development and training activities for their member's as part of their service delivery to members. Such services delivered in the early stages of an REN formation process may significantly strengthen the REN in terms of the value placed on it by member institutions. However, many of the emerging RENs do not have the organisational or human capacity to undertake such activities. Developing such capacity and then undertaking such activities are key priorities.
9. Advocacy and lobbying for ICTs in general and bandwidth management and optimisation in particular, should be undertaken at all levels where there is an opportunity to engage with senior institutional managers and policy makers. Advocacy and lobbying should be undertaken by RENs, the UbuntuNet Alliance, AAU, INASP and other interested parties. A number of forthcoming events should be actively targeted in this area and existing and emerging RENs should pursue these issues at national level when ever possible.
10. Adequate technical skills at institutional level remain a real challenge for practical bandwidth management and optimisation. Skills development and training activities should be undertaken in this area. Such activities should be led by RENs and based on determined training needs via consultation with individual institutions. Where ever possible technical trainers should be drawn from the relevant REN community or from neighbouring communities. Encouraging skills sharing, exchange programmes and locally facilitated training is important to help build the REN based communities, strengthen the REN and help base such activities on a locally resourced and sustainable footing. Engagement of external technical experts should also be considered where skills, resources and the reality of the situation demands it. The involvement of technical capacity development organisations such as AfNOG, Aptivate and others should be considered in such instances. Such organisations can be used to support and build local capacity.
11. Enhancement of various ICT management skills is an important pre- or co-requisite for technical skills capacity. Such enhancement can and should be undertaken using professional and management training organisations from within an REN's community. For example, this could mean engaging a business school in advocacy and lobbying skills development training for ICT managers within a particular REN. Engagement of such local capacity is important for building sustainable and appropriately tailored activities.
12. The experiences and resources used in capacity development and training activities in the areas of bandwidth management and optimisation should, where ever possible, be captured and shared amongst the community working in this area. Such resources will go on to build an important library of resources, case studies and experiences that can be shared amongst interested parties. If all content is made available with an open access license (e.g. a flavour of one of the Creative Commons licenses) then it will enable rapid sharing and adoption of approaches amongst members of this community. A number of options for such sharing mechanisms already exist and it may be useful for an organisation such as the UbuntuNet Alliance to play a role in facilitating access to these resources.

In many places these recommendations involve a significant input or role for RENs in the required capacity development. It should be recognised that most RENs in the region are not presently in a position to actually deliver in this regard. They do not generally have the capacity or resources to do this at present. Therefore strengthening the RENs will often be a prerequisite to enable them to lead or contribute to capacity development in these areas at the level that is required.

In addition, it should be recognised that bandwidth management and optimisation is only a part of ICT services provision. The strengthening of bandwidth management will be best delivered as a part of wider ICT services provision/network administration strengthening. A holistic approach to bandwidth management is required. This should sit within the wider ICT services and infrastructure management system. For bandwidth management to have maximum impact, it should be approached in view of these wider issues.

2. Background to the workshop

The workshop reported on here was a two-day participatory planning and review workshop involving selected professionals working in the areas of bandwidth management at African universities, Research and Education Network (REN) development and invited experts. The workshop had the following objectives:

- Establish a vision of sustainable bandwidth management and optimisation at institutional and research and educational network level
- Mapping of existing and past activities in this area
- Review of recommendations and lessons learning in bandwidth management capacity development activities to date
- Identification of “Critical Success Factors” necessary for future capacity enhancement activities in this area
- Develop a collaborative bandwidth management programme activity outline and proposal

2.1 Collaboration and participants

The workshop was jointly organised and hosted by INASP, Aptivate and KENET. It was facilitated by Aptivate and INASP. Participants in the workshop were invited based of their interest in the area of BMO, their professional experience and because they cover a range of the organisations that will be required to build sustainable capacities in this area. It is recognised that this group is not a completely representative selection of all possible stakeholders that could be involved. The group was kept small to allow for rapid discussion and planning. The final workshop participants were as follows:

Name	Email	Organisation	Country
Alan Jackson	alan@aptivate.org	Aptivate	UK
Boniface Mwirigi Kiula	bmkiula@aa.jkuat.ac.ke	Jomo Kenyatta Uni of Agriculture & Technology	Kenya
Antony Muyepa	muyepaa@medcol.mw	MAREN	Malawi
Apolo Kyeyune	akyeyune@dicts.mak.ac.ug	RENU	Uganda
D S Uwizeyemungu	damascene@kist.ac.rw	KIST / RwEdNet	Rwanda
Didier Nkurikiyimfura	dnkurikiyimfura@nur.ac.rw	NUR	Rwanda
Elija Tenai	tenai99@yahoo.com	University of Nairobi	Kenya
Geoff Hoy	ghoy@tenet.ac.za	TENET	South Africa
Godfred Oforisom	gofori@hotmail.com	AfNOG	Ghana
Jabiri Kuwe Bakari	jabiri.bakari@out.ac.tz	TERNET	Tanzania
Kevin Chege	kchege@kenet.or.ke	KENET	Kenya
Liz Fearon	liz@aptivate.org	Aptivate	UK
Martin Belcher	mbelcher@inasp.info	INASP	Sweden
Meoli Kashorda	mkashorda@kenet.or.ke	KENET	Kenya
Michuki Mwangi	michuki@swiftkenya.com	AfNOG	Kenya
Tusu Tsubira	fftusu@gmail.com	UbuntuNet Alliance	Uganda

3. Key issues identified

During the workshop, key issues, recommendations and areas for follow up action were identified. These centred around three key themes:

- Strengthened policy and management environments
- Technical skills capacity building

- Improved ICT Leadership at institutional level

Each of these themes is presented below in the following detail:

- Challenges: an outline of what the challenges are in each area.
- Questions: what the questions or capacities are that relate to the identified challenges.
- Recommendations/proposed responses: either recommendations on how to overcome the challenges identified or proposed responses in light of the challenges.
- Drivers/stakeholders: details of who should be driving responses to the identified challenges and any observations on key stakeholder issues.
- Actions for follow up or recommendations: where actions and follow up were identified as being possible by participants in the workshop, then details of actions and next steps were identified and allocated. Where possible these have been broken down to specific organisations, people and dates. In some cases this has not been possible, as the people identified as linked to an issue or action were not present and so it was not possible to allocate tasks or activities to them. Where that is the case, recommendations have been made with possible follow up actions identified.

4. Strengthened policy and management environments

Challenges associated with the policy and management environments were identified as being of critical importance in relation to the wider environment in which ICTs and BMO sit. This is important in an institutional, network (REN) and national context. Important changes to this wider environment are required to allow real progress in the effective management of ICTs, of which BMO is an important component.

4.1 Challenges

- Problems with institutional (university) structures that do not support effective ICT or BMO policy development.
- Lack of engagement of stakeholders (by the ICT managers) in the policy development process.
- Bureaucratic policy development and review process that takes too long to implement things for it to be effective. Lack of experience with this process by ICT managers means that the process can take even longer.
- Lack of clear institutional policy and strategic planning in general and a lack of general awareness of the importance of these issues, means that ICT policy development is often in a vacuum.
- Lack of understanding (at institutional and often ICT manager level) of an appropriate policy environment;
 - Of the need for policies (ICT policies but also policies in general);
 - Of the role of an appropriate policy development process.
- Lack of priority for ICT issues at institutional level to help drive BMO policy.
- Lack of skills at ICT manager level for building senior management understanding and support for ICT policy.
- Poor understanding from ICT managers (and other ICT professionals) of advocacy and lobbying and institutional impact of these activities.

4.2 Questions

To address these challenges five areas are outlined as requiring action. If these areas are addressed then it will be an important aspect of capacity development that will result in bottom up and top down support and drive for ICT and BMO policy development. It is important to build from both these directions.

- How to build lobbying and advocacy skills amongst ICT managers and other professionals?
- How to strengthen the management competencies of ICT managers?

- How to build understanding of the importance, role, function and characteristics of ICT policy amongst ICT managers?
- How to build support from institutional senior management for ICTs and supportive (BMO) policies?
- How to bring ICT managers into the institutional senior management structure and in particular the budget allocation process?

4.3 Recommendations/proposed responses

4.3.1 How to build lobbying and advocacy skills amongst ICT managers and other professionals?

Short course training in:

- Basic/appropriate communication skills focused on communicating ICT issues in effective ways to non-ICT people.
- Support on customising ICT communications (the message) to different groups.
- Building a (business) case and effective presentation of that case.
- Institutional “political”, communication and lobbying skills, in particular for working within the university environment/people/processes/centres of power/academic hierarchies/etc.
- How to build ownership of ICTs amongst senior institutional management

4.3.2 How to strengthen the characteristics and management competencies of ICT managers?

Short course training (courses tailored/offered for different needs) in¹:

- Executive development
- Project management
- Information resource management
- Integrated system management

4.3.3 How to build understanding of the importance, role, function and characteristics of ICT policy amongst ICT managers?

Short course training in:

- The importance of policy
- The policy development process
- Sample policy review
- Developing appropriate ICT policies (in particular strategic management of bandwidth, AUP and general BMO policies)

4.3.4 Training intervention format and structure

The format of the training should be short course/workshop in nature, with follow up support and mentoring from within the network or appropriate external local level groups. Case studies and real examples taken from within the REN community or neighbouring RENs should be included. All case studies and examples

¹ Many of the issues identified in this area are well covered in ITIL (IT Infrastructure Library – is an integrated, process based, comprehensive framework for IT Service Management which includes both Service Delivery and Service Support). ITIL training has been adopted by TENET to provide support and capacity development for TENET member institutions. See: <http://en.wikipedia.org/wiki/ITIL>

should be based on relevant and appropriate ICT issues that participants can take away and learn from. Case study authors will be from the relevant community and so they can also then form the basis of mentors and REN based experts.

Involvement of representatives from other RENs as observers or case study presenters should be considered where possible, to help build collaboration and experience sharing.

RENs should be enabling, administrating and delivering this training to their members. These activities are:

- High priority; they should be made available and undertaken as soon as it is possible, especially for RENs in early stages of development, as this is particularly important at that stage.
- Pre-requisite; the only pre-requisite is that RENs should have a formal structure in place already before offering this. This then becomes something that those RENs can offer to their members as an early value added service.
- Facilitated by; in-country capacity should be utilised to design and deliver this training e.g. management schools/faculty from REN member institutions, local consultants, etc. It is important that these facilitators are drawn from the national skills base so that the capacity in this area remains even after the completion of the event. It can then be repeated easily if/when needed. If capacity does not exist in country, then it should be from within the region e.g. drawn from another REN's member community.
- Cost sharing; participating institutions should meet some costs of having their people trained in this way. They must make some resource allocation to help reduce overall central costs and help ensure commitment from institutions and participants.
- Selection of participants; should be on a first come first served basis but sending institutions must be fostering an enabling environment that will allow training to be put into practice. This should be supported by applications from the individuals that include CV submission/application process.
- Institutional commitment; a very clear set of objectives and requirements of participation should be provided to the institution and committed to by that institution.
- Costs: resources should come from a mixture of sources – the institutions, REN and external sources. Resources being supplied by appropriate sources e.g. RENs, INASP, IDRC, etc. Need to secure resources from one of these sources to organise these activities. The mobilisation of REN resources is important in this regard.
- Responsibility; it is the responsibility of the RENs to take advantage of the opportunities that are available in this area.

4.4 Drivers / stakeholders

Who should be organising this and pushing for the delivery of such training activities?

- UbuntuNet Alliance – acting as champions – but using capacities of other organisations e.g. like TENET, INASP to apply and administer resources.
- RENs
- REN member institutions

4.5 Following up these actions and recommendations

Action	Who	When
Define training support offer for RENs in this area from resources currently available	INASP, TENET	1 June
Secure additional resources to supplement initial offer	All	TBC – ASAP
Identify or validate training requirements within REN member institutions	RENs	As appropriate within the REN
Develop training programme outline and identify training provider requirements	RENs	As appropriate within the REN

Engage suitable REN member institution (e.g. business school) to act as training provider	RENs	As appropriate within the REN
Secure training activities support from REN members and other national bodies	RENs	As appropriate within the REN
Apply for support/resources from various sources via funding/training activity application	RENs	As appropriate within the REN
Provide training support and resources in response to (appropriate) applications (allocation of resources on a competitive bases – details to be determined)	INASP, TENET, other (?)	As appropriate within the REN
Provide training in identified management skills to ICT managers from institutions	RENs	TBC – ASAP On demand
Assess outcomes of training (M+E) and share experiences with REN members and wider community	RENs, UbuntuNet Alliance	As appropriate within the REN
Document results of training activities, develop case studies and share with wider community	RENs, UbuntuNet Alliance, INASP	As appropriate within the REN

4.6 Questions continued

4.6.1 How to build support from senior management for ICTs and supportive (BMO) policies?

Advocacy and lobbying activities run and supported at two levels:

- AAU advocacy level
- National advocacy activities run and supported by RENs

Seminars and briefings from the AAU and RENs on these key issues to the senior management of institutions and those engaged with REN formulation. Illustrative case studies, drawn from the community or relevant external communities (other RENs) should be used and presented. These activities are not training as such, as that is inappropriate at this level. Rather they are more based on experience sharing. These activities should be complimentary to institutional policy development activities and where possible should be combined.

AAU to lead (ASAP) on this by including content in this area in the following events:

- Next general AAU assembly
- AAU Leadership courses
- COREVIP and other senior management meetings (at continental, regional and national level)
- Specific advocacy workshops run in this area

REN to lead (with support from other RENs) and focus support on:

- Seminars for REN institutional representatives, VCs/senior managers
- Specific lobbying events

4.6.2 How to bring ICT managers into the organisational senior management structure and in particular the budget allocation process?

This is an important objective of building support from senior management for ICTs and supportive (BMO) policies. It will also be supported by the strengthening of the ICT managers as outlined above. As such it can form a focus of activities in both those areas e.g. by including issues in this area in case studies and advocacy activities. This should focus on;

- Documenting and sharing examples of where ICTs have moved up the institutional hierarchy and what the positive results have been.

- Characteristics and results of this move.

RENs should identify successful examples of this and share those with their members and the wider REN community/the AAU. Support should be provided for formal publications / grey literature / informal publications to share such case studies and best practice. Existing documentation, reports and case studies should be reviewed and used where possible, as good examples in this area do exist already. AAU and RENs to lead on this as outlined above. This should also be supported and championed by the UbuntuNet Alliance.

4.6.3 Other considerations in the area of policy and management at institutional and national level:

- Consideration needs to be made of the wider policy (not just ICT) environment in place within institutions – is it sufficiently well developed? Often the answer is no.
- How best to engage relevant government departments/levels in these policy development issues and wider frameworks? They can be important agents of change and efforts should be made to engage them at AAU and REN levels.

4.7 Drivers / stakeholders

Who should be organising this and pushing the advocacy and lobbying activities?

- UbuntuNet Alliance – acting as champions – but using capacities of other organisations e.g. like TENET, INASP to apply and administer resources.
- AAU
- RENs
- Other interested parties

4.8 Following up these actions and recommendations

Action	Who	When
Capture Nairobi workshop in understandable form and circulate to workshop participants for comment	INASP, Aptivate	6 May
Comment and validate workshop report and recommendations	Nairobi workshop participants	16 May
Repackage summary details and recommendations of workshop for general distribution	UbuntuNet Alliance, INASP	26 May
Circulate report	UbuntuNet Alliance, INASP	27 May
Present recommendations and outcomes of workshop at AFREN Rabat meeting	INASP	31 May
Present elements of recommendations as advocacy and lobbying activities at, Open Access conference (Malawi)	UbuntuNet Alliance, INASP	November 2008
Present ideas and recommendations to AAU	UbuntuNet Alliance, INASP	31 May
Allocate resources to AAU or secure resources from AAU for advocacy activities at AAU events	UbuntuNet Alliance, INASP	30 June
Agree agenda items in this area for inclusion at AAU General Conference, Leadership seminars and at least one other event	UbuntuNet Alliance, INASP, AAU	30 June
Develop supporting materials and resources for use in above events	UbuntuNet Alliance, INASP, AAU	TBC

5. Technical skills capacity building

Capacity building in the technical implementation of BMO is still considered a key requirement. There are increasing numbers of skilled professionals working in this area but in many cases such people are limited to the larger and leading institutions in each country. This means that many smaller institutions are not able to apply the technical solutions of BMO that are required. Experience of technical training over the last few years has provided important learning and recommendations for future training activity design and implementation in this area. In particular, we have found that the policy and management environment in an institution is key to the success of any technical training.

5.1 Challenges

- The effectiveness of training is variable; some participants will benefit more than others.
- Technical capacity building and policy/management training benefit each other, but are often out of sync at institutions.
- Holistic approach to training and the challenge of management support.
- Training must be put into practice quickly. Many system administrators do not have the time or the mandate to practice and implement new skills.
- Institutions often have trouble recruiting and retaining skilled network administrators.
- Some younger RENs have little access to technical capacity themselves.
- There are not enough training opportunities to meet demand.
- Many smaller institutions do not build ICT training into their budgets.
- Building the local capacity to deliver the required training.

5.2 Question: What are the priorities for core technical competencies in BMO?

- The matrix below shows the core competencies in technical aspects of BMO. These competencies are an extension on those previously developed (INASP, 2005) and updated to reflect priorities and experiences within the community as of April 2008. BMO should be viewed as a part of the wider context of network and systems administration
- RENs could work closely with institutions, in particularly ICT Managers, to determine institutional (and by extension, REN) technical training needs.
- RENs can be more proactive in determining and providing technical training through conducting their own institutional traffic monitoring to identify target areas.
- RENs should work with AfNOG's assessment programme to help determine training requirements.
- Open Source tools training should be provided.

Technical core competencies² skills matrix

The core and contributing competencies are presented in the matrix below. The matrix, moving from left to right, broadly represents the order in which the core competencies should be addressed. However, it was recognized that the exact order could not really be ascertained for any individual institution until more was known about their current bandwidth usage and network traffic patterns. Therefore, the key core competency that needs to be addressed first is that of network traffic monitoring. It is only on the successful development of capacities in this area that institutions can move into other areas of BMO policy and action implementation. RENs could/should play an important role in helping institutions set up monitoring and analysis of their network traffic.

Assuming that the network traffic monitoring presents standard (or expected) patterns of usage, then the core competencies are represented in the approximate order and importance by moving left to right across the matrix. However, different institutions may have significantly different requirements depending on their actual usage, as shown by detailed network traffic monitoring. It should be remembered that some of the issues presented in a single cell below are not equal to others in the table – some could be covered in a short, day long training event. Others could take several weeks to cover.

Monitoring traffic	Network control	Mail service provision	Content caching and filtering	Authentication	Network traffic shaping	Scheduling downloads	Routing and network design	Other misc. issues
Defining network traffic monitoring needs	Firewalls as a means to control network access and usage	Understanding the advantages of mail front end	The importance of secure content caching and proxy services	The role of authentication in BMO	Network traffic shaping as a tool in BMO	Scheduling OS updates	Network design or re-design and its role in BMO	Monitoring and analysis of BMO policies and actions
Monitoring software selection	Selection and implementation of appropriate firewall solutions	Design of a mail front end	Prioritising key strategic users (e.g. library resources) by using caching and filtering	Directory services and authentication systems selection and implementation	Understanding the possibilities and options of network traffic shaping solutions	MS SUS server implementation	ASN numbers	Knowledge base development and sharing of BMO recommendations and experiences
Logging of network traffic	Virus control at network level	Central anti-virus, anti-SPAM and mail control	Proxy server authentication	Selection of appropriate network traffic shaping software	Set up and traffic routing for REN SUS server and mirrored resources	Managed switches	Project management for technical implementation projects	
Graphing of	Firewall based	Strategies for	REN level	Authentication	Commercial and	Institutional and	Peering at REN	Mobilising HR

² A core competency can be defined as "a knowledge, skill or attitude that contributes to successful completion of a task or job". Each core competencies may also have 'contributing competencies' i.e. the skills, knowledge or abilities needed to achieve the core competency.

network traffic	authentication (as a quick fix to authentication)	controlling SPAM in central mail services e.g. farside mail scrubbing	caching and cache peering	linking to acceptable use policy monitoring and enforcement	Open Source network traffic shaping solutions and their implications	REN level mirror servers for commonly used resources e.g. virus definitions, software downloads, educational resources, etc.	level	capacity to address BMO issues
Analysis of network traffic patterns		Selection of components for a secure bandwidth friendly front end mail			Resource allocation to support network traffic shaping		Hosting location and traffic routing of key network resources e.g. VLEs, digital library resources, etc.	Content design issues for low bandwidth environments of locally provided content e.g. learning resources, VLEs, etc.
Alerting and acting on traffic patterns e.g. other BMO technical interventions, external hosting, etc.		Implementation of secure bandwidth friendly front end mail services			Implementation of recommended network traffic shaping solutions		Incorporate power reliability issues into network design training	
Management reporting of traffic patterns and usage								

5.3 Recommendations / proposed responses

5.3.1 How to ensure that technical skills learnt in training will be adopted?

- Technical training provides the most benefit to institutions with good ICT management and policy in place. Training in both management/policy and technical areas should therefore be provided.
- RENs could determine the prerequisites for deriving benefit from training and demand these be in place. For example, RENs could demand that institutions have an Acceptable Use Policy and a BMO strategy in place before participating in REN training activities.
- Hands-on training is considered to be the most effective pedagogical approach.
- Skills and knowledge resulting from training must be practiced or implemented immediately, which requires management commitment for immediate use of skills. In situ, hands-on training on actual issues face by the institution and training on specific tools rather than generic training will be best placed to support this.

5.3.2 How to make training delivery sustainable?

- RENs could facilitate training as part of their services to members.
- International organisations have a role in providing training to RENs and institutions where the necessary technical trainers do not exist. The demand for training should still come from the REN and its members.
- RENs should draw on their member resources in providing training. This could mean using an institutional technical member of staff as a trainer, facilitating exchange programmes, 'matchmaking' between institutions where one is strong and one weak in a given area.
- Similarly, RENs should draw on each other to develop technical capacity across the regional network, which could be facilitated by the UbuntuNet Alliance.
- RENs should consider appropriate business models to support training.

5.3.3 How to hire and retain skilled technical staff?

- The quality of the working environment and culture is key to job satisfaction. This is largely derived from the ICT Management, the improvement of which is addressed in the 'Policy and Management' and the 'Leadership' sections of this document.
- Institutions can use computer science students to assist in managing the institutional network.
- In the long-term, BMO competencies should be integrated into the ICT curriculum.

5.4 Drivers / stakeholders

Who should be organising and pushing technical training activities?

- RENs in response to member's demands and requirements
- REN member institutions
- UbuntuNet Alliance – acting as champions
- International capacity building organisations such as Aptivate, AfNOG, NSRC, INASP, etc.
- Other interested parties

5.5 Actions for follow up or recommendations

Action	Who	When
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Collate materials for training and e-learning in BMO	RENs, UbuntuNet Alliance, INASP, Aptivate	TBD
Develop business models to provide training	RENs	As appropriate within the REN
Secure resources to provide training	RENs	As appropriate within the REN
Develop a programme to support less established RENs in providing training.	INASP, Aptivate, RENs	TBD

6. Improved ICT Leadership at institutional level

Related to the strengthened policy and management environments is improved ICT leadership at institutional level. The professional skills development of ICT managers will help contribute to this and in addition there should be some specific targeting of enhanced leadership amongst ICT managers and professionals. It was felt that many technical staff were being held back by ineffective management and poor leadership and that the development of a more enabling work environment would help to harness this untapped potential that exists amongst technical staff to actually implement BMO solutions.

6.1 Challenges

Within technical human capacity the following challenges exist:

- recruitment
- training
- retention and motivation

Motivating and retaining technical staff is a key challenge, exacerbated by most institutes paying below the market rate for these skills. It was agreed that staff retention and motivation depends upon:

- leadership
- (working) culture
- incentives

Financial reward is not the only motivator of technical staff. The working culture and non-financial incentives are important and can compensate for lower levels of pay. Of these factors, leadership is judged to be the most critical as it plays such an important role in determining the culture and incentives. Enabled technical capacity is dependent on good leadership being in place. Therefore to build technical capacity within institutions it is also necessary to build leadership capacity amongst ICT professionals.

6.2 Questions

A leadership development programme should address the following:

- How to identify or recruit technical leaders?
- How to implement leadership training?
- How to develop good working cultures?

6.3 Recommendations / proposed responses

6.3.1 How to identify or recruit technical leaders?

RENs may be well placed to provide support to institutions for leadership recruitment and identification. Job specifications and interview processes can be shared to enable institutions to develop their technical leadership capacity. RENs can help identify emerging technical leaders and promote them to institutions

- assist career development
- provide awards

6.3.2 How to implement leadership training?

A leadership training programme should include the following elements:

- leadership skills
- conflict resolution
- team building
- developing shared values
- management training
- developing inter-personal skills
- developing incentives

6.3.3 How to develop good working cultures?

Staff exchange programmes and visits can play an important role in building effective working cultures within institutions and ICT teams, by exposing staff at various levels to diversity in working cultures and examples of best practice. RENs can play a role in coordinating staff exchanges and by organisation best practice exhibitions.

RENs can also play an advocacy role by promoting proper ICT management structures within institutions (see “Strengthened policy and management environments” for details).

6.4 Drivers / stakeholders

Who should be organising this and pushing for the delivery of such training activities?

- RENs
- REN member institutions
- UbuntuNet Alliance

6.5 Following up these actions and recommendations

Action	Who	When
Develop leadership recruitment support	RENs	As appropriate within the REN
Develop a leadership training programme	Business schools, RENs, Institutions	As outlined above
Promote and facilitate staff exchange programmes and visits	RENs, Institutions	As appropriate within the REN

Incorporate project management skills into technical training	RENs, Institutions, INASP, Aptivate	As appropriate
Advocacy to institutions for proper ICT management structures	RENs, UbuntuNet Alliance	As appropriate within the REN
Organise best practice exhibitions	RENs	As appropriate within the REN

7. Further information

Martin Belcher, Head of ICT Training

International Network for the Availability of Scientific Publications (INASP)

60 St Aldates, Oxford OX1 1ST, UK

E-mail: mbelcher@inasp.info - Web site: <http://www.inasp.info/>

Tel: +44 (0)1865 249909

Fax: +44 (0)1865 251060

Alan Jackson, Chief Technology Officer and Liz Fearon, Programme Officer

Aptivate

Fenners, Gresham Road, Cambridge CB1 2ES, UK

Email: alan@aptivate.org , liz@aptivate.org - Website: <http://www.aptivate.org/>

Tel: +44 (0)1223 760887