The Case of NRENs in Central Asia

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Abstract

National Research and Education Network organizations (NRENs) provide advanced information and communication technology (ICT) services for the academic community of their country. Their focus is often on providing affordable high speed bandwidth amongst their members and to other research networks, but NRENs also provide other advanced services such as electronic repositories, educational environments and supercomputing facilities.

Higher Education and Research institutions have to play an active role in the transformation to the "Knowledge Society". A recent (2010) report of the International Telecommunication Union has identified NRENs as important vehicles in reaching the goals of the World Summit of the Information Society.

It is also demonstrated that the Central Asian countries score very low in the Networked Readiness Indices of the World Economic Forum, including areas where strong NRENs could improve the status quo. NRENs therefore have a role that is also important for the nation itself and therefore claims for government support are legitimate.

About 62% of the countries of the world already have an NREN and there are four characteristics that are common to these NRENs. In nearly all of the cases the NREN is a not-for-profit organization that not only serves the academic community, but is also owned by the same community.

Four out of five Central Asian countries have an active NREN and these NRENs all participate in the EC funded CAREN project that aims to set up a sustainable regional network for the academic communities in the participating countries. Today, the Central Asian Research and Education Network (CAREN) is upgrading the ancient Silk Road to a 21st-century high-speed internet highway for research and educational institutions through the region. Operational since July 2010, CAREN currently interconnects scientists and students from Kazakhstan, Kyrgyzstan, Tajikistan, and Turkmenistan.

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Perspective

Introduction

National Research and Education Network (NRENs) are organizations that provide a wide range of common and advanced information and communication technology (ICT) services for primarily the Higher Education and Research sector of a country. In Europe every country has its own NREN; however, the governance and funding models, organizational structure, types of member institutions, and services that are provided differ.

The Central Asian countries also have NRENs, but their role is not always recognized in the same context as their European peers: they are usually seen as

Internet Service Providers (ISPs) for a special user group (higher education and research). In most of the countries there is hardly any (financial) government support (Turkmenistan is the only exception) and the NRENs have to compete with commercial ISPs. In this article we will demonstrate that NRENs have a broader role than merely an ISP and advocate that government as well as the Higher Education and Research institutions should provide more support for the NREN of their country.

The Need for ICT in Higher Education and Research

Before understanding the need of NRENs is it important to emphasize the need of ICT in (Higher) Education and Research. The Central Asian countries, like many other countries in the world, are transforming into a "Knowledge Society". This process is part of achieving the goals of the World Summit of the Information Society (WSIS) that was initiated in 2003 in Geneva with a follow-up in 2005 in Tunis. In the WSIS context ICT is identified as a driving force in transforming to the Knowledge Society as is visualized in Figure 1: ICT drives educational reform that leads to innovation and then through the development of new services to the Knowledge Society.

Figure 1: ICT as Driving Force Towards the Knowledge Society

The WSIS goals themselves are part of a much broader initiative to reduce extreme poverty in the world: the United Nations Millennium Declaration that was adopted in September 2000. One of the targets of this declaration is "in cooperation with the private sector, make available the benefits of new technologies, especially information and communications". In 2010 the International Telecommunication Union (ITU) published a midterm review of the accomplishments towards reaching this specific target. In this review NRENs were identified as important vehicles in reaching four out of the ten WSIS goals, and it was

stressed that "… *governments must work with NRENs to ensure that they are fully embedded within the national innovation system and that they serve the needs of the local research community*." So if a country has underwritten the WSIS goals (and the Central Asian countries have done so) then it is only natural that they should take an active role in supporting the NREN.

The Central Asian countries have expressed the ambition to reach the Millennium Goals, but they still have a poor ranking among the 142 countries in the Networked Readiness Index of the World Economic Forum[1]. This readiness index is calculated from indices of various sub variables, of which some are listed in Table 1[2].

The overview in this table presents only a small subset of the indices that were used to determine the overall readiness and were chosen to demonstrate area's where higher education can contribute in improving the readiness of the Central Asian countries. For comparison the calculated indices of the countries of the Commonwealth of Independent States (CIS) are presented in the most right column.

Table 1: Networked Readiness Indices of the Central Asian Countries

Key variables are the poor penetration of Internet usage under the adult population and the poor business and innovation environment. These factors are of course beyond the direct influence of the HEI sector. However factors that drive these indicators, such as infrastructure and digital content, availability of the latest technology, and skills to make effective use of ICT are within the domain of the HEI sector and two of these indices for the Central Asian countries are nearly the lowest in the world. By joining forces in the area of ICT support the HEI sector can contribute to the WSIS goals of Central Asia as mentioned earlier. As said, an NREN is an important vehicle in this process, which

demonstrates why strong Central Asian NRENs are more than necessary.

Characteristics of NRENs

In 2010, 62% of the countries in the world had an NREN[3]. Although in most of these cases there is a strong collaboration with the government, NRENs themselves are usually separate entities with common characteristics. There are four common denominators of all NRENs:

1.   NRENs provide services for a closed user group.

    As said the primary user group is the Higher Education and Research sector, but there are variants that also provide services for secondary and sometimes even primary education. Also hospitals and libraries are members of an NREN in some countries. Most NRENs confine their members to public organizations (with the exception of private HE institutions).

2.   NRENs are not-for-profit organizations

    The mission of most NRENs is to provide (advanced) services at the lowest possible tariffs for their users. Any profits that might occur are funneled back to the members. NRENs should also be not-for loss, meaning that they will have to have a sound financial basis with sufficient funding for investments and operational expenses.

3.   NRENs provide at least national and international connectivity

    The core business, and most often the reason why NRENs are established, is to provide high speed communication services for their members. The NRENs operate a national network with international connectivity to other research and education networks and also to commodity Internet. The NRENs are never responsible for the ICT environment within the member institutions.

4.   Additional NREN services

    Besides connectivity NRENs provide other services for their user constituency, such as library services, electronic learning environments, ICT tools for research, hosting and housing for smaller institutions, security platforms and many other ICT related services. The common base for these services is that they make use of the national network that is being provided for by the NREN.

NRENs are most usually set up as separate organizations with a governance model that ensures that the member organizations have control of the activities of the NREN. In some countries (e.g. BELnet in Belgium) the NREN is part of government, but this model is very rare. For funding most NRENs are, in varying degrees, dependent of their government. The rationale behind this is that there is proof that NRENs are an asset for economic growth and prosperity of the country as a whole (as presented earlier). NRENs are the motor of innovation and they actively support the transfer of this innovation to society and industry. Most often the funding model is a mix of government funding and tariff-based funding from the members. The running costs of the NREN are funded by user tariffs and long term infrastructural investments and the development of advanced services are funded by government (or other donors). In some cases even industry participates in and co-funds NREN activities. Telecom operators for example collaborate with NRENs in developing new services that are not yet fit for market.

The organizational structure of the NREN is closely related to the strategic decision whether to setup an organization that actually runs the network and the services that are provided or to create an organization that is only responsible for the functional operation of

the network and services and subcontracts the actual operations to other companies or public organizations. In the first case a large organization might evolve that has the technical expertise at hand but will easily lose its flexibility to meet the rapidly changing demands from its users. On the other hand an organization that outsources most of the actual ICT operations needs a specific human capacity that is focused on contract management and this may lead to cost disadvantages. Of course a mixed strategy is also possible: if a service is available, at a reasonable tariff, in the market then outsource it, otherwise develop and deploy the service within the NREN.

With regard to the services that are provided there is a (healthy) tension between user demands and technology push. The, often short term, user demands are mostly directed towards cheap tariffs for national and international connectivity. Long-term validity of having an NREN is however more directed towards providing advanced services that have their impact on society, either in terms of the valorization of innovation or in terms of closing the digital gap. The NREN management will have to provide a balance in this tension[4].

In relation to the services that are being provided by an NREN it should be emphasized that in first instance the NREN provides a national network for science and education. Internet connectivity is just one of the services that are available on this network. This clear distinction between infrastructure (the national network) and the services (including Internet) is an important characteristic of the business model of the NREN.

The Central Asian NRENs

The Central Asian NRENs have a long history: in 2001 they were established as part of the NATO funded Silk project that provided satellite based connectivity to the Higher Education and Research sectors of the Central Asian countries. The Silk project demanded that the Central Asian Research and Higher Education communities set up an NREN as beneficiary partner and the NRENs were made responsible for the distribution of the connectivity within their user constituencies by setting up national networks.

Over the years the NRENs have evolved to relatively strong organizations that provide services for their users. Satellite technology has been abandoned and since 2010 international fiber-optic-based connectivity is provided by the EC funded CAREN project. Besides connectivity the NRENs are providing support for applications that run on the network, such as disaster prevention systems, telemedicine applications, video conferencing, distance education, and supercomputing facilities. Disaster prevention is priority for regional cooperation in Central Asia. A major part of the Central Asian countries' territory is located in the seismically active zone and is prone to hazardous natural processes and phenomena. It requires organizing detailed study of hazardous natural processes and phenomena practically in the whole territory of Central Asian countries. Such kinds of studies are based on the integrated monitoring of the seismic situation, tectonic structures movement, geodynamics of processes, and phenomena development, as well as changes of environmental parameters. Without active NRENs such a regional approach to disaster prevention would be impossible. Telemedicine is another important area for collaboration among Central Asian NRENs due to the shortage of qualified medical doctors and services in rural areas.

Figure 2: The Central Asian Countries that CAREN Is Serving

Although the NRENs have grown, they are in most cases still mainly dependent on user tariffs for their financial sustainability, with little to no support from their governments. The exception is TURENA, the Turkmen NREN that is fully funded by its government. The Kyrgyz NREN (KRENA) receives support from its

government for the international connectivity. The Kazakh NREN (KAZRENA) and Tajik NREN (TARENA) receive no support from their governments. The Uzbek NREN (UZSCINET) is even worse off as they not only receive no support from their government, but also do not participate in the CAREN project due to lack of government support for the CAREN project.

The intention is that the current CAREN project will evolve to a sustainable regional network organization for the Central Asian countries. The CAREN NRENs are currently developing Business Models that will demonstrate their worth for the Higher Education sectors in their countries. These business models will show that government support is essential for the sustainability of the NRENs. The CAREN project itself will evolve into a regional organization that represents the interests of the Central Asian NRENs. By combining forces, the Central Asian NRENs, through CAREN, can contribute significantly in reaching the WSIS goals, but of course only if the Higher Education and Research Institutions fully support the NREN of their country.

Relevant URLs:

DANTE CAREN page: http://caren.dante.net

iCAREN portal: http://www.icaren.org/

World Summit of Information technology: http://www.itu.int/

World Economic Forum, The Global Information Technology Report 2012: http://www.weforum.org/reports

Notes

[1]Source: World Economic Forum, The Global Information Technology Report 2012

[2]Remarks in relation to Table 1:

1. Data were published in May 2011 are presumably from 2010

2. If not specified the index values are in a scale from 1 to 7

3. The indices are all in the range 1 to 142

4. As base line the index values of the CIS countries is used in the right column.

5. For some reason there were no data for Turkmenistan and Uzbekistan

6. Cells with "?" indicate missing data

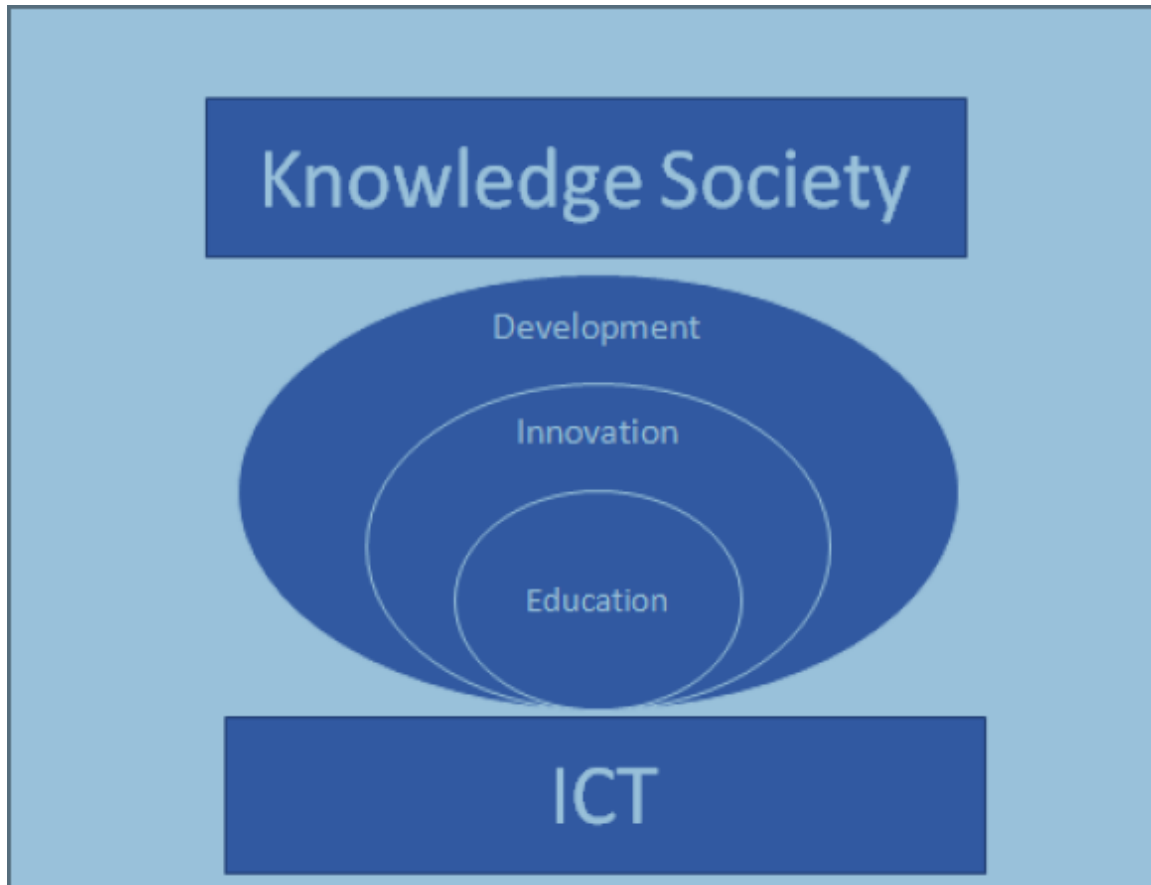[3]Source: "Monitoring the WSIS Targets", of the ITU, 2010

[4]A quote of Henry Ford, the founder of Ford Automobiles is very relevant here: "If I had listened to my customers I would have given them a faster horse".

Figure 1: ICT as Driving Force Towards the Knowledge Society

Table 1: Networked readiness indices of the Central Asian countries

Index	KG		KZ		TJ		CIS
	Index value	Index	Value	Index	Value	Index	Value
Overall	3.13	115	4.03	55	3.19	114	3.7
Business & Innovation	3.25	131	3.99	71	3.36	110	3.79
Availability latest technology	3.49	138	4.41	103	4.42	102	4.26
Infrastructure and digital content	3.21	98	3.88	71	1.94	138	3.77
Skills	4.87	75	5.12	60	1.94	138	5.21
Individuals using Internet	20%	95	34%	78	11.5%	110	35.5%
Affordable Internet	2.0	?	1.81	73	?	?	5.21
Price fixed broadband ($/month)	$ 142	$ 125	$ 18	$ 13	$ 956	$ 136	$ 133
International bandwidth per user	0.28 kbps	137	8.59 kbps	79	0.53 kbps	132	19.9 kbps

Figure 2: The Central Asian Countries that CAREN Is Serving