THE ROLE AND STRATEGY OF AN ARNET IN A DEVELOPING COUNTRY

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Abstract: Information technology is changing the way we live and work. The extent and speed of change is tremendous. Society needs a guide and an aide in the introduction of changes. This is the role of academic and research community. However, they too need help, integration and infrastructure, which should be the assignment for an ARNet: Academic and research Network. It should provide infrastructure for academic community, research testbed, and be pilot for other nation-wide networks, organizer and motivator of the community.

To accomplish this, ARNet's strategy should be to ensure connectivity by the mean of connecting all, public access and broadband connections. It should also provide content through reference information, referral information, common databases, centralized databases and information services. By offering services like specialized helpdesks, national services (DNS, IP addresses), public host and resource sharing and by organizing and providing education for end users, teachers, technicians and administrators ARNet would enable and empower academic users. Through pilot projects and consulting services for non-academic communities and activities ARNet would guide academic community in fulfilling it's mission.

Approach, described in this paper as theory on role and strategy of an ARNet, has been approved by nine years of practical experience and results of CARNet, Croatian Academic and Research Network.

Keywords: **Information technology, ARNet, strategy, connectivity, content, pilot projects, services, consulting, education, CARNet**

The Environment and Trends

Information Technology (IT) is the major driver behind unprecedented extent and pace of changes in modern society. The ability of every individual regardless of all types of boundaries to access but also emit any kind of information from/to unlimited number of sources/recipients is changing human society from its roots.

The materialistic, market-driven economy is tremendously changing under the influence of proliferation of IT. The main recognized effect is dubbed "globalization of economy". Product, service or just an idea has the world as a market. No business can be either protected or prevented by political, financial or legal boundaries.

Trading, publishing, governance for centuries have been relying on exclusive access to information and careful and protective dissemination of it, but even more on weakness of the voice of an individual. IT has brought empowerment of individuals as nothing else in the history, because a voice of a single mind can be heard by billions. Also, no information can be hidden from the masses.

The concept of society has been cantered on geography. With IT we've got "distance everything": education, medicine, work, meeting. It almost seems that physical contact is completely unnecessary for everything we do.

Working and living together in this global room, village, world requires universal language, customs, habits: culture. In the same time, individual, historical cultures each bring something valuable to others. In order to do that, increased awareness and understanding of one's own culture as well as of all other's, is necessary. The simplest definition of cyberworld culture would be: "cultural blend and awareness».

While the changes used to take decades to be recognized and generations to catch on, today we have years and months to adopt. While kingdoms used to vanish without anyone knowing about it for decades today news, information and transactions travel at the speed of light.
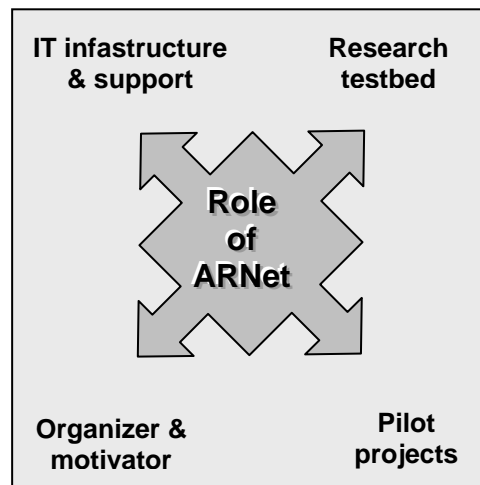

The Role of an ARNet

The world is changing rapidly. But unattended and uncontrolled changes rarely end up the way it would be desirable. In order to guide (through) the (everlasting) change process one needs knowledge and experience. Since the dawn of the mankind curious, systematic, educated men and women have been leading in change and forecasting the future. In modern times we call them scientists and professors and expect them to do so even in the future. Indeed, if academic and research community is not going us which way and how to travel, who is? The same is true for the changes introduced by IT. However, individualistic, spontaneous, ad hoc and scattered nature of scientific work needs to be amended with systematic, integrating approach. Academic and research (computer) networks inherently carry such integrating property. What should and could be their role in assisting academic community in helping society to change?

Advising others one can do well only on the basis of personal experiences. Thus the fundamental activity of an ARNet is to establish **IT infrastructure for academic community** enabling community to work effectively and gain first hand experience in using and applying IT.

Changes in existing or establishment of totally new, large information systems (IS) need to be verified in safe environment and on the (relatively) smaller model. Academic community and its IT infrastructure are ideal **research testbed** and should serve as such for all major and vital societal ISs.

ARNet should assist and help community in various **pilots for other nation-wide** networks in order to gain experience and create human resources able to implement IT and changes elsewhere.

Picture 1: The Role of an ARNet

Individual institutions, researchers, projects and efforts need to be joined, activated, initiated and directed. They require an **organizer and motivator of the community** and ARNet is ideally suited for this task.

To put it in one sentence, and ARNet should be the guide and the glue of academic community aimed at adoption of IT and required knowledge in order to introduce and aid in the change process.

The Strategy of an ARNet

In order to fulfill such a mission, it is obvious that an ARNet is much more than a mere communication backbone infrastructure. A range (and mix) of activities is necessary to be developed and maintained.

Connectivity is the first service to be offered, but not only on the level of the backbone. It is ARNet's role to reach out to every location of academic and scientific activity and life: classroom, laboratories, libraries, dorms, administrations, and homes of students, professors and researchers. The proven method of letting individual administrations to recognize the need is no longer acceptable for it is much to slow! More push is required.

Providing communication infrastructure is only first step. It is fruitless without the proper **content**. ARNet is definitively not the one to provide the content, but is definitively the one to organize its presence. Common and joint data and information need to be available to the whole community. Individual collections need to be transparently accessible to other collections and users. Exchange with

other communities and availability of out-of-the-community data is of crucial importance.
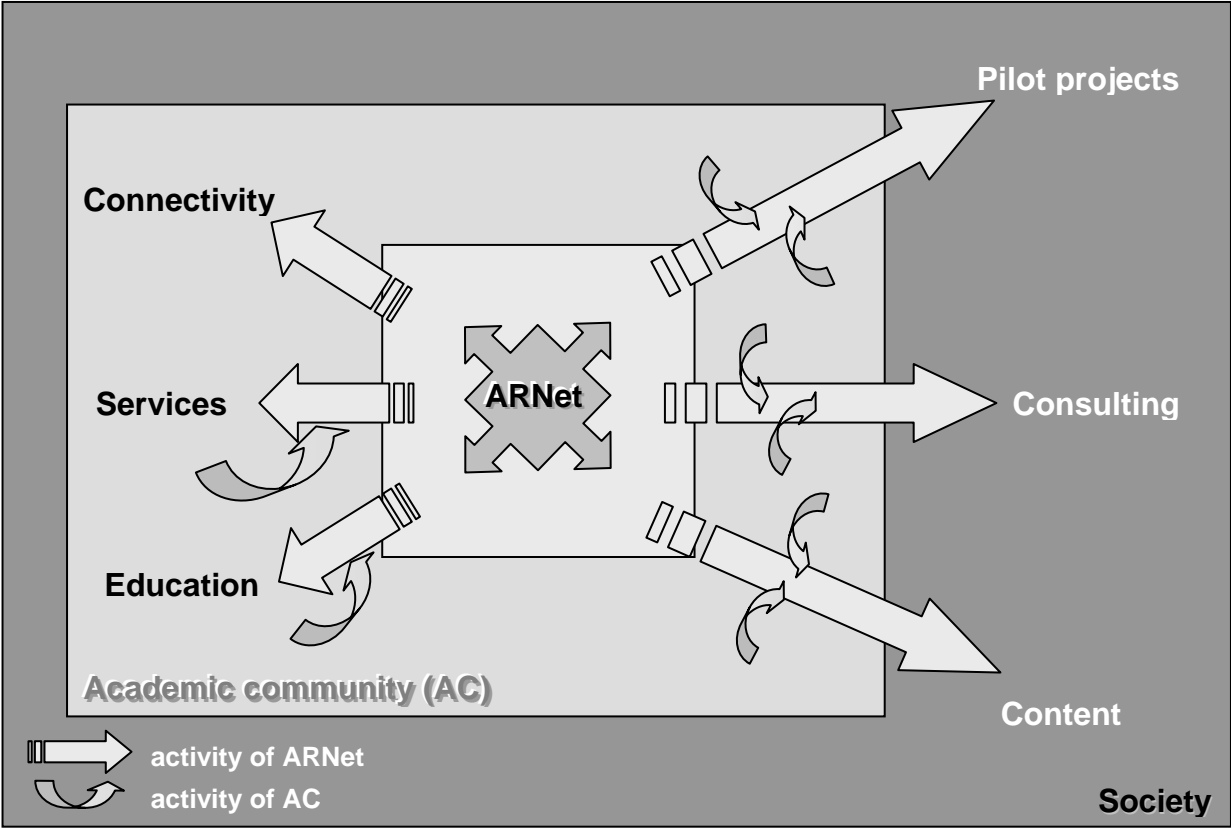
Academic community as users of the infrastructure, content and information services need constant support and assistance from the range of **services, which** need to be initiated, organized and monitored by ARNet.

Traditionally academic community is inclined to get self-educated in auxiliary skills like using the IT. However, things are getting much to complex and again available time is ever shorter. Therefore, ARNet has t organize a range of **education** «products and services».

ARNet must serve as a bridge between academic community and society's needs. It has to run (initiate, organize) **pilot projects**, which apply IT in public health, public administration, education, culture, judicial system and others.

All the knowledge and experience in academic community and ARNet itself in the processes described, need to be available to public and governmental institutions and projects in the form of **consulting**.

These strategic points each present the world for itself and thus need to be described in more detail.

Picture 2: The Strategic Activities of an ARNet

Ensure connectivity

Computer-communication infrastructure for academic community must **connect all** regardless of their importance, activity, financial source. State owned and privately owned, research and education, information producers and information consumers, within own academic community and with other academic communities, at work and at home there should be no difference and no hesitation.

Academic community must be the forerunner and thus will have infrastructure and content not available to others at the given moment. However, academic community should in no activity and in not a single moment become exclusive and closed. Rather, ARNet has to take care for **public access** to all the wealth of the community.

Communicating written words is no longer enough. Voice, music, drawings, animation, photographs and moving pictures are the basis for full communication, which is required today. Therefore all infrastructure needs to be planned and developed on **broadband connections**.

Provide content

Individual contents are produced by institutions and individuals within and outside of the community. However, in communication and daily work a lot of **reference information** is required.

Who knows (or does) what, is the key question to efficiency. Therefore, **referral information** represents one of the cornerstones of the system.

Despite the variety of private data collections, a number of **common databases** are required for daily functioning of the community.

Although distributed technology is the concept of modern ISs, it is not always feasible or affordable. Therefore, **centralized databases and information services** are required.

All the mentioned services will be operated by members of academic community, but they need to be designed and organized, and that is the role of ARNet.

Offer services

Almost every user community (users, computer administrators, librarians) needs a **specialized helpdesks** service.

In addition, IT requires establishment of a number of **national services** (DNS, IP addresses).

Users need a place of first referral and the last resort for a number of services like **public host**.

Although IT is getting cheaper and increasingly affordable, there will always be some expensive resources. IT enables most of them to be shared. **Resource sharing** is yet another service an ARNet should provide.

Organize & provide education

With the speed of changes and introduction of new applications on the daily basis, everybody needs quick, easy and available education: **end users, teachers, technicians, and administrators**.

They need textbooks, computer and web based training materials, self-examination modules and traditional courses.

Again, production of educational products and offering of services is the job for institutions and individuals in the community and outside. However, ARNet needs to detect the need, define service or product and make it available to users.

Pilot projects

Pilot projects have important role in the change process. They gain **experience for building of ARNet** and **experience for other national networks** through experiment-like miniature projects aimed at much larger goals in the future. They are also irreplaceable in **preparation for start-ups,** the future commercialization of today's ideas, the vital point of market economy. In the craze of unbalanced changes, numerous gaps are created in the fabric of social system. To some extent, pilot projects are **filling the (social) gaps** by providing services or paradigms missing for proper functions of old or new subsystems.

Consulting

In order to be efficient and keep the pace with changes, a high degree of **knowledge management** and **expertise sharing** is required within the academic community. The same knowledge, skills and systems are required for the society as a whole and they should be available to almost everyone in the form of **consulting** by ARNet and academic community.

As a pioneer and forerunner academic community has the potential to ease and speed up the change process in society. Therefore ARNet should be **involving academic community in broader community.**

CARNet - the theory approved in practice

Croatian Academic and Research Network (CARNet), started in the 1991 as a project of the Croatian Ministry of Science and Technology, is today the

governmental institution (founded in 1995) with following basic objectives:

- providing state-of-the-art services in filed of information and communication technologies (ICT) to academic and research community;
- education and support to users and ICT professionals;
- experimental applications of ICT in various fields and different segments of the society;
- popularization and promotion of the mass use of ICT in different fields and activities.

By the end of 1996 initial plan to connect (by means of CARNet network) all scientific and academic institutions in Croatia was successfully realized. Initial experimental implementation of ATM technology in CARNet in the 1995, resulted in the modern, nation-wide ATM computer network that is in operation since 1996 ([1], [10]). Today, this expanding and growing ATM based backbone of CARNet network connects more than 20 nodes in 8 Croatian cities. All of about 150 institutions at 190 locations in 22 Croatian cities are connected to the CARNet backbone.

From the very beginning CARNet was user-oriented network. Whole palette of activities ([2], [7]) was developed to enable users to effectively use ICT infrastructure and services, provided by CARNet. Variety of general (end-user) or specialized (e.g. system administration or on-line data base access) helpdesk services are provided to community. Extensive educational activities are conducted. Besides courses on the basic or advanced Internet literacy for end-users, specialized courses are organized for specific target groups, such as system administrators or librarians. *Training the Trainers* program, started in 1999, is meant to extend possibilities for delivering end-user training, to come nearer to users and to gather Internet teachers into cooperative community.

Many of pilot projects, performed with institutions, groups or individuals from both, academic community and general public, where important contributions to promotion of ICT or to initiation of change processes in different fields. We should mention just some of them:

- WWW servers of the World Festivals of Animated Films - Animafest'94 and Animafest'96 (first world films festival on the Internet);
- WWW.HR - initial Web page of Croatia;
- First experimental WWW servers of the Presidential Office and of the Government of The Republic of Croatia;
- Telemedicine in heart electrostimulation;
- Educational multimedia presentation of diabetes;
- Biological database and GIS;
- Automation of the Visnjan astronomical observatory telescope and its connection to the Internet;
- PGP chriptographic center.

Conclusion

Through a range of boldly and carefully designed and performed activities, services and infrastructures, an ARNet can fulfill two very demanding tasks: provide academic and research community with information base required in their work and life, as well as mobilize all forces to aide society in the change process.

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