

Collection of Untraditionally Developed Academic IT Services in Eastern Europe

Rihards Balodis and Inara Opmane

Abstract—Deep and radical social reforms of the last century's nineties in many Eastern European countries caused changes in Information Technology's (IT) field. Inefficient information technologies were rapidly replaced with forefront IT solutions, e.g., in Eastern European countries there is a high level penetration of qualitative high-speed Internet. The authors have taken part in the introduction of those changes in Latvia's leading IT research institute. Grounding on their experience authors in this paper offer an IT services based model for analysis the mentioned changes' and development processes in the higher education and research fields, i.e., for research e-infrastructure's development. Compare to the international practice such services were developed in Eastern Europe in an untraditional way, which provided swift and positive technological changes.

Keywords—Computing, data networking, e-infrastructure, IT services.

I. INTRODUCTION

IN this article the 20 year experience in research and education e-infrastructures' development is being analyzed based on academic IT services' approach. The experience is taken from a research institute's action and the practice of international cooperation, and generalized as a possible principle for Eastern European block. In the article there is introduced the academic IT services' classification (Despaired, "At the same time" and Unwanted academic services), described the purposes of those services' application, their link to knowledge transfer, innovation, core business and outsourcing. In the end there are conclusions about those services' effects and availability in research e-infrastructure in Eastern Europe.

Service is an action consumed by the users (institutions, individuals or businesses) and often does not require any further processing. Many information technology services support others business services. Service definition usually consists of:

- the service description – what is the particular service;
- description of possible help – how do I get the help;
- service's cost and pricing – what and how much does it cost;
- service's support description – what service support I can

R. Balodis-Boluzs is with the Institute of Mathematics and Computer Science, University of Latvia (IMCS UL) Riga, Latvia (phone: 371-6-7224730; fax: 371-6-7820153; e-mail: imcs@lumii.lv).

I. Opmane is with the Institute of Mathematics and Computer Science, University of Latvia (IMCS UL) Riga, Latvia (phone: 371-6-7224730; fax: 371-6-7820153; e-mail: imcs@lumii.lv).

Supported from project ERAF Nr.2010/0206/2DP/2.1.1.2.0/10/APIA/VIAA/011.

receive from its provider;

- delivery of the service – how do I get this service.

As often as not to provide some service one has to get permission, e.g., a licence.

To ensure the necessary service there are a couple of maintenance financing models:

- pay per service usage;
- project funded services;
- institution based funding of services.

Frequently the acquisition of permission is linked with setting up of a project or action of some institution. Typically, the firsts of the financing models is related to services.

Usually in society there are certain notion of what provides specific services and where they can be received, e.g., public transportation services in city are provided by one or a number of specially formed companies, operations with money are carried out by banks, etc. We can draw up a rather static structure of service providers' network to get the idea of service receipt possibilities, this also refers to IT.

II. TYPES OF ACADEMIC IT SERVICES IN EASTERN EUROPE

The authors of this article base their model of IT services on a lasting work experience in a research institute – the Institute of Mathematics and Computer Science of University of Latvia (IMCS UL). Building on the experience and enduring international contacts we can infer that the experience described in this article can be generalized to many Eastern European countries. However, in the article IT services' model is limited to academic environment – IT services provided by higher education establishments and research institutions. We will divide the academic IT services in the following types:

- despaired services;
- "at the same time" type services;
- unwanted academic services.

III. DESPAIRED SERVICES

A. Despaired Services for the Internet Development in Eastern Europe

With despaired services we understand such services which are being provided atypically to the established notions of society about the way it receives them.

In Eastern Europe we can find a lot of anomalies – despaired services which do not comply with international and European practice, e.g., a substantial part of Latvian Post's business is the post's payment system (practically it carries out a limited bank function), post offices sell goods, it has created a data transmission network and provides Datacom services,

there are Internet access points in post offices and it carries out Internet service provider functions.

In this article we will analyze the role of such anomalies in Eastern Europe's development, in a narrow activity field – e-infrastructure's development for science and education as well as the connected services.

Of course, the notions of society about the typical service provider network change and in the long run anomalies vanish. Moreover, those processes go side by side with new innovative businesses' development and outsourcing.

Nowadays in Europe the e-infrastructure's IT services for academic environment are being structured in a number of layers (see fig. 1.) and in every layer there are available different services. Also historically the layers have developed from the basis – Network layer – initially, from a simple Internet access in the academic environment to special GEANT network in Europe. Since the historical development of the Internet took place in universities, the Research and Education Network (REN) is also sustained by universities.

Historically, REN development was furthered by universities with their resources and research funds. The Internet in the academic environment was not perceived as IT service with an appropriate service payment system.

In Eastern Europe during the time of great political changes it was impossible to get the public funding for large Internet maintenance and introduction projects. Short-term Internet development projects and donations appeared. For more information on Latvia science's funding policy see [1]. International commercialization of the Internet started in the mid-90s when an innovative purpose of the Internet was seen by universities. There was no other choice of how to find the funding; therefore its development was typically a pay per service usage IT service, where payments were made between academic institutions.

Hence research infrastructure was developed according to actual revenues and needs of practical research without any state support, public financing for science infrastructure in Latvia, for a long time, was negligible and episodic, and only from 2006 state aid was received for funding international connectivity to GEANT.

Such approach in the academic environment and in this manner developed IT services we will call despaired services, which in some way, from the point of international practice, are anomalies.

Thus the academic community step by step furnished e-infrastructure's base level development and maintenance.

E-infrastructure services

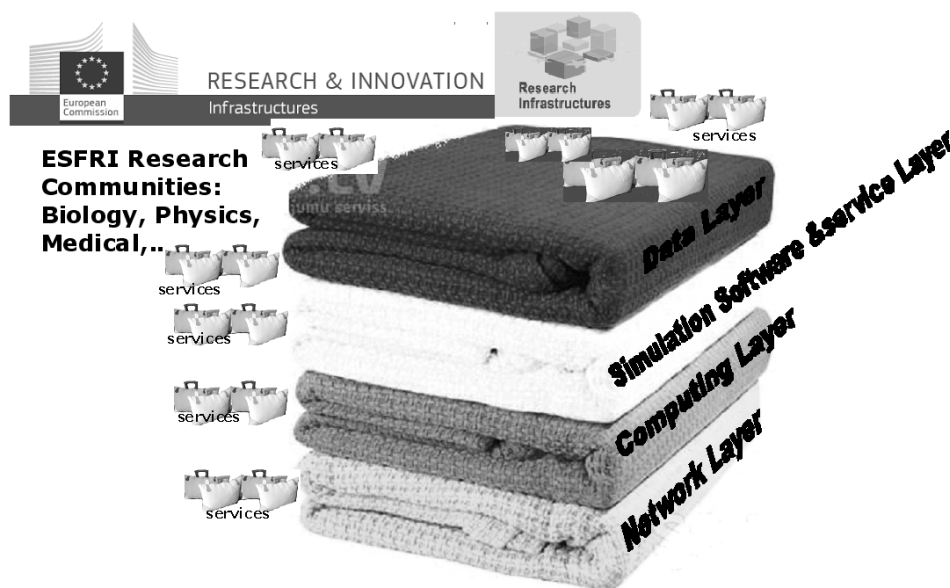


Fig. 1 E-infrastructure services

B. Data Centres' Development as Despaired Services

Nowadays the actions of computing layers above and including the Network Layer are commonly concentrated in data centers. Fig.2 shows timeline of data centers' development (derived from [2]).

Data centers are also seen as an important e-infrastructure's component in the academic environment, because they provide cloud services, HPC services, collocation services and

other computing services.

Even though the initial period of the Internet introductions and modern data centers' development projects in the academic society has a gap of almost two decades, Eastern European research institutions still struggle to obtain the public funding for data centers' maintenance. European Union's structural funds ensure only the primary investments for data centers' establishing or modernization. IMCS UL's

estimation points out that 30% of funding have to be obtained by the institutions themselves from IT pay per service usage. Thereby we will also classify those services as despaired services.

Service utilization experience is based on the former IMCS UL's action [2] and the current Computing facility's development [3].

C. Moving Secondary Schools to the Cloud as Despaired Services

The third group of despaired services in the academic environment is related to "Moving secondary schools to the cloud" strategy, using the same computing resources that are within the framework of academic e-infrastructure [4].

In Latvia IT is being used for full spectrum of educational necessities. There are available Internet access points with

high-speed connectivity in schools, they are provided with informatics teacher and computer-room, as well as with modern interactive whiteboards; contents digitalization and moving schools to the cloud.

Secondary school teaching's digitalization encompasses:

- Digital e-Learning content;
- Learning management system;
- Social networking;
- Pupils' competition – subject Olympiads;
- Management and administration of secondary education.

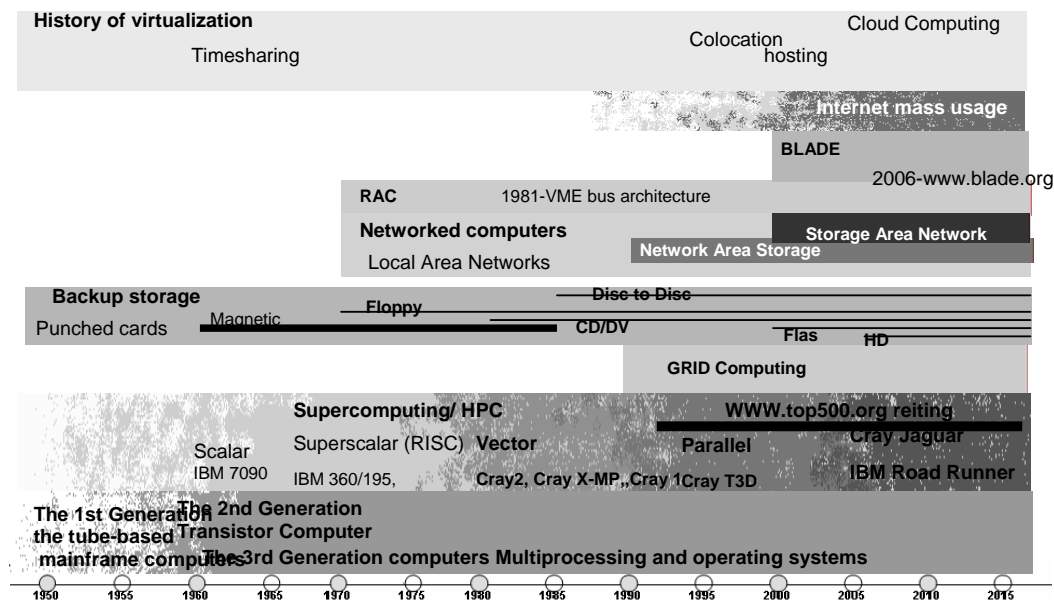


Fig. 2 Computing development

IV. "AT THE SAME TIME" TYPE SERVICES

"At the same time" type services, according to our classification, is one type of academic IT services, whose provision is closely related to some despaired IT service. Explicitly this group contains Networking Layer based services:

- maintenance of academic users' registry, identity, authorization/authentication;
- the Information Technologies Security Incident Response Institution's services for academic users and state;
- register and domain name on-line management system.

Computing Layer's despaired services are interlinked with the specific (defined by the European Strategy Forum on Research Infrastructures – ESFRI) research e-infrastructure's services.

V. UNWANTED ACADEMIC SERVICES

In some places there are services being rendered, whose provision from academic institutions' side is unnecessary, unreasonable and undesirable, e.g.:

- rental of research and education institutions' disposable premises;
- polygraphy's, printing facility's and scientific article data base's maintenance;
- conferences' organization as a business;
- software development (part which, according to Frascati Manual, is defined as non-research);
- teleconferences, Internet service provider business and telco services.

VI. ACADEMIC IT SERVICES, KNOWLEDGE TRANSFER AND INNOVATION

Innovation is a process by which an idea or invention is translated into a good or service for which people will pay, or something that results from this process. The academic IT services are innovative IT services. In the vast majority on the academic IT services' utilization base new companies are formed and they render those services as their business. In this way business incubator's functions are realized and knowledge transfer from academic environment to commercial environment occurs.

Jim Stikeleather, Chief Innovation Officer at Dell Services divides three core types of innovation (2011) [5]:

- Sustaining Innovation (continual improvements in existing goods, services, and processes);
- Breakthrough Innovation (introduction of new usage patterns and applications of existing technology, products and services);
- Disruptive Innovation (introduction of new, radically different inventions, products, processes, or services into the market, which deeply impact on people's lifestyles and purchasing patterns).

Academic IT services (mainly Despaired services) in Eastern Europe are more related to Breakthrough Innovation than Disruptive Innovation. Nationally that is a service with substantial influence on society, yet, looking at it from an international point of view, innovations brought in Eastern Europe where already known technologies abroad. Therefore we classify it as Breakthrough Innovation.

VII. ACADEMIC SERVICES AND CORE BUSINESS FOR ACADEMIC E-INFRASTRUCTURE

A core competency is a concept in management theory originally advocated by C.K Prahalad, and Gary Hamel (en.wikipedia.org/wiki/Gary_Hamel). In their view a core competency is a specific factor that a business sees as being central to the way it, or its employees, works. It fulfils three key criteria:

- it is not easy for competitors to imitate;
- it can be re-used widely for many products and markets;
- it must contribute to the end consumer's experienced benefits.

In research infrastructure development we meet competition at a global, multi-country, regional and institutional level. There are many factors that determine the structure of competition in the environment of growing globalization.

Competition at European level means solution in cooperation of pan-European science infrastructures and establishing of national infrastructure facilities.

Pan-European Research Infrastructures must be centralized and distributed. ESFRI strategy 2010 defines role of regional partner in European Research Infrastructure Consortium (ERIC). A "Regional Partner Facility" (RPF) to a Research Infrastructure of pan-European interest must itself be a facility of national or regional importance in terms of socioeconomic returns, training and attracting researchers and technicians.

The quality of the facility including the level of its scientific service, management and open access policy must meet the same standards required for pan-European Research Infrastructures. The recognition as an RPF should be under the responsibility of the pan-European Research Infrastructures itself (or the members of a to-be ERIC) based on regular peer-review [6].

Strategic choice between development of national Cloud Computing and High Performance Computing centers and usage of pan-European community cloud infrastructure (e.g., Luxemburg or Amsterdam) raises the question of global competition. The same as strategic choice in the networking field: whether to build own optical network for academic environment of Baltic region states (project Baltic Ring) [7].

In shaping institute development strategy it is important to reach balance between outsourcing, cooperation and competition.

For IMCS the development of science infrastructure is its core business and must be kept in-house. But the definition of core services is obviously different in case of university IT departments, research institutes, and NRENs. Besides circumstances change and basic tenets from time to time should be revised: if the function is technical and innovative activity is no longer visible, it should be handed over to commercial enterprises.

VIII. ACADEMIC IT SERVICES AND OUTSOURCING

Analysis of IT/IS Outsourcing Factors in Higher Education is given in [8]. Academic institutions have different experience in respect to outsourcing their own services and in respect to which services institutions are ready to outsource or have already outsourced. From technical institutions IMCS receives one answer, from humanities institutions – other.

Terena has opened the discussion and raised questions that are more important for Latvia. They are as follows [9]:

Which services could or should NREN provide to the R&E community before this community turns to other providers with the risk of weakening the NREN's business case?

Is Cloud Computing a strategic domain in which NREN should invest and which NREN should organize?

Is there a need in obtaining a pan-European community cloud infrastructure?

Are Email services, collaborative platforms, e-learning services, to be considered as strategic for NREN?

Higher education and Research institutions and NRENs are often engaged in deep thinking about strategic issues around the possibility of outsourcing services.

There are identified several pro and contra arguments for outsourcing of academic IT services.

IX. CONCLUSIONS

Research infrastructure development objectives are indicated on the basis of long time experience in IMCS. Impact of international collaboration and poor public funding for research infrastructure in Latvia resulted in the

development of commodity services.

1. Implementing an untraditional approach – despaired IT services, the countries of Eastern Europe could develop the Internet in general at a good pace, inter alia, its accessibility to academic environment and linked services Internet services (“At the same Time” services). In accordance with Net Index, by Ookla (<http://www.netindex.com>), Ookla is the global leader in broadband testing and web-based network diagnostic applications, USA) data, in many Eastern Europe’s countries there are high Internet accessibility rates – ranks high in Upload and Download speeds as well as all-in-all quality test.

2. There was doubt, that by ensuring Despaired services in research institutes, it will facilitate the research institutes’ reformation in enterprises. Still, it did not happen in Eastern Europe.

3. Practice verified that Despaired services would be rapidly taken over as businesses in new companies and such an untraditional approach created an effective knowledge transfer system.

4. Despaired services divided in two categories: 1) services based on well tested technology, and that swiftly commercialize; 2) services that are still innovative, are considered innovative by the academic institutions or that maintain an innovative services’ development environment became the core business for academic institutions, from their point of view.

5. A typical example of this is the services of “At the same time”, e.g., domain name administration. With the creation of registry mechanism, the technical service’s part is handed over to the market, but the innovative part is still maintained by the institute.

6. Several Despaired IT services are the core business for the academic environment, because they create the possibility of other innovative services’ development, they are necessary and effective in higher education’s maintenance. There is an observable inertia in the yesterday’s Europe – from the authors’ point of view the usage of outsourcing could develop much faster, e.g., forming GEANT Networking services applying more telecom services. In Eastern European countries, basing on the institutes experience, services’ commercialization is politically higher adjusted. Reason for such opinion is based on Nordunet Baltic Ring that anticipates creating the academic data networking services by renting telecom’s optical fibres. Currently the academic network in Latvia is fully maintained by data services of telecom. Similar situation is shaping with ESFRI’s e-infrastructures.

7. Practice verifies that unwanted academic services rapidly vanish.

8. European Union structural funds’ financed projects do not tolerate Despaired services, because they can distort the market. This problem in Eastern Europe is settled by using Despaired services as commercial activity within the volume of permissible quotas.

ECSS 2011 Informatics Transforming Society p.p. 87-96, 7th Annual European Computer Science Summit Proceedings Bertrand Meyer (ETH Zurich, Switzerland) Letizia Tanca (Politecnico di Milano, Italy), Milan, 7-9 November 2011

- [2] R. Balodis, I. Opmane, "History of Data Centre Development" p. 128-151 Reflections on the History of Computing: Processing Memories and Sharing Stories History of Computing Ed. Arthur Tatnall (Victoria University, Australia) IFIP AICT Volume 178, The Book Serie: Lecture notes in Computer Science, Subseries: IFIP - Advances in Information and Communication Technology.
- [3] R. Balodis, I. Opmane, L. Truksans, "Unified computing facility design based on open source software," 2012 International Conference on Systems and Informatics (ICSAI 2012) 19-20 May 2012. Yantai University pp.337- 342, IEEEExplore Digital Library DOI: 10.1109/ICSAI.2012.6223629.
- [4] R. Balodis, I. Opmane, "Moving Secondary Schools to Power of Cloud," Conference ICACT2012: 2012: 3rd International Conference on Advancements in Computing Technology, Seoul, Korea, December 2-5 2012
- [5] <http://www.sourcingfocus.com/site/blogentry/4674/>, Jim Stikeleather . Three Core Types of Innovation. December 22, 2011
- [6] http://ec.europa.eu/research/infrastructures/pdf/esfri-strategy_report_and_roadmap.pdf, European Strategy Forum on Research Infrastructures. Strategy Report on Research Infrastructures. Roadmap 2010
- [7] <https://portal.nordu.net/display/.../Baltic+Ring+Design+Study>, Baltic Ring Design Study - NORDUnet Wiki - NORDUnet Portal, 2011
- [8] Ellen Hasset et al., IT Outsourcing in Higher Education., 2002, <http://net.educause.edu>
- [9] NRENs’ Strategic Perspective on Storage and Cloud „Build or Buy” Green Paper v0.5 Peter Szegedi (Terena), 2011, 2011, <http://www.terena.org/activities/tf-storage/Storage-and-cloud-v5.pdf>

REFERENCES

- [1] I. Opmane, R. Balodis, "Objectives of Research e-Infrastructure Development in Latvia", In Politecnico di Milano, Informatics Europe