EUROPEAN SCIENCE FOUNDATION (ESF)
Standing Committee for the Humanities (SCH)
Strategic workshop on research communities
and research infrastructures in the Humanities
Strasbourg – France, 29-30 October 2010

List of Speaker Abstracts

Friday 29 October 2010 – Day One

Theme 1: Research communities and adoption of research infrastructures

❖ **Elmar Mittler (DE)** – Göttingen University

E-research in the humanities – who takes care of the research infrastructure?

E-research is promising to develop and provide tools and technologies to do research work collaboratively with other researchers managing the increasingly complex range of tasks and data. But in reality we can see a lot of individual projects and activities using self made data structure and software lacking long term perspective. The paper will discuss aspects of the development of:

- generic research and publication workflow

- tools, apps and services for the *research cloud*

- persistent service infrastructures.

❖ **Jordi Marti Henneberg (ES)** – Department of Geography and Sociology – University of Lleid

A Geographical Information System (GIS) database on the Evolution of Transport Infrastructure and Population Distribution in Europe (1850-2010).

This session will be devoted to present the importance of GIS databases for a general use. As an example our work on this field will be presented, which is about an integrated GIS on the development of transport infrastructure, demography and socioeconomic data for Europe. The main idea is that new light on traditional disciplines can only be provided by systematic databases to allow statistical and geo-historical analysis.

To date, considerable investment has been made in the creation of national historical GIS databases, but much less at the European level. So our innovation consists on assembling census data relating to the 19th and 20th centuries matched with the administrative boundaries used when publishing them.

An additional relevant component is quality control in database creation, which is established through initial protocols and continuous tracking. This runs from the initial digitalisation stage through the data conversion process and to the final product. Because of the variety and imperfections inherent to both historical and contemporary data, a great deal of effort has to be devoted to creating metadata that describes the data content and also to its construction process and reliability.

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❖ **Beata Wójtowicz (PL)** – Department of African Languages and Cultures – University of Warsaw

Digital research infrastructures at the University of Warsaw – still to come?

The idea of digital research infrastructures is not new to the Polish research community. The major universities and research institutions in Poland offer free access to international databases of journals and books to their researchers and students. With such possibilities at our disposal, some of us gladly search for and use research papers that are available directly from our desktops. This has revolutionized our work conditions and academic education. We agree that open access is the key issue of today's research and that the digital era has entered all spheres of our lives. Nevertheless, it somehow does not affect our means of disseminating our own research.

The obstacles appear to be rooted in individual habits and preferences, possibly also in the academic practice. We can easily access numerous foreign journals and papers but not those that are being published by our colleagues or at our University. At the University of Warsaw, we publish around seven thousand papers a year, our database of publications lists nearly ninety thousand of them, but only 2% have links to their online versions. Being published online is still only a welcome but not a necessary addition to being published in print. There are even cases when online publishing is shunned by the decision-making bodies.

In my presentation I will discuss the issues responsible for this state of affairs, and present and evaluate efforts undertaken by the University of Warsaw and the Polish research authorities in order to push our research community further into the digital era.

❖ **Gabor Gelleri (IE)** – The Moore Institute for Research in the Humanities and Social Studies – National University of Ireland Galway

Travel studies in the digital era

Travel is among the most popular scientific topics of the last 20 years. Several reasons could justify this domain being at the forefront of integrated digital studies: the international character of the field; the variation of media (text, image, maps); the endless possibilities in visualization; the large number of texts available.

Still, we can encounter a very limited amount of activity in this area. The existing projects are mostly isolated from each other, and some of them are using standards that are not recognized everywhere. In other fields, the lack of appropriate tools is the blocking factor.

We are planning to tackle the following issues:

- existing research networks in travel studies (mailing lists, research centres, running and projected cooperation)
- domain-specific digitization versus larger digitization projects (EEBO, Gallica, etc.)
- obstacles encountered during research and cooperative efforts
  - national versus international
  - library copyright issues
  - database copyright issues
  - software environment: databases; GIS for Humanities

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- manpower for cooperation
- two examples of cooperation
  - the network of travel illustration databases
  - a domain-specific "crowd-sourcing": the "art of travel" project
- a possible domain of large-scale cooperation: "Ways of Europe" – massive mapping of traveller's itineraries
  - what is already available in practice
  - what is available in theory
  - what should be created
- is there an emerging "digital travel scholar"?

Theme 2: Re-purposing/re-use of data

❖ **Andrea Seier (AT)** – Institut für Theater-, Film und Medienwissenschaft Hofburg - Universität Wien

Media as Data of Research

Remediation processes and their various forms like Re-purposing, Re-Modelling, Re-Fashioning are discussed by Jay David Bolter and Richard Grusin as specific cultural strategies, which in the sphere of a cross-media based culture offer an answer to intermedial competitions, mostly between 'old' and 'new' media. The newness of 'new media' however, is only possible and addressible through processes of repetition, citing and re-fashioning. This paper discusses the question of what kind of impact these remediation processes have on scientific research.

Usually the digitalization process and its impact on research practices is described with the growing availability of traditional material resources on the one hand and the growing need to select material from the huge amounts of available data on the other hand. With regard to traditional research material in the field of media studies (like newspapers, films, television programs) the question is by which criteria the access will be realized (or not realized). Discussing possible criteria and making them transparent seems to be a very important task for research communities, because these decisions have an impact on the use of the material by scientific researchers in the future. Which sources should be provided and made accessible in digital form and which not? Who should decide and govern these processes? This paper will discuss these questions in regard to films/television programs and moving images and their different forms of storage and archive, mainly the relation between scientific video libraries and YouTube as an archive for historical television programs.

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❖ **Marie-Luce Demonet (FR)** – Centre d'Etudes Supérieures de la Renaissance – Université François-Rabelais / ESFRI

Text-and-image digital humanism

The Bibliothèques Virtuelles Humanistes (BVH, or Virtual Humanistic Libraries) is a project run by a research team in the Centre d'Etudes Supérieures de la Renaissance (Center for Renaissance Studies) at the University of Tours, France. This Center is a laboratory belonging to the National Center for Scientific Research, Department of Social Sciences and Humanities. It is run in an open source spirit, towards sharing knowledge, sharing the sources, in order to build a sustainable digital infrastructure for the humanities, and, particularly, for humanism.

The digitization project, begun in Tours in 2003 (http://www.bvh.univ-tours.fr) offers two types of digital representations: the image of a copy (its "facsimile"), and, when it is possible, its corresponding transcription without modifications. 414 books or manuscripts of the Renaissance are on-line by September 2010 (300 more are already digitized). Lately, the BVH project joined the Europeana consortium as a data provider, in the work package dealing with the semantic web.

The BVH team is devoted to conducting research on several fields in order to provide "generic" data: indexing text in image mode; extracting images from scanned pages; classifying and indexing them; acquiring significant corpora (10 %) of transcribed texts, TEI encoded. The project has been built depending on the requests of large communities, composed of disciplines with a variety of requirements about textual scholarship: historians, art historians, specialists of literature, philosophy, languages, sciences, and book history. The content is selected mainly out of regional collections, to be displayed in a single website with different levels of queries (thanks to the XTF search engine). Genericity and "cultural heritage" attitude are compatible with the scholarly expectations, whereas they have been more or less antagonistic in the past.

❖ **Rosemarie Fiebranz (SE)** – Department of History – Uppsala University

GaW - building the Gender and Work database

In Swedish history research, it is most common to work individually at collecting and organising sources. However, in the research project Gender and Work we are working with a research problem that requires special efforts because of the difficulties of finding information particularly on women's work. We strive to explore how people in early modern Sweden (1550-1800) used their time in order to make a living. We are interested in all kinds of activities, whether carried out as paid or unpaid work. Our method can be described as a verb-oriented approach: we are planning to collect and organize thousands of phrases from various sources (such as e.g. court records and accounting records) in the form transitive verb + direct object, e.g. "transport firewood", "make bread". The source fragments are stored in the database in original (early modern) language and linked to some context data (the sex of the performer, the work organization). The database embraces qualitative source material, but can provide quantitative weight to our research question. Our model has attracted considerable interest outside History, e.g. from linguists, and we are running a project investigating a model for automatic collection of verbs from 17th c. (digitized) Swedish texts. Image analysts and linguists also work with us in a project to enable machine reading of manuscript sources, selection of verbs and contextual presentation in a database. We anticipate great gains both for historical research and for collaboration across disciplinary boundaries thanks to the opportunities that the development of this research infrastructure allows.

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❖ **Catriona Crowe (IE)** – Senior Archivist – National Archives of Ireland

The 1901 and 1911 Irish Census Records

The 1901 and 1911 Irish census records are now available online on a free-to-access website. It has proved immensely popular, with genealogists, scholars and the general public. Visits to the site have reached 10 million. The fact that the site is free allows for scholarly explorations of the material which would not be possible with a purely genealogical pay-per-view site. The presentation will give some examples of how the site has been used, and propose further uses for it, including a possible oral history element which will allow people to interact with the site.

Saturday 30 October 2010 - Day Two

Theme 3: Text vs. Non text

❖ **Elisabeth Kieven (DE/IT)** – Bibliotheca Hertziana – Max Planck Institute for Art History

Research infrastructures for historic artefacts

The online availability of information and images for artefacts is essential for scholars in a variety of disciplines in the humanities. While texts can be "published" and made accessible on the internet in their entirety, material objects– like works of art - can only be "represented" to a certain degree through digital images and metadata. So far, cultural artefacts have mainly been catalogued digitally in a comparatively simple way, often without adequate visual documentation, for instance many museum inventories publish on the internet.

For research purposes, these kinds of repositories are not sufficient, as artefacts are not "self-contained": They carry additional cultural information referring to their production, reception and subsequent history which are of particular interest to scholars. This information itself is subject to interpretation and needs scholarly evaluation before publication. Due to these circumstances, requirements for metadata (standards and data models) and technical infrastructures (storage and retrieval systems) are more sophisticated and at the same time less developed than in text-oriented disciplines.

A first step in this direction are formal ontologies as the basis for knowledge representation networks. An example is the CIDOC conceptual reference model, which describes actors, objects and relationships in the cultural heritage field. So far it is used to facilitate metadata exchange, but not yet for implementing knowledge or research structures.

Only a few databases are advancing in the direction to unite the traditional repositories of libraries and the photo collections with specialized archival and collection resources.

Research infrastructures in the future will face new challenges regarding convenient software interfaces for data input and retrieval, world-wide unique identification of cultural heritage objects, the adequate handling of institutional and individual responsibility (scholarly authority and scientific credits) and a feasible management of image accessibility and copyright policies.

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❖ **Jost Gippert (DE)** – Institute for Comparative Linguistics – Frankfurt University

Manuscripts - between Text and Image

In the digital age, manuscripts (and other artefacts carrying handwritten text) require special research infrastructures that are able to handle them under both their material aspect (as images) and their content (textual data). The paper addresses several questions relating to:

a) the impact of a digitisation of originals for the study of their textual content;

b) special techniques required by special types of artefacts (palimpsests, stone inscriptions, etc.);

c) methods of linking textual and image data in online retrieval systems;

d) requirements for future developments.

The paper draws upon examples that have been dealt with in several projects relating to digital manuscript studies since 1995 in the course of the TITUS and ARMAZI projects and outlines the approaches of the LOEWE research unit at Frankfurt University.

❖ **Matija Ogrin (SI)** – The Institute of Slovenian Literature and Literary Studies

Electronic scholarly editions of primary sources – a citadel difficult to conquer

In the Humanities, scholarly editions of primary textual sources occupy a privileged position in the system of scholarship. The electronic scholarly editions share this priority by opening excellent ways for old philological methods in combination with new technological routines to achieve new and better transmission of textual sources – both in view of presentation as well as of search facilities and dissemination.

Nevertheless, electronic scholarly editions are produced relatively rarely. They do not enter the academic community in great numbers, they do not represent a prevalent current in the scholarly publishing of critical editions. The reason is the lack of technological services and tools that are needed for elaboration and publication of electronic editions. These missing services and tools can be legitimately referred to in terms of research infrastructure, which should be in place, but instead are still missing. For this reason, it is still rather difficult for a textual scholar to produce her or his electronic critical edition. These editions remain a *citadel*, difficult to conquer.

This contribution attempts to address the missing infrastructure in terms of technological services and tools that are needed in order to prepare and publish scholarly editions of primary sources on-line. The paper treats the issue of insufficient infrastructure in all three stages of the work-flow:

a) the elaboration of encoded electronic texts;

b) presentation of the texts;

c) repository and search system.

❖ **Ewa Dahlig-Turek (PL)** – Institute of Art – Polish Academy of Sciences

Between Science and Public Use: Music-Related Research Infrastructures

- Since the invention of music notation in the 9th century, music can be written down and analysed in a simplified and reduced textual form.

- Since the invention of the phonograph (1876), it is possible to fix the sound as such,

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making the fleeting phenomenon of music reproducible, and opening new perspectives for music analysis.

- The information technology solutions of the 20th century led to the development of software and research infrastructures in both these areas: textual and non-textual.

As for 'text', the generally accepted and applied music notation (called "Western"), with its rules and 'ortography', requires translation into machine-readable codes, variety of which have been developed in many musicological centres. Such translated music notation, in alphanumeric strings, looks and can be processed like a text. "Textual" music databases have been created in a number of national research institutions, mostly in connection to European folk and popular music. Due to the specificity of the encoding "languages", the use of such research infrastructures is limited to specialists.

Contrary to this, the "non-textual" research infrastructures, based on recorded sound, can be used both by scientists and broad public. Invention of the phonograph marked the beginning of the era of music archives (since 1899 in Europe). Established at academies of sciences and universities, they is today a particularly active group of musicological institutions actively engaged in creating huge repositories of metadata and recordings available online for researchers, but also for the general public. The most recent examples are *DISMARC* and *EuropeanaConnect*.

DISMARC (*DIS*covering *M*usic *ARC*hives, 2006-2008) was a broad European initiative to build a network of archives sharing their matadata and sound recordings on the internet, for simultaneous search in multiple languages. *EuropeanaConnect* (2009-2011) is a project connecting *DISMARC* and *Europeana*, the Europe's flagship digital library of digital cultural heritage, to aggregate music-related content existing in a wide variety of formats in dispersed locations. Although both projects were meant for general audience, the resulting huge database (at present almost 2 million records) is of great interest and use to researchers and students (mainly musicologists, but also ethnologists and linguists).

Theme 4:   Disciplinary vs. interdisciplinary resources

❖ **Graeme Earl (UK)** – Department of Archaeology - University of Southampton

Archaeological visualisation and multidisciplinary research

The Archaeological Computing Research Group (ACRG) at the University of Southampton, UK has specialised in the balancing both of multidisciplinary research agendas and curriculum designs for the last twenty years. This paper will focus on research by the ACRG in the domain of digital archaeological representation and consider the costs and benefits of collaboration between archaeologists, computer scientists, conservators, electronic and mechanical engineers, and chemists in the creation and analysis of archaeological visualisations. The particular case study will be the 9000 year old Neolithic site of Çatalhöyük in Turkey. Here we have begun to generate interactive computer simulations of a number of household interiors in order to explore issues of perception and lived experience. The engagement with digital methods is of crucial significance in this context, alongside the development and application of novel engineering and other scientific solutions.

The paper will also discuss current work in the production and management of digital resources in

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this domain, including the creation and attribution of descriptive metadata, the creation of repositories for digital cultural heritage visualisations and future directions in data management. Finally, it will provide some thoughts on the place of such multidisciplinary research in the context of formal methods of research assessment.

❖ **Elton Barker (UK)** – Department of Classical Studies – The Open University

HESTIA (the Herodotus Encoded Space-Text-Imaging Archive): an interdisciplinary project

HESTIA (the **Herodotus Encoded Space-Text-Imaging Archive**) is an interdisciplinary project, sponsored by the AHRC and involving the collaboration of academics from Classics, Geography and Archaeological Computing, that aims to enrich contemporary discussions of space by developing an innovative methodology to the study of an ancient narrative, Herodotus' *Histories*. Using the latest ICT in combination with close textual study, it investigates the ways in which geographical concepts are represented in the *Histories*, and develops visual tools that challenge the usual Cartesian maps of the ancient world by bringing to the fore the network of logical connections that underpins Herodotus' organisation of space. In addition to examining that network culture, however, HESTIA explores the potential of these new technologies to bring that world to a wider public.

By virtue of its interdisciplinary make-up and its combination of research-driven objectives with broad disseminative aspirations, HESTIA represents a project that is good to think with in the evaluation of the impact of digital resources on Humanities research. In this paper, I outline the HESTIA project in terms of the radically different methodologies developed and the collaborations, whether formal or informal, pursed. In particular, I hope to address the following concerns:

- Does the engagement with digital methods and technologies impact on research practice and, if so, in what ways?

- To what extent does the production of scholarly-driven digital resources affect the way in which collaborative research, particularly interdisciplinary study, is conducted? What works? And what fails?

- Are the outcomes recognised by peer review, or how might they be evaluated at the academic level? And does it matter?

❖ **Renzo Derosas (IT)** - Department of History, Ca' Foscari University of Venice

Large databases on historical populations using microdata, and the metamorphosis of historical demography

Since its very beginning, historical demography relied on the collection of highly formalized and structured data. However these remained largely local in nature and were not conceived to be publicly distributed and re-used by other scholars. In the latest 20 years or so, things changed dramatically, and a growing amount of resources have been devoted to the development of large databases on historical populations based on microdata. The availability of technologies for data storage was a prerequisite for this, but the main reason was radical transformation of the whole discipline, where a microanalytic approach became the dominating paradigm. Besides the availability of microdata and of computing facilities, the reasons for the success of the microanalytic approach include the development of appropriate statistical methods; the intellectual fascination of new theories to model individual behaviours, the opportunity to establish a fruitful dialogue with other disciplines, including economics, sociology, epidemiology, genetics, and of

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course contemporary demography. The success of the microanalytic approach is also having deep intellectual consequences: the disciplines involved are becoming much more theory-driven, much less local, much more formalized and technically sophisticated. Hence the growing interest to make larger and larger amounts of raw data accessible to scholarly public. In this, historical demography is probably in a unique position in comparison to other historical disciplines, usually more locally focused.

In my presentation, I will talk shortly of the recent evolution of historical demography, describe some of the most important databases available, and highlight the consequences of this process in the organization of research and in the intellectual and scientific profile of researchers.

❖ **Peter Boot (NL)** – Huygens Institute, Royal Netherlands Academy of Arts and Sciences

A multidisciplinary approach to the study of online literary communities

All good resources are multidisciplinary. Interesting resources tend to be interesting from multiple perspectives. They serve people with different interests from different backgrounds. One of the reasons for this is that disciplines themselves are not the inflexible single-track, single-interest communities that they are sometimes portrayed to be.

Most researchers, in addition to their home discipline, have one or more cross-disciplinary interests, which often become the main focus of their work.

The study of online literary communities is a good example of a field where a single-discipline approach would be inadequate. As social network sites, they need a sociological or ethnographic methodology. As literature sites, their study needs a literary approach, such as perhaps a form of reader-response criticism. However, unlike the case of traditional literary studies, online literary communities offer a wealth of empirical data on actual readers' responses to texts.

In my talk I will sketch what a research infrastructure for studying online literary communities might look like. It should consist of archiving tools, (shared) archives, tools to help recover site data structure from its manifestation in web pages, and adequate Natural Language Processing, querying and visualisation tools for these data. This infrastructure should support network analysis, reception theory, computational stylistics, and other approaches.

Theme 5:	Integrating extant resources

❖ **Peter Doorn (NL)** – Data Archiving and Networked Services (DANS) / ESFRI

From "me and my database" to linked data resources in the humanities

Thousands of historical, archaeological, literary, linguistic and other databases live an isolated and undiscovered life in their containers, be it databases, spreadsheets, GISes or some other software. If they survive at all.

The digital humanities took off seriously after the introduction of the PC in the 1980s. In the early years, many scholars in the humanities occupied themselves with the creation of research databases. Many papers in the field of history and computing, for example, were devoted to the structuring of historical sources in such a way that they digitally represented the original sources as faithfully as possible. In the past, I have labelled such projects mockingly as the "me and my database" approach. In archaeology, a similar "me and my GIS" trend could be observed: here the

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task was to enter the archaeological finds in a Geographic Information System, in order to visualize them in different ways on maps.

With the invention of the hyperlink, in particular in the World Wide Web, the wish to open up individual data silos and to connect them has steadily grown. Especially over the last decade, the number of projects to link up distributed data has virtually exploded. Collaboratories have been created to bring data resources together in a virtual way. The task is not just to create links, but also to produce a deeper integration, involving also a degree of harmonization or standardization.

Data Archiving and Networked Services (DANS) in the Netherlands has been and is involved in a variety of projects that have the ambition to do this: on corporate collective action (guilds), economic history (Clio-infra), medieval memory books, dendrochronology, historical demography, typological language data, and so on. One of our challenges is to find solutions for linking the data in such a way that the linked data is sustainable, because DANS' mission is to provide permanent access to data in the humanities and social sciences. We also try to find solutions that are as generic as possible, in order to reuse the technology across projects and themes. This is however easier said than done. The 'linked data' approach of the semantic web holds promises, but whether they result in solutions that satisfy the researchers' needs is by no means certain in all cases.

It is an explicit aim of DARIAH, the emerging Digital Research Infrastructure for the Arts and Humanities, to "link and provide access to distributed digital source materials of many kinds". One example of the kind of services that DARIAH will deliver is the ARENA-portal, which was created as a demonstrator in the preparatory phase of DARIAH project. Another example of such an integrating project, which has just started, is the European Holocaust Research Infrastructure (EHRI) project.

❖ **Steven Krauwer (NL)** – Utrecht Institute of Linguistics – Utrecht University / ESFRI

Integrating language resources: what's the point?

Integration of language resources has a number of dimensions, each with a different impact on the user community. Along the data dimension, users will get easy access to far more data than before and also to data originating from more languages and/or cultures. This will help linguists interested in cross-linguistic research, and also historians or social scientists in placing their research in a more international context.

Language resources can also take the shape of tools that the researcher can use to perform operations on his/her data. This allows the researcher to ask new questions to old (and new) material.

As language is everywhere (and not just in the humanities) language resources infrastructures can be an important stepping stone to cross-discipline research.

The integration of existing data and tools will invite researchers to deposit their own results in data centres, so that they can easily be shared with the rest of the community in a sustainable way and can be found by other researchers.

Quality is a delicate point: in contrast with the big physical installations where researchers have to compete for a time slot to conduct their research there is often no capacity problem for access to language resources. Only education and training and promotion of best practice will help. Reproducibility of results is an interesting side-effect that can have a high impact on quality.

Standards are a key issue. Funding agencies can play a key role here, by not only imposing that

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research results are shared through the infrastructure, but also that they adhere to common standards.

Sustainability is important, and is only possible on the basis of long term (i.e. not just project based) support from the funding agencies.

Integration will change local research practices, if only because research will become more global, but at the same time it should be said that the new kind of researchers will not automatically emerge: the use of infrastructures will have to be integrated in the education system.

❖ **Louise McNally (ES)** – Department of Translation and Language Sciences –Pompeu Fabra University / ESFRI

Four kinds of resources for Humanities research, what kind of infrastructure?

The five infrastructures in the current ESFRI Roadmap for Social Sciences and Humanities are digital in nature, providing raw data and media (especially DARIAH), massive data structures (ESS, SHARE), portals for accessing data and media (especially CESSDA), and tools for handling/accessing them (especially CLARIN). In this presentation I consider the distinguishing characteristics of these four kinds of resources and, based on my experience with existing resources as a researcher on language, I offer an assessment of the implications for the ongoing development of a Humanities research infrastructure. The first issue I will raise concerns the importance of distinguishing (to the extent possible) the "raw materials"' of Humanities research from resources that presuppose research activity; I will provide a specific example of how insufficient sensitivity to the possible future uses of a "raw material" for research can result in products (and corresponding investments) which, while useful, could have been more so. Second, I will suggest (no doubt polemically) that there is an inverse correlation between the usefulness of portals and the degree of integration of the researcher into his/her research community; if this is so, the implications may not be pleasant, but they must be looked at seriously. Finally, I will consider the consequences of the observations made in the course of this presentation for the enterprise of creating and integrating research-specific tools, and for the training of young scholars in the Humanities.

❖ **Franco Niccolucci (CY/IT)** – Archaeology Research Center – Cyprus Institute Science and Technology

Interdisciplinary Research Infrastructures in the Eastern Mediterranean

Interdisciplinary RIs for Cultural Heritage face a number of challenges. At the *Science and Technology in Archaeology Research Center* (STARC) of the Cyprus Institute (http://www.cyi.ac.cy) in Nicosia we are in the cyclone's eye because of our twofold nature, combining Science applications to tangible heritage with Digital Heritage, and our geographic scope on the Eastern Mediterranean.

As shown by STACHEM, a EU-funded regional survey of needs and potential in these two domains led by STARC, there is a strong demand for integrating available resources, especially to support teams having no easy access to laboratories.

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Challenges include:

1. Trans-national coordination of efforts: high-quality research centres exist in the region but mainly with a national scope.

2. Cross-domain integration of information produced by research, to address research questions in a holistic way from all the relevant perspectives. This will require high-level data integration using state-of-art semantic technologies.

3. Quality assurance of data and methods, especially when digital replicas are involved. Principles and best practices concerning e.g. 3D should be mainstreamed.

4. Research on tangible heritage is location-dependent: RIs should be locally rooted in a very strong way.

5. Technological innovation is quickly adopted when appropriately presented: importance of training and involvement.

6. New research patterns emerge from combined technological/cultural expertise and methodology. Examples will be provided.
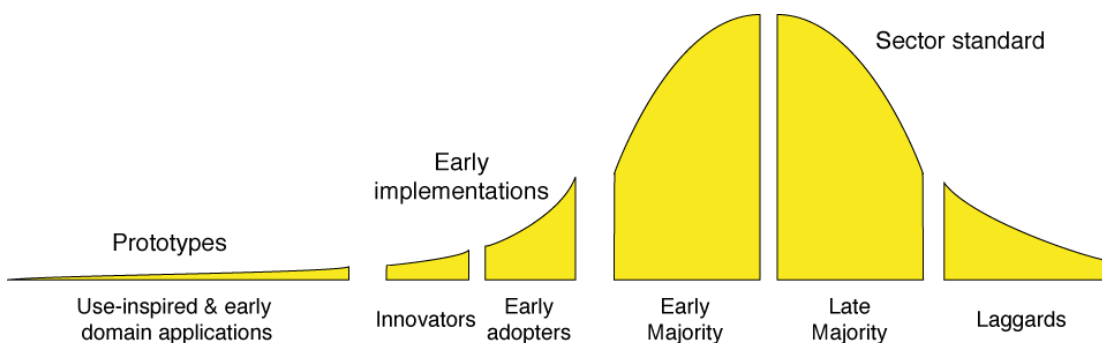
The above diagram (used in D. Arnold and G. Geser, Research Agenda for the Applications of ICT to Cultural Heritage, *Archaeolingua*, Budapest, 2008, p.77) to illustrate technology adoption, may also apply to integrated RI with adoption of innovative research patterns.