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Digital Humanities and Society: an impact requiring 'intermediation'

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Abstract. Impact and sustainability are the leitmotiv of current Research Policies in Europe. Science is required to show its positive socio-economic influence on Society, and Humanities Research is not exempt from this requirement. Within this context, Digital Humanities might enhance the external impact of Humanities Research, more specifically the commitment to public engagement, by means of strategic opportunities offered by digital techniques. To pursue this objective, intermediation seems necessary in order 'to switch on the Humanities' within Society. Indeed, virtual objects might be as silent as real ones, i.e. unused books in a library. The value of a Digital approach lies in its usability, in the additional tools and help it supplies, and in stimulating users in becoming active agents of their reading. As in good storytelling, the consideration of what can provoke reactions is as important as the narrated action itself. Digital objects can be used to stimulate and trigger users' curiosity, questions and original solutions. The paper concentrates on three elements: the requirement for external impact of research activities; the need for intermediary agents and a concrete experimentation of intermediation. Digital Humanities are analysed in the context of the Humanities and beyond the academic realm in their targeting of diverse recipients, external to the scientific community. The test conducted so far is addressed to the specific stakeholder community of teachers, whom are called to act as intermediaries between Humanities Research outcomes and the scholarly community.

Abstract. Impatto e sostenibilità sono il leitmotiv delle attuali direttive europee sulla ricerca. Si richiede alla scienza di esercitare direttamente una positiva influenza socio-economica sulla società. La ricerca umanistica non è esente da questo vincolo. In tale contesto, le Digital Humanities possono rafforzare l'impatto esterno della ricerca umanistica, ossia mirare al coinvolgimento del pubblico, attraverso le opportunità strategiche offerte dalle tecniche digitali. Per il raggiungimento di tale obiettivo, l'intermediazione sembra necessaria come 'attivatore' delle scienze umane all'interno della società. In realtà, gli oggetti virtuali possono restare inerti tanto quanto quelli reali, esattamente come i libri in una biblioteca senza visitatori. Il valore aggiunto dell'approccio digitale sta nella sua sostenibilità, nella facilità d'uso, negli strumenti e nei supporti che fornisce, oltre che nella peculiare capacità di stimolare gli utenti nel diventare agenti attivi della loro lettura. Tuttavia, così come in una buona narrazione

l'attenzione a che cosa può provocare reazione è importante quanto l'azione narrata, gli oggetti digitali necessitano di indicazioni, suggerimenti e spunti per stimolare e attivare la curiosità degli utenti, le loro domande e condurli a formulare soluzioni originali. L'articolo si concentra su tre elementi: la richiesta di impatto esterno delle attività di ricerca; il bisogno di agenti di intermediazione e la sperimentazione concreta di intermediazione. Le Digital Humanities sono analizzate nel contesto delle scienze umane, ma al di fuori dell'ambito accademico, attraverso l'individuazione di destinatari esterni alla comunità scientifica. I test eseguiti finora sono indirizzati alla specifica categoria degli insegnanti, chiamati ad agire come intermediari tra prodotti della ricerca in scienze umane e le loro classi.

Keywords: Digital Humanities, Education, Impact of Humanities, Public Engagement

1 Humanities in the Knowledge Economy - Major drivers transforming research conduct

A first relevant issue is to understand what the Humanities are required to achieve within the current context and purposes of the so-called Knowledge Economy.

The imperatives of research funding programs are very clear: *valorization* (sustainability) and *impact*, precise criteria, which, in a nutshell, imply the need to get the most return (benefit) from public research funding. This cultural climate derives from socio-economic pressures towards a *third mission* for universities, the Entrepreneurial University,[1] Interdisciplinarity in research conduct, and, more recently, towards Public Engagement and Responsible Research and Innovation.

In truth, it has been a long-standing objective if we recall Galileo's motto "La luce della scienza cerco, e 'l beneficio" (I pursue the light of science, as well as its benefit), Galileo Galilei (1564-1642).

What changes today is the novel requirement to apply this logic – *valorization* (sustainability) and *impact* – to Humanities research:

> Valorisation is at the centre of many debates on the future of academic research. Valorisation encompasses all activities that contribute to ensuring that the outcomes of scientific knowledge add value **beyond** the scientific domain.([4]: 567).

A relevant bibliography on the evolution of the discourse on valorization and impact in the Humanities is provided in [4], along with a relevant perspective view of the stakeholders involved in impact.

> It includes making the results from academic research available or more easily accessible in order to increase the chances of others – outside academia – making use of it, as well as the co-production of knowledge with non-academic groups [...]. Valorisation is therefore broader than 'commercialisation', motivated by commercial profit in the context of an increasingly marketised academy [...]. However, there is

[1] See also [19]: 91.

> also an active tension between valorisation and commercialisation, with valorisation often framed as commercialisation, potentially narrowly understood in terms of universities' economic contributions, potentially overshadowing broader societal contributions (OECD 2007). [4].

Identifying the diverse set of stakeholders involved in the research process is critical to understanding the need for interdisciplinary research groups, and to carrying out research programs oriented to problem solving (see also the following sections in this paper).

A number of structural transformations (already in place or in progress) in the scientific system have already been extensively theorised in the literature; among these, two are interdependent,[2] and are briefly described below.

1.1 Shift in research ethos: from CUDOS to PLACE

Mertonian ethics[3] (CUDOS – Communism, Universalism, Disinterestedness, and Organized Skepticism) defines what in literature is the model of public science, an *open science system*, as opposed to the secret and esoteric medieval science. A contrasting position is the view by [21], with his model (PLACE – Proprietary, Local, Authoritarian, Commissioned and Expert) for post-academic science (or industrial research). Industrial research, in contrast to academic science, respects rules that are clearly defined and strictly imposed by private organizations, which fund researchers' employment contracts. This means that industrial research pursues objectives and priorities established, ultimately, by the market. This setting favours areas of investigation of short- or, at most, medium-term applicability, to the detriment of basic or exploratory research, whose results are applicable in the long-term and are not measurable *ab initio*.

The CUDOS logic well suits, even today, the *modus operandi* of Humanities research, while the PLACE logic has been poorly, if at all, implemented in the Humanities.

In the Digital Humanities in particular, the prevailing trend is to act as an instrument and/or infrastructure for knowledge sharing and collaboration *within* the scientific community rather than outward.

1.2 New models of knowledge production: Mode-2

The model known as "Mode 2 knowledge production" is entirely consistent with the post-academic ethics in research. Following Gibbons [11], Becher & Trowler ([3]: 7) provide a concise and effective definition of the concept:

> Increasingly Science involves 'Mode 2', transdisciplinary, problem-oriented knowledge, where:

- knowledge isproduced in the context of application;
- transdisciplinarity is the norm;
- heterogeneity and organizational diversity are common;
- there is enhanced social accountability;

[2] See also [2].
[3] See also [15].

– there is a more broadly based system of quality control.

In a first approximation, the difference between the two models is that the Mode 1 knowledge production model is *internal* to the scientific community, whereas in Mode 2 the production process is driven *from the outside*.

In Mode 1, the investigation is led by academic research interests according to shared methodologies and theoretical schemes within the scientific community.

In contrast, in Mode 2 the research project is commissioned and geared towards meeting the short-term and application interests of the *consumers* of knowledge products.

In fact, a fundamental pre-requisite for the social impact of research is application to which the Digital Humanities are fully committed. In his seminal work, Boyer states:

> The scholarship of application.
>
> The first two kinds of scholarship – discovery and integration of knowledge – reflect the investigative and synthesizing traditions of academic life. The third element, the application of knowledge, moves toward engagement as scholar asks, "How can knowledge be responsibly applied to consequential problems? How can it be helpful to individuals as well as institutions?" And further, "Can social problems themselves define an agenda for scholarly investigation?" [5].

2 Consultation on the state of the Social Sciences and the Humanities (SSH) in Europe

With regard to the merits of the Humanities, among the European Commission's broad spectrum of activities and initiatives, a consultation addressed to socio-humanistic researchers in Europe was launched between April and July 2013 and asked five fundamental questions:

1. SSH research is often conducted in disciplinarily defined contexts. Can you give examples of how your own research area has been involved in: (a) opening up to other research fields, (b) translating findings and/or methods to or from other academic fields, (c) contributing to the emergence of new, cross-disciplinary fields, and/or (d) transcending, with its results and insights, the fields of academic research?
2. The research agendas of the different subfields of SSH are very heterogeneous. What are the broad research questions, new methodological or theoretical developments, or generally new approaches that are high on your own research agenda? Which ones are high on the research agenda of your field? Where do you see potential contributions to societal relevance?
3. Horizon 2020 will provide new opportunities for SSH to contribute to new research on societal challenges. What are the potential contributions from your field?
4. Do you foresee (or have you experienced) obstacles that may prevent you and your research community from making contributions to the societal grand challenges approach? Please provide specific indications.
5. In order to foster a more integrative approach that would also benefit the SSH research communities, what would you consider the most important incentives that Horizon 2020 could provide?

The results of the analysis of the 306 consultation responses received from all over Europe are available at: <http://cordis.europa.eu/result/rcn/141620_en.html>.[4]

They have provided valuable input for the drafting of the Vilnius declaration on Horizons for SSH: "Europe will benefit from wise investment in research and innovation and Social Sciences and Humanities are ready to contribute".[5]

3 Economic and Social impact of Research (Humanities-focused Perspective)

A crucial question is how theoretical models and socio-economic pressures affect research evaluation and, consequently, the funding criteria of research projects.

From an international perspective, the OECD Frascati manual, in its 2015 Edition, puts new emphasis on the Humanities in measuring research activities and outcomes. This has a direct influence on the very definition of Research & Development (R&D), as explicitly asserted in the manual:

> This manual gives greater emphasis than past editions to the social sciences, humanities and the arts. This requires no changes in the definitions and conventions, but it does require greater attention to the boundaries that define what is and what is not R&D.
>
> [...]
>
> Definition of research and experimental development (R&D)
>
> 2.5 Research and experimental development (R&D) comprise creative and systematic work undertaken in order to increase the stock of knowledge – including knowledge of humankind, culture and society – and to devise new applications of available knowledge.
>
> [...]
>
> For an activity to be an R&D activity, it must satisfy five core criteria.
>
> 2.7 The activity must be:
>
> – novel
> – creative
> – uncertain
> – systematic
> – transferable and/or reproducible. ([9]: 44-5).

Furthermore, the Frascati manual 2015 formulates a number of stringent criteria for activities in the Humanities to be classified as 'research activity':

[4] http://cordis.europa.eu/result/rcn/141620_en.html

[5] Vilnius Declaration – Horizons for Social Sciences and Humanities, September 24th, 2013 – Vilnius, Lithuania

R&D in the social sciences, humanities and the arts

2.102 In the definition of R&D in this manual, the phrase "knowledge of humankind, culture and society" includes the social sciences, humanities and the arts. Also for the social sciences, humanities and arts, the use of clear criteria to identify R&D, such as having an appreciable element of novelty and dealing with uncertainty, is extremely helpful for defining the boundary between R&D and related (routine) scientific activities as well as non-scientific investigations. The conceptual, methodological and empirical components of the project concerned have to be taken into consideration to identify an R&D activity.

2.103 In the social sciences – e.g. sociology, economics or political science – data collection activities, e.g. statistical surveys on specific populations, can only be included in R&D if they are undertaken as an integral part of a specific research project or for the benefit of a specific research project.

2.104 For the humanities, the same approach could be used as for the arts (studies on literature, music, visual arts, theatre, dance and other performing arts). Their historical or comparative nature can be pointed out as well as the relevant role played by universities or other specialised institutions in developing scientific guidelines to be followed by the scholars in the field. ([9]: 74).

Worth to notice is the view of the OECD that seems to penalize the Social Sciences as methodological and ancillary to research projects from the other disciplines.

It is worth noticing how the view of the OECD seems to penalize the Social Sciences as methodological and ancillary to research projects from other disciplines.

In Italy, ANVUR, the National Agency for the Evaluation of the University and Research Systems (Agenzia Nazionale di Valutazione del sistema Universitario e della Ricerca), in its 2015 Guidelines [1] identifies two kinds of activities to be assessed:[6]

- enhancement of research activities (patents, third party contracts and conventions, spinoff, intermediaries);
- social and cultural public goods production activities (*public engagement*, production and management of cultural heritage, such as museums, archaeological sites and historic buildings, continuing education, clinical trials).

'Public Engagement' is the set of non-profit activities with educational, cultural and societal value. The activities and the benefits of higher education and research can be communicated and shared with the public in many ways.

Public Engagement activities are therefore considered to be within the sphere of activities of social impact and are specified in detail in the ANVUR Guidelines (2015): [1]:

- publications signed by teaching staff at national or international level;
- investments of the teaching staff in broadcasting nationally or internationally;
- active participation in public meetings organized by other entities (e.g. scientific science cafés, festivals, fairs, etc.);

[6] See also [1].

– organization of public events (e.g. Researchers' night, open day);
– publications (paper and digital) addressed to the public (e.g. magazine of the University);
– training in communication strategies (addressed to teachers);
– interactive websites and/or popular blogs;
– community enjoyment of museums, hospitals, sports facilities, libraries, theaters and historic buildings.
– Organization of concerts, exhibitions and other public events open to the community;
– participation in programs of public interest (policy-making);
– participation in committees to define standards and technical norms;
– health initiatives (i.e. orientation days and prevention);
– initiatives in collaboration with agencies for urban development projects or local development;
– guidance and interaction with schools;
– educational initiatives for children and young people;
– initiatives for participatory democracy (e.g. consensus conferences, citizen panel).

In this list, however, Digital Humanities products are not included even if, according to Boyer (see section 1.2 of this paper), they constitute a relevant form of «scholarship of application» and, as such, are deeply oriented towards different forms of engagement. Zorich [22] identifies a set of potential partners of DH projects:

– higher education (university schools, centers, departments, and faculty and students)
– K–12 teachers and schools
– funding organizations
– industry
– cultural heritage organizations
– community groups
– federal, state, and local municipalities
– professional associations
– nonacademic professionals (e.g., multimedia producers, artists, writers)
– nongovernmental organizations
– broadcast and print media (television, radio, newspaper)
– publishers
– general public ([22]: 32-33)

In the next section of this paper, we describe a Digital Humanities (hereafter DH)project that specifically addresses teachers (the top entries in Zorich's list above).

4 Time measurement Lab: a successful intermediation experience

4.1 Circumstances

During the Festival della Scienza 2014, a group of researchers of the IRCrES-CNR[7] institute presented the event named *Time measurement Lab*, centred on the topic of *Time*, the Festival's title that year.

[7] Instituto di Ricerca sulla Crescita Economica Sostenibile del Consiglio Nazionale delle Ricerche.

The goal of the lab was to revive historical legacy for modern society on three levels: by fostering 'Public Engagement', by proposing exploitation models of contents, and by promoting an effective dialog among the operators themselves, and between the operators and the users.

Participation at the Festival was an opportunity for the researchers to propose and test an idea of enhancing the historical bibliographic legacy of the IRCrES-CNR library. The library stores approximately 250 ancient books on scientific and technical subjects; some are ancient philosophical treatises on Mathematics, Physics and Astronomy, some are 16th-18th century pre-industrial manufacturing handbooks containing drawings and practical instructions for diverse procedures, others are manuals designed for didactic purposes. The challenge was to turn the volumes of the IRCrES library from their hidden, still-life nature into a dynamic tool for developing knowledge and competences in different cultural and social settings.

Another important challenge was to initiate a conversation between Humanities scholars, technical developers specialized in DH, and users (i.e. scholars, students, teachers, and the general public). The productive communication among these three kinds of actors could lead to a successful exchange of different questions, motivations and needs.

To this end, IRCrES researchers planned a series of activities. The first activity concerned the choice of books to be digitized; the second concerned the digitization itself and the consequent decision on how to arrange files to suit different purposes. The third activity regarded the use of the digitized texts, the creation of exercises based on the contents of the texts, and identifying potential applications of these tasks in didactics.

4.2 Motivation for the 'Le macchine per fare il tempo' Lab

The lab was organized by IRCrES researchers to bring participants into close contact with a selection of ancient books stored in the IRCrES library and relevant to the topic of *Time*.

The lab defined *time* as a physical element to be *measured.* The devices proposed to explore this topic were ancient volumes about *time measuring* and *machine building* for time measurement.

In the lab, users had the opportunity to simultaneously work with two different versions of the same object or book: one real, made of paper – fragile and to be handled with care – and one virtual, digital, robust and easy to handle.

The virtual experience led the users to appreciate how different, interesting and curiosity-driven operations were possible within the texts. For example, they could browse through the summary and bookmark the subjects they were most interested in; they could also read through the transcription of the titles of the different chapters and immediately grasp the topics thanks to researchers' previous translation and interpretation work of the texts.

One of the aims of the lab was to stimulate users to test and practice their knowledge by exploring, with a multidisciplinary approach, mathematical, scientific, linguistic and literary contents. In fact, the nature of the books is diverse: the library gathers philosophical academic books on Mathematics and Physics, Astronomy and Chronology; handbooks to build concrete machines for time-measurement; and pedagogical manuals for high school and Eighteenth-century university students. By scrolling through the pages of the digitized texts, users could access information, advice and instructions about different topics.

In order to enhance the information written in the volumes, researchers had drafted a series of quiz and exercises for the participants. The solutions of the tests were all retrievable within the pages of the digitized books.

Through these experiments, users became progressively aware that, unlike today where commonly considered opposite and distant fields, the Liberal Arts and Science in the past were intrinsically joined together as part of the same heritage, sharing, indeed, a common and identical cultural background. Starting with this awareness, and eliciting the need to deepen the exploration of the contents of the digitized books on time measurement, it became evident that research and initiatives within DH only could meet novel knowledge needs.

In short, the proposal of the lab aimed at exposing people (scholars, teachers, students, and the general public) to:

- the existence of a specialized collection of ancient technical books;
- the infrastructural CNR project, *Science and Technology Digital Library*, which includes the digitization of the institute's ancient bibliographic record;
- the advantage of collaboration between different institutions, such as schools and research entities;
- the need for knowledge exchange and transfer between Humanities researchers, developers in DH, and users.

4.3 The Lab: format and contents

Different tools were made available during the lab; some physical, others 'digitally real'. The lab was spread out across three different working spaces.

The first space was a traditional yet interactive museum space. It contained modern paper books, ten ancient and rare volumes, and a series of explicative panels.

The modern books were placed on a table for free consultation. The ten ancient and rare volumes, protected in a glass case display, constituted the substantial and more appealing part of the museum space. The books were opened at a particularly relevant page of time measurement. The exhibited books were:

- *Mondo Elementare et celeste* [31]
- *Epitome gnomonica* [32]
- *Elementi di astronomia* [24]
- *Institutio Astronomica* [27]
- *Introduzione all'arte nautica* [23]
- *Caelestis Mathematicae* [29]
- *Euclides Adauctus et methodicus...* [28]
- *Planches de l'Encyclopédie de Diderot et D'Alembert* (III vol. 1758) [26]

together with three rare anastatic copies of*:*

- *Descrittione della sfera celeste* [34]
- *Trattato di cronologia* [35]
- *La meridiana del tempio di S. Petronio in Bologna* [25]

The explicative panels displayed the different conceptions of the calendar in past and present cultures. They also explained how the arrow graphically representing the direction of time on a surface was differently conceived in other civilizations and in other historical periods.

The second part of the lab included the possibility of looking inside the mechanisms of two clocks: a water clock and a spring clock. The water clock was purposely built following the instructions of a drawing of a medieval water clock reproduced by D. Landes [12] in *Storia del tempo. L'orologio e la nascita del mondo moderno*. The machine proposed at the lab was a simplified version, made with wood and perspex, of the medieval one, as the intention of building this machine was to show how it worked and its degree of performance. The spring clock, on the other hand, was opened to allow participants to observe the movement of the escapement, of the rotation of the cogwheels, as well as the beating of the hammers on a metal chanting reel at the hour, the quarter, and the half. For wider dissemination, 3D objects reproducing the clock's original movements would be desirable.

The third part of the lab consisted of a video presentation on the history of time measurement, and of two workstations to help users interact with seven digitized, and indexed, ancient books. These included some of the books exhibited in the display case:*Institutio Astronomica, Caelestis Mathematicae; Introduzione all'arte nautica; Elementi di Astronomia con breve saggio di cronologia; Epitome Gnomonica,* and also *Delle cose meravigliose del mondo* [33], and *Gli artifitiosi et curiosi moti spiritali di Herrone* (Gio. Battista Aleotti 1589), which was too fragile to be shown.

Users could:

- test their knowledge on the topic time;
- browse the digital books;
- move between indexed chapters;
- read through the biographies of the authors of the volumes.

When preparing the lab, the IRCrES researchers had to, firstly, to devise ways to raise awareness of, and disseminate, the contents of the ancient and specialized bibliographic heritage of IRCrES; secondly, to forecast how the scientific contents could be shared on the web; and, thirdly, how to make use of these contents for educational projects and how to transform them into novel interdisciplinary strategies.

4.4 Users, Interaction and Feedback

During the week of the Festival della Scienza 2014, the lab was visited by 690 students (aged between 12 and 19 years old) and 30 teachers.

Professors intervened were for the most part Maths and Physics teachers. None of them knew of the existence of a library dedicated to technical subjects in possession of a collection of rare ancient books.

Participants enjoyed the opportunity of 'touching' these precious bibliographical items, and discussed numerous teaching ideas emerging from this experience. They all agreed that exploring these primary sources was not only important for a better understanding of the history of Mathematics and Physics *per se*, but could also be used as a tool to raise awareness of the culture and the history of the civilization from which they originate.

Teachers were interested in jointly planning a method to integrate ancient knowledge within their Mathematics and Physics *syllabi* and to proceed in compiling exercises or detailed studies according to the needs and the motivations of their classes. In addition, they all agreed that they would pursue collaborations with researchers in order to understand and together elaborate on educational strategies, aware that (advanced) digital devices are integral to modern language and expression, thus allowing for more immersive classes.

Teachers envisaged numerous other benefits for their *curricula*. They expected an increase of students' curiosity and interest through the exposure to primary sources via digital means. They suggested that this approach would stimulate the advancement of competences, acquired and to be acquired by users, scholars, and technology developers, promoting a rich dialog.

Teachers expressed a need to be trained in DH and to learn how to use digital resources. They also understood the potential of DH for their own educational purposes, and asked for a dialog between themselves, scholars and developers in order to make the most of these resources. They began considering the possibility of involving their Literature and History colleagues in drafting an original and interdisciplinary syllabus for more comprehensive understanding of culture and science.

What they particularly appreciated were:

- the rapid and free access to the digital resources;
- the possibility of retrieving digital objects stored in local libraries from their personal workstations;
- the user-friendly interface for consulting and reading through ancient fragile volumes.

5 Concluding remarks

The lab experience led to the establishment of a new interdisciplinary dialog between teachers, scholars and DH developers. In particular, the project pointed out the efficiency of some opinions, and of some best practices implemented by the lab. The main driver behind the lab was the understanding that the DH approach was appropriate to opening up access to resources as fragile as ancient books. Both students and teachers welcomed the lab. The positive result can be attributed to the connections built between different approaches and actors. The most evident issue was the dynamic and interactive structure of the proposed method, where end-users could benefit from the contents of the books selected for the project. Specifically, it means that, beyond the 'front-end' – built by the previous work of philologists, 'scriptwriters', and technical developers –, technologies and DH are fed by the end-users' increasing competence and curiosity.

In order to foster skill, questioning, and thirst for tool and content knowledge, the lab confirmed that a strict collaboration between all actors is necessary. Furthermore, as our first impact domain was, and is, schools, and as the bibliographical library of IRCrES-CNR covers science and technology, a first step to identifying useful content for scientific education could be to seek the collaboration of teachers. This collaboration, in turns, contributes to the definition of priorities in digitization policies, and focuses on real didactic needs. A dialog for mutual knowledge among developers and users is also suitable to know better and better tools and their potential.

This lab provides a digital platform together with a new way of structuring a discourse around the chosen bibliographic items. Indeed, digitization and the archival storage of digital objects improve access but do not modify the relationship between books and readers. The main qualities of a digital approach lie in its usability, in the additional tools and help it supplies, and in making users active agents of their reading. All this 'equipment' is as efficient as it is well targeted, robustly fitted out, and strongly communicative. As in good storytelling, the consideration of what can provoke reactions is as important as the narrated action itself. Digital objects can be used to stimulate and trigger users' curiosity, questions and original solutions.

The ongoing debate on the value of the Humanities is multifaceted, as is that of DH. There is a resistance to embrace a research approach based on a utilitarian logic; nevertheless, the evaluation criteria of funding agencies are rigid and geared towards the logic of sustainability.

A somewhat bitter quote provides food for thought: «As much as we do not like it, we have to partner with businesses in order to perform high-quality intellectual work. Research is a luxury, one we cannot afford to lose». ([14]: 6).

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