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e-Infrastructure adoption in the social sciences and humanities: cross-national evidence

Franz Barjak[1], Julia Lane[2], Zack Kertcher[2], Meik Poschen[3], Rob Procter[3], Simon Robinson[4], Gordon Wiegand[1]

[1] University of Applied Sciences Northwestern Switzerland

[2] National Opinion Research Center at the University of Chicago (NORC), USA

[3] National Centre for e-Social Science (NCeSS), UK

[4] empirica Communication and Technology Research, Germany

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Abstract

This paper is a first attempt to compare e-Infrastructure adoption across the UK, continental Europe and the USA. Using data from a survey among early adopters in the social sciences and humanities we find three differences across these countries, each potentially affecting adoption: funding approaches, the technical configuration of projects and research support. Our findings also suggest that the purpose of e-Infrastructure adoption (for research or teaching) as well as the scientists' orientation from a geographical perspective – local embeddedness versus a non-local, mainly national, orientation – influence why some successfully work with e-Infrastructure and others do not.

Key words

e-Infrastructure, research infrastructure, adoption, social sciences, humanities

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Olten, October 2008

Franz Barjak, Gordon Wiegand, Julia Lane, Zack Kertcher, Meik Poschen, Rob Procter, Simon Robinson

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1 Introduction

The aim of this paper is to compare the adoption of e-Infrastructure in the social sciences and humanities (SSH) between the USA, the UK and continental Europe. The US and the UK can be considered as the path setters of e-Infrastructure development, in the western hemisphere and probably world-wide (Schroeder *et al.* 2007). As Figure 1–1 suggests, many other countries like Ireland, the Netherlands, Japan, China, India, Australia, Germany, Italy, have followed the leaders and started to build their own national e-Infrastructures.

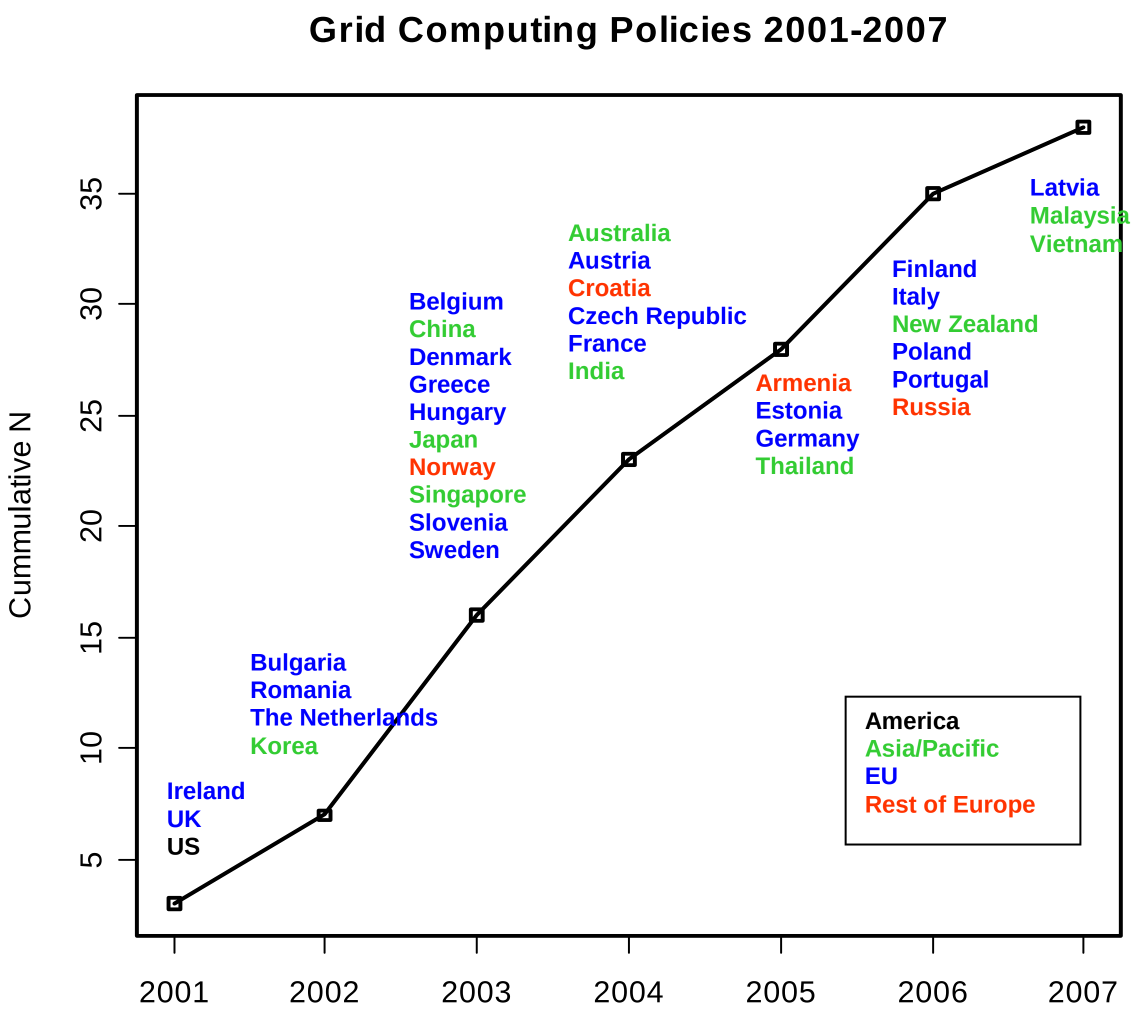

Fig. 1-1: Grid Computing Policies 2001-2007

However, the results of these investments are yet to be seen across different scientific disciplines. As the development of cross-national infrastructure has for many years been one of the pillars of European research policy (European Commission 2000, 2001), the European Commission has become an important promoter of e-Infrastructure in Europe. These efforts have led some experts to propose that Europe is “leading the pack” (Gentzsch 2005).

While public investments may differ across countries, there are a number of shared and distinct characteristics to these national programs (Schroeder *et al.* 2007; Schroeder & Fry 2007).

For instance, the US National Science Foundation and some other US institutions invested in the development of Cyberinfrastructure to establish a national technology infrastructure that caters mainly to large scientific projects, such as genomic research. Similarly, at the core of continental Europe's policy has been particle physics and in particular the Large Hadron Collider at CERN, the European Organization for Nuclear Research (see http://lcg.web.cern.ch/LCG/overview.html).

Furthermore, common to these initiatives is their computer science and engineering perspective. One notable example can be found in the European e-Infrastructure Reflection Group's (e-IRG) *e-Infrastructures Roadmap* that focused on outlining the necessary steps Europe should take in regard to e-Infrastructures in the next twenty years (Leenaars *et al.* 2005). Likewise, in the UK the main interest of the e-Science program is computational research and applications in computational scientific fields such as bioinformatics. Indeed, by January 30, 2005, two third of the projects in the e-Science program shared this computational orientation (Wouters & Beaulieu 2006). Still, e-Science appears to have a broader agenda, as most projects aimed to go beyond their application domain and develop e-Infrastructure tools for the wider research community.

Thus, while e-Infrastructure activists are envisioned to be used by all scientific disciplines their orientation have been grounded to particular domains. To ameliorate this tension e-Infrastructure advocators have explored the potential of their technologies to scale beyond the physical and natural sciences into the social sciences and humanities. In the US, scientists have explored the potential uptake in workshops and commissions producing remarkable reports such as the one on *Cyberinfrastructure and the Social Sciences* (Berman & Brady 2005) and on *Our Cultural Commonwealth* (ACLS Commission on Cyberinfrastructure for the Humanities and Social Sciences 2006). These efforts have kicked off the development of e-Infrastructure in these domains. In the UK, a set of exploratory studies were commissioned by the Economic and Social Research Council in 2003. These preliminary investigations have subsequently led to the establishment of the National Centre for e-Social Science (Procter *et al.* 2006, Halfpenny *et al*. in press). Eventually, several UK research councils established such domain-specific offices to implement dedicated programs and support researchers in the development and uptake of e-Infrastructure (see http://www.rcuk.ac.uk/escience/default.htm).

The US and the UK's efforts appear as an exception as no other European country has adopted an initiative that promotes e-Infrastructure uptake by the social science or humanities.[1] At the same time, the European Strategy Forum on Research Infrastructures ESFRI has recognized the importance of including these domains of science in the ESFRI Roadmap report. This foundational report identified three long-term strategic goals for SSH research infrastructures: comparative data and modelling, data integration and language tools, and coordination (European Strategy Forum on Research Infrastructures 2006). These aims create a potential for researchers in SSH who want to develop or use e-Infrastructure.

Considering that all e-Infrastructure initiatives aim to scale beyond the natural and physical sciences by engaging social scientists and humanist scholars we ask the following questions. (1) How do the different e-Infrastructure national policies influence researchers' involvement with e-Infrastructure? And (2) What are the catalysts and barriers that early adopters in different countries encounter?

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[1] Maybe with the Netherlands as an exception, were various e-Research initiatives in the social sciences and humanities have been reported (Wouters & Beaulieu 2007).

2 Data

Data for this study were collected through an email survey in the spring of 2007. Our aim was to cast the net wide enough to ensure a useful number of responses from social scientists and humanity scholars. Our sample was compiled from the participant lists in UK and US e-Infrastructure events and activities. In particular, we relied on lists provided by the National Centre for e-Social Science and the National Science Foundation, and the ESFRI working groups. To ensure a comprehensive list we also conducted targeted Internet queries on the various pertinent programs, projects and conference pages. To identify additional participants our survey also included a snowball component. The final sample involved more than 1900 individuals who were interested and potentially involved in e-Infrastructure work. This sample included scientists from 45 countries and various institutional domains – such as universities, governmental research organizations, and commercial firms. Of the 450 usable responses we received (24% of the sample), the UK and the US each made up roughly one third; one fourth came from continental Europe and fewer than 10% from other countries (see table 2–1).

Tab. 2-1: Country distribution of responses

	Cases	**in %**
Continental Europe	114	25.4
UK	156	34.8
USA	139	31.0
Other countries[a]	39	8.7
Total[b]	448	100.0

a Other countries with significant participant numbers in the survey are Australia (11), Canada (10) and New Zealand (7).

b Total of 450 cases, 2 cases without country information.

In addition to the snowball component, the survey included items on four main areas: (1) the respondent's organizational affiliation, time use (for research, teaching), collaboration network, and level of experience with e-Infrastructure; (2) the respondent's current involvement with an e-Infrastructure project; (3) funding, technological configuration, scientific results and other characteristics of this project; and (4) the respondent's experiences on the catalysts and barriers to the development and implementation of their e-Infrastructure projects.[2] We should note that in the survey we relied upon a common e-Infrastructure definition, that is used, by such groups as the e-IRG. According to this definition, e-Infrastructure is viewed as an *integrated ICT-based research infrastructure* (Leenaars *et al.* 2005). Key elements include networking infrastructure, middleware and various types of resources (such as supercomputers, sensors, data and storage facilities). Though the definition includes established components like supercomputers, the World Wide Web and e-mail as well as newer technologies e-Infrastructure is regarded as an integrated technological parcel.

[2] A full report on the survey results can be obtained from the authors upon request.

3 Results

a) Involvement with e-Infrastructure

Respondents' involvement with e-Infrastructure was assessed through a number of questions on their background and the e-Infrastructure projects on which they reported: the experience with e-Infrastructure, the number of projects in which they have been involved and the size of the main project (measured through several input and output variables).

Respondents' involvement in e-Infrastructure projects is similar across countries. Around 50% currently use these technologies. 10-15% have previously used e-Infrastructure but do not use it any more, and around 35% do not utilize this infrastructure. However, the rate of respondents who intent to use e-Infrastructure in the future is highest in continental Europe (15.3%), followed by the UK (13.7%), and the US (9.3%, total of all responses is 13.6%).

Tab. 3-1: User status of e-Infrastructure by country

	Continental Europe	UK	USA	Total[a]
Current user	51.0%	51.1%	52.7%	51.2%
Former user	14.3%	10.7%	12.4%	11.8%
Non-user	34.7%	38.2%	34.9%	37.1%
Total	100.0%	100.0%	100.0%	100.0%
Cases	98	131	129	391

a Including 33 cases from other countries outside of Europe and the US.

We also asked the respondents about the year in which they first became engaged with e-Infrastructure and in how many e-Infrastructure projects in the social sciences and humanities they have been involved. To reduce the influence of some extreme values which might have been caused by varied understandings of e-Infrastructure we show in Figure 3–1 median values. For both variables, respondents from the US show more enduring and enhanced involvement than European respondents. The UK efforts are relatively recent. On average, UK respondents only started to work with e-Infrastructure in 2003.

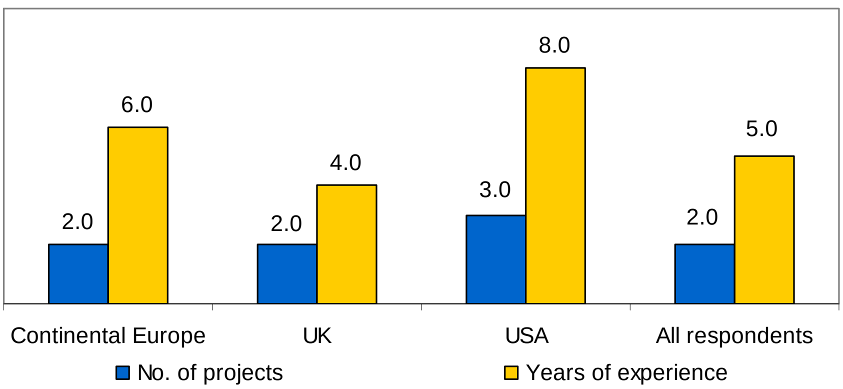

Fig. 3-1: Experience in e-Infrastructure projects by region of the respondent (median)

One third to one fourth of the respondents provided data on their current e-Infrastructure projects (see Tab. 3–2). UK projects are smaller than projects from the other regions, both in regard to people and budget. In particular, they involve only half as many scientists and very few graduate students. According to the project budgets given by continental European and US respondents their projects were 1.5-2 times larger than those noted by UK respondents. However, we suspect that the budget differences may be just a consequence of longer project durations in continental Europe and the US. When considering annualized budgets the difference is reduced to only 20%.

Tab. 3-2: Characteristics of projects

		Continental Europe	UK	USA	Total[a]	Respondents
People involved	Total	15	10	20	14	178
	Scientists	8	4	7	5	167
	Graduate students	4	1	5	3	165
Funding in 1'000 €	Total	734	307	522	335	119
	Annual[a]	188	151	164	149	116
Scheduled funding period in months		36	30	36	36	160

a Partially estimated from total budget and project duration figures.

Funding structure, on the other hand, exhibits a number of distinctions (see table 4). The funding portfolio of continental European projects was more diverse. These projects have received roughly equal support from national research councils or research foundations, the European Union, education ministries and the respondents' own institutions. UK projects mainly rest on funding from the research councils and some internal institutional contributions. In the US, both the National Science Foundation and the respondents' own institutions were the core e-Infrastructure funding bodies. Local education bodies, private foundations and other unidentified sources contributed to up to one fourth of the projects budget. Taking all sources listed in table 3–3 together, responses from the US and continental Europe point to multiple sources per project—on average, 1.8 in the US and 1.5 in Europe. In the UK it adds up to only 1.1 different funding sources per project which restates the dominant role of the research councils and their affiliates.

Tab. 3-3: Funding structure of projects[a]

	Continental Europe	UK	USA	Total
National research council or research foundation	36.4%	63.3%	54.9%	52.8%
European Union	30.3%	6.3%	2.8%	11.5%
National/state research or education ministries	28.8%	12.7%	21.1%	20.4%
Own institution	33.3%	19.0%	50.7%	34.0%
Private foundation	9.1%	1.3%	26.8%	12.3%
Other	12.1%	7.6%	22.5%	13.2%
Respondents	66	79	71	235

a Positive responses in % of total responses (multiple funding sources per project possible).

Among the technological features the clearest differences are (see Tab. 3–4): the comparatively low importance of high bandwidth in the UK, the high importance of learning environments and high performance computing and communication in the US, and the backlog in continental Europe in regard to Grid-enabled videoconferencing.

Tab. 3-4: Technological features of projects[a]

	Continental Europe	UK	USA	Total
Collaboration tools/systems	83.9%	77.3%	83.1%	82.0%
Distributed data, data repository	89.3%	81.8%	69.0%	79.1%
High bandwidth	71.4%	48.5%	70.4%	63.0%
High performance communication	39.3%	40.9%	56.3%	47.9%
Learning environments	41.1%	33.3%	47.9%	39.8%
High performance computing	32.1%	34.8%	42.3%	36.5%
Grid-enabled videoconferencing	17.9%	36.4%	32.4%	30.3%
Innovative data collection methods	26.8%	21.2%	25.4%	26.1%
Virtual/3D environments	14.3%	13.6%	21.1%	16.1%
Other	17.9%	9.1%	8.5%	12.3%
Respondents	56	66	71	211

a Positive responses in % of total responses.

The vast majority of 80-90% of the projects have published, developed new tools, established further collaborations, and engaged in new methods (see Tab. 3–5). However, collaborations, new tools, data and methods were more often stated as outcomes in the US than in Europe. Again, we interpret these differences as a result of the longer experience of US scientists with e-Infrastructure (see Fig. 3-1, above) and the more advanced state of the projects in which they are engaged.

Tab. 3-5: Project outcomes[a]

	Continental Europe	UK	USA	Total
Publications	92.3%	84.3%	85.5%	86.5%
New tools	75.0%	80.4%	85.5%	83.6%
Follow-on collaborations	71.2%	76.5%	92.7%	83.6%
New methods	69.2%	72.5%	85.5%	75.4%
New data	57.7%	62.7%	74.5%	66.7%
Others	13.5%	7.8%	18.2%	12.9%
Patent Applications	1.9%	0.0%	1.8%	1.2%
Respondents	52	51	55	171

a Positive responses in % of total responses.

b) Information sources, catalysts and barriers on e-Infrastructure

Another section of the survey asked respondents about the catalysts and barriers in the adoption process of e-Infrastructure and how they learned about it. Word of mouth from other scientists is the most important source of information (see Fig. 3–2). Staff responsible for computers and IT infrastructure is also an important information source, whereas written information on e-Infrastructure is the least often cited source for learning about these technologies. Meetings or workshops on the topic were of higher significance in the UK compared to the other countries.

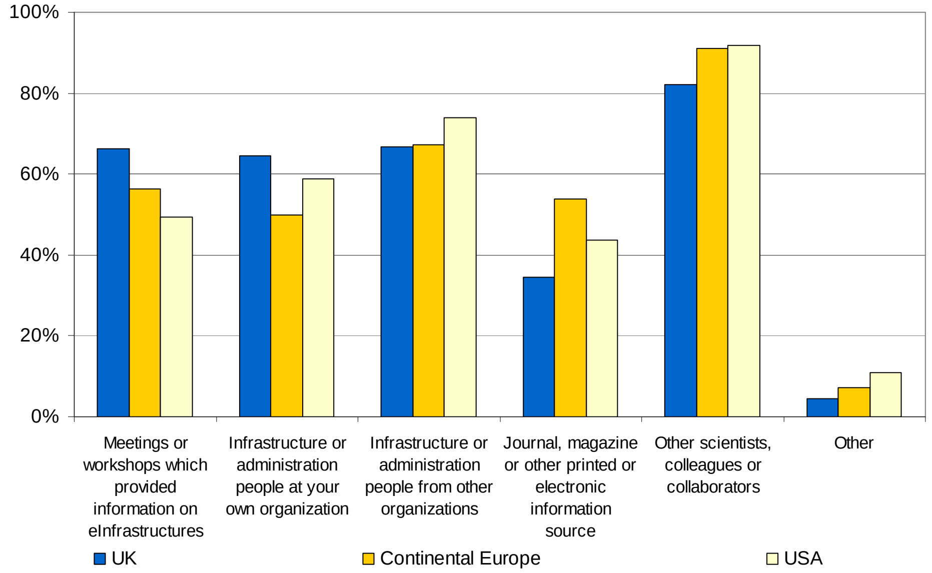

Fig. 3-2: Sources of information on e-Infrastructure by country (% of respondents who considered a source as very or somewhat important)

We see a triangle of catalysts of e-Infrastructure adoption – collaboration, funding and contribution to interesting research – in Fig. 3–3. In Europe the computational requirements also play a larger role than in the US. Support for teaching was seemingly irrelevant and the other listed responses do not show any notable differences. Among the barriers there are mainly funding/costs and staff that mattered for all respondents. In the UK, confidentiality problems regarding data and the applicability of the technology were of more importance than elsewhere.

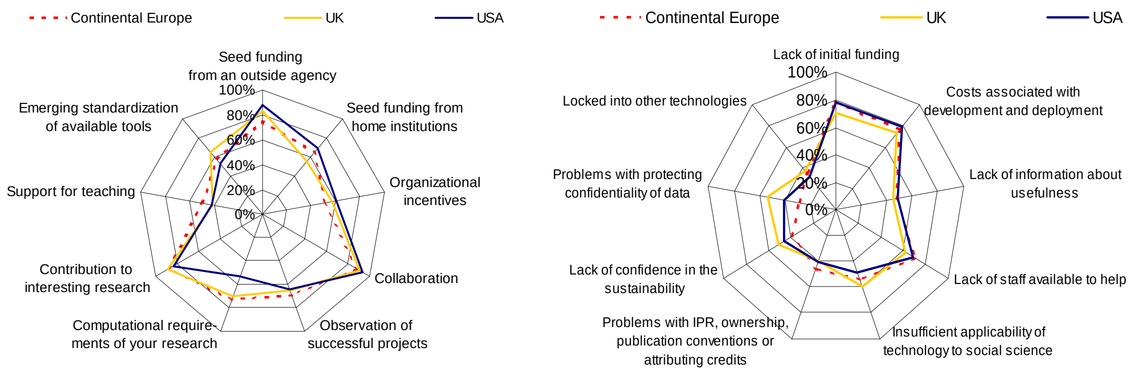

Fig. 3-3: Catalysts and barriers for work with e-Infrastructure by country (% of respondents who considered a response as very or somewhat important)

On top of this more detailed information on the relevant information sources, catalysts and barriers we conducted a cluster analysis to identify response patterns. The hierarchical clustering employed the Ward algorithm and used the squared Euclidean distance as distance measure. Our cluster analysis grouped the respondents into six different clusters:

- Localists and information isolates (44 respondents). Respondents from this cluster highlight the importance of their local organization for motivating the use of e-Infrastructure while at the same time also pointing to a lack of information from external sources.
- Technology-averse scholars (28). This cluster consists of respondents who turned to e-Infrastructure for finding support for their teaching; as a matter of consequence they are less affected by research-related catalysts and barriers, like expected benefits for research, computationally demanding research, IPR or confidentiality problems. Their work suffers more from a lack of staff and infrastructure support.
- Research-oriented low-raters (13): This (rather informal) label is used for a cluster of respondents who gave all variables in the areas of information sources, catalysts and barriers lower than average ratings. This means that they benefited less from information sources; they were less often drawn to e-Infrastructure through seed funding, but they were also less often burdened by funding problems. They were drawn to e-Infrastructure mainly through their research and encountered few barriers in the course.
- High-raters (45). The opposite of the previous cluster is a cluster in which all the variables received higher than average ratings. All information sources played a more important role, in particular people from infrastructure departments and administration. Among the catalysts all were rated highly, too. Collaboration was deemed important by all respondents in this cluster, seed funding from outside and contribution to research by all but one. Like other respondents, the most important barriers cited were funding and staff related. However, the other problems, in particular those of IPR, confidentiality and sustainability were also rated highly.
- Locally isolated researchers (15). A fifth cluster consists of respondents who received little information, funding or other support from their own organizations, but nevertheless decided to become involved with e-Infrastructure. They did so because their research required it. They consider themselves well informed, in particular through other scientists and meetings. They encountered IPR, confidentiality and sustainability problems nearly to the same extent as difficulties with funding, cost and staff.
- External fund raisers (24): The sixth and last cluster consists of respondents who received information, technical and personnel support at their organizations but not funding. The acquisition of initial funds for which they had to turn to other organizations, was by far their biggest problem in the adoption process.

The distribution of the clusters across countries is shown in Tab. 3–6. UK respondents are spread across the clusters rather evenly with localists/information isolates constituting the largest share. Among the respondents from continental Europe are hardly any locally isolated researchers, but localists/information isolates, high-raters and technology-averse scholars add up to nearly 70% of all respondents. The USA respondents are also frequently in these three groups, with nearly a third among the high-raters; 20% of US respondents was classified as external fund raisers.

Tab. 3-6: Clusters by country

	Continental Europe	UK	USA	Total
Localists/information isolates	26.7%	25.5%	21.1%	26.0%
Technology-averse scholars	20.0%	17.6%	15.8%	16.6%
Low raters	11.1%	11.8%	3.5%	7.7%
High raters	22.2%	19.6%	31.6%	26.6%
Locally isolated researchers	4.4%	15.7%	8.8%	8.9%
External fund raisers	15.6%	9.8%	19.3%	14.2%
Total	100.0%	100.0%	100.0%	100.0%
Respondents	45	51	57	169

4 Influences on e-Infrastructure adoption

As a next step we explored the various possible influences on e-Infrastructure adoption in a series of multivariate regressions. Adoption was operationalized in two different ways. As a discrete option distinguishing users and non-users and as a cumulative process considering the number of years that a respondent has been involved with e-Infrastructure. These results are reported in Tab. 4–1 which provides different functional specifications for the same set of variables (variable definitions are shown in the annex). The variables were selected on the basis of bivariate calculations eliminating those that would not contribute anything to explaining the variance of the dependent variable.

Tab. 4-1: Regressions on adoption status (current users = 1, non-users = 0)

Model	PROBIT	LOGIT	COMPLOG	GOMPERTZ
Constant	1.160	2.064	0.612	2.650+
CONTEUR	0.106	0.143	0.176	0.064
UK	0.231	0.333	0.292	0.233
RESEARCH	0.656	1.299+	0.472	1.619*
PROFESS	0.491	0.888	0.405	0.910
SCHOLAR	-0.030	-0.028	-0.064	0.102
RESINST	1.131+	2.053	0.977	2.793*
COLLOWN	0.012	0.019	0.014+	0.015
COLLNAT	0.021*	0.037*	0.021*	0.036**
B_20	-0.199+	-0.325+	-0.202*	-0.322*
B_22	-0.221*	-0.398*	-0.193+	-0.407**
D_2	0.128	0.190	0.155	0.115
D_3	-0.154	-0.251	-0.162	-0.198
D_8	0.301**	0.522**	0.274**	0.484**
D_13	-0.361*	-0.630*	-0.327*	-0.672**
D_16	0.152	0.272	0.126	0.304+
D_20	-0.165	-0.278	-0.166	-0.240
Model statistics				
Restr. LogL	-86.53	-86.53	-86.53	-86.53
LogL	-68.14	-68.15	-68.06	-68.35
Pseudo R2[a]	0.228	0.228	0.229	0.225
Chi-squared	36.78**	36.74**	36.94**	36.34**
Cases	160	160	160	160

a Pseudo R2 = $1-(LogL/Restr.LogL)^{(-2Restr.LogL/n)}$

On the variable definitions see the annex Tab. A–1.

Significance levels: + < 0.1, * < 0.05, ** < 0.01

First we note that there is no effect of the country of the respondents (CONTEUR, UK) on adoption. There is also no effect of their activity profiles, i.e. whether the respondents have the activity patterns of RESEARCHers, PROFESSionals or SCHOLARs. A positive effect can be seen for the type of organization. Surprisingly, we find that respondents from non-university research institutes (RESINST) are more likely use e-Infrastructure technologies than respondents from other organisations, mostly universities. In addition, the range of the collaboration network also bears some relationship to e-Infrastructure use. Distinguishing between collaborators at the same organization, at other organizations in the same country and at foreign organizations we see that e-Infrastructure use correlates with a large share of collaborators at other organizations in the same country (COLLNAT).

Next, we included in the regressions a set of variables taken from the questions on the roles of information sources, catalysts and barriers in the adoption of e-Infrastructure. We see negative effects if respondents stated that information from other people at their organization (B_20) or from printed sources (B_22) was important in the adoption. In these cases, respondents are more probable to be non-users than users of e-Infrastructure. A clear positive relationship is shown for the support for teaching (D_8), i.e. respondents who claimed that this factor was important in the adoption are more likely to be e-Infrastructure users. As we already argued above, costs are a critical barrier in the adoption process. This is also confirmed in the multivariate regressions (D_13).

Regressions with the same set of variables on the experience of the respondents with e-Infrastructure, measured as the number of years since they have first become involved with e-Infrastructure, produced only one result that is worth mentioning (but not shown as it is already presented in Fig. 3–1): respondents from the UK became significantly later involved than other respondents.

Another set of regressions was run on the size of the projects reported by the respondents. Size was measured in two different ways: first through the number of people involved and second through the project budget. The number of people involved in the projects is an integer that varies in the dataset between 1 (4 cases) and 1000 (1 case). The median is 14, the arithmetic mean 31.7 and the variable is considerably skewed to the right. Count data models best fit to this type of data (Cameron & Trivedi, 1998) and we estimated Poisson and Negative Binomial models. In the case of over- or underdispersion, as indicated by the significant alpha parameter in Tab. 4–2, the Poisson model with a robust covariance matrix and the Negative Binomial model are superior to simple Poisson models (Greene 2002).

We see again in Tab. 4–2 what we already had seen in Tab. 3–2, namely that in UK projects there are significantly fewer people involved than in projects from the US or continental Europe. We also see that projects reported by RESEARCHers and SCHOLARs were smaller than those reported by administrator type of respondents, which is only logical, as larger projects require a more sophisticated project management and administrative back office. The collaboration network is not very relevant in this case and neither are – to our astonishment – any of the funding variables. Instead of the single variables on information sources, catalysts and barriers in the adoption of e-Infrastructure we included in these estimations the cluster categories (see above). We find that the so-called “research-oriented low-raters” (LRATER), i.e. respondents who gave all variables a rather low rating on the available 5-point scales, and external fund raisers (FURAISE) reported on small projects. This is indeed a plausible result, as we would expect that smaller projects encounter fewer barriers to realisation and that projects that needed external funding early on to get started are smaller because of tighter budget constraints.

Tab. 4-2: Regressions on project size (total staff of the project)

Model	**POISSON, robust**	**NEGBIN**
Constant	4.716**	4.087**
CONTEUR	0.341	0.176
UK	-0.841**	-0.651**
RESEARCH	-0.474+	-0.427+
PROFESS	0.213	-0.089
SCHOLAR	-0.811**	-0.766**
RESINST	-0.596	-0.219
COLLOWN	-0.016*	-0.008+
COLLNAT	-0.004	0.002
EUFUND	0.146	0.492
GOVFUND	0.297	0.086
OWNFUND	-0.260	-0.123
OTHFUND	-0.120	-0.026
LOCALIST	-0.482*	-0.287
TAVERSE	-0.373	-0.285
LRATER	-0.679*	-0.712*
DISINTEG	0.254	-0.003
FURAISE	-0.558+	-0.521*
Alpha	–	0.608**
Model statistics		
Restr. LogL	-2402.211	-554.911
LogL	-1527.354	-1527.354
Chi-squared	1749.714**	1944.887**
Cases	140	140

On the variable definitions see the annex Tab. A–1.

Significance levels: + < 0.1, * < 0.05, ** < 0.01

The regressions on the project budgets did not produce any results that are worthy of being presented here.

5 Summary and conclusions

The exploratory data on e-Infrastructure adoption in the social sciences and humanities in continental Europe, the UK, and the USA does not always paint a clear picture. However, it shows some facets that can be investigated further and are worth of being discussed among e-Infrastructure policy makers and the social science and humanities communities concerned with e-Infrastructure.

One of the interesting differences between continental Europe, the UK and the USA appear to be funding models and the problems associated with funding in general. The annualized project budgets are quite similar in all three countries and mainly shorter project durations cause smaller total budgets in the UK. However, funding structures differ across countries and we see a much more pronounced role of private foundations and own institutional money in the US. This is compensated in continental Europe by the EU and national (or regional) government grants and in the UK by the research councils and the Joint Information Systems Committee (JISC) as a particularly significant funder. This seems to have created a slightly more relaxed funding situation in the UK than elsewhere, as UK respondents less often pointed to funding barriers. It also reduced the pressure on UK scientists to look for funds from other sources outside the “regular” range of science funding. At the moment, it is hard to say whether this is an asset or a liability. Sufficient internal science funding probably eases initial adoption. However, in the long run this funding is not sustainable and it might prove difficult to keep the projects alive and convert them into “true” infrastructure that is used by follow-up research and other researchers who have not participated in the original development.

A second issue relates to the technical configuration: in Europe, both the UK and the continental part, the computational requirements of the research constituted a bigger incentive to use e-Infrastructure than in the US. We may gather that regularly available computational resources of social scientists and humanists are poorer in Europe than in the US. However, at the same time 40% of the US respondents stated that high-performance computing was a feature of their project compared to only one third in Europe. These survey responses might appear contradictory at first sight, but they are not: in Europe SSH researchers in need of better computing infrastructure turned to the Grid, but have not necessarily found what they were looking for. If this is so, it creates an adoption problem in the long run. Drop-out rates are still quite similar in all countries and the rate of former users varies between 10% and 15%. But we would expect this to shift to the negative, if the European Grid and e-Infrastructure framework were not be able to accommodate the technical needs of social scientists and humanists to a sufficient extent.

The third issue that shows up refers to the information sources and the supporting information infrastructure of Grid and e-Infrastructure developments for social scientists and humanists. In the UK we see high importance of meetings and workshops for learning about e-Infrastructure compared to continental Europe and the US. Still, this made it possible for UK respondents to adopt e-Infrastructure bypassing their local organizations – the rate of respondents who are classified as “locally isolated” is highest in the UK. A support system of e-research centres, as it has been established in the UK, is obviously well suited to help researchers who would otherwise not have sufficient local support for becoming involved with e-Infrastructure.

Besides these country differences, we find that the cluster analysis and the regressions point to two influential dimensions in the adoption process. The first dimension is the research-teaching dimension and the second dimension is one of local embedding versus non-local, mainly national collaboration.

- The promise of interesting research is clearly an important incentive for investing time in e-Infrastructure. Without this incentive, many would not be willing to bear the associated learning and other costs. However, using e-Infrastructure for research also raises the stakes in many regards, e.g. quality, professionalism, or data protection, as the work results will be communicated to the scientific public. In teaching, the audience is more restricted, the target group usually being students at the same organization; the interest is not so much on the mere results of the work but more on the process and the "how-to-do things". Fault-tolerance is higher, too, with younger people being more open to technology and willing to improvise if necessary. Taking these arguments seriously it is surprising to find that support for teaching is not an important driver for becoming involved with e-Infrastructure. However, those who became involved for this reason, encountered fewer problems, became less often frustrated, and consequently more often list among the users than among the non-users of e-Infrastructure. It could be a promising strategy for enhancing adoption to capitalize on this and provide particular support to teaching-oriented e-Infrastructure or those tools that at least take the teaching nexus into account and reserve resources for it.
- The distinction between locally constrained and more nationally integrated researchers is also an important one, as we could see in several occasions in the analysis. Though some initial funding and support from the local university or organization is without doubt important, support that projects receive must quickly transcend these narrow boundaries. Information from other external sources is important to avoid reinventing wheels and reach the (inter)national state-of-the-art quickly; collaborators with complementary knowledge are also best to be found outside the same organization.

Annex

Tab. A-1: Variables of the regressions

Variable	Definition
CONTEUR	Dummy variable: respondents from continental Europe = 1, others = 0
UK	Dummy variable: respondents from the UK = 1, others = 0
RESEARCH	Dummy variable: respondents mainly involved in research = 1, others = 0
PROFESS	Dummy variable: respondents mainly involved in professional work = 1, others = 0
SCHOLAR	Dummy variable: respondents with activity profiles of scholars = 1, others = 0
RESINST	Dummy variable: respondents from research institutes = 1, others = 0
COLLOWN	Percentage of collaborators from respondents' own organization
COLLNAT	Percentage of collaborators from other organizations close by
EUFUND	Dummy variable: project EU-funded
GOVFUND	Dummy variable: project funded by research/education ministries
OWNFUND	Dummy variable: project funded by own organization
OTHFUND	Dummy variable: other funding
B_20	Importance of information from people at the respondent's organization
B_22	Importance of printed information (5-point scale)
D_2	Importance of seed funding from home institutions (5-point scale)
D_3	Importance of organizational incentives from home institutions (5-point scale)
D_8	Importance of support for teaching (5-point scale)
D_13	Importance of costs associated with e-infra. development and deployment (5-point scale)
D_16	Importance of applicability of tech. to social research problems (5-point scale)
D_20	Importance of being locked into other technologies (5-point scale)
LOCALIST	Dummy for cluster "localists, information isolates"
TAVERSE	Dummy for cluster "technology-averse scholars"
LRATER	Dummy for cluster "low raters"
DISINTEG	Dummy for cluster "locally isolated researchers"
FURAISE	Dummy for cluster "external fund raisers"

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