



Performing digital ways of knowing: epistemic walks with methods-as-prototypes

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ABSTRACT: Based on our experience in the project ‘The Importance of Being Digital: Exploring Digital Academic Practices and Methods’, we narrate our different trajectories of engagement with digital methods and digital practices. Inspired by emerging scholarship that looks at prototypes as a cultural and epistemic form, we delve into an exploration of methods (both traditional and digital) as prototypes – open-ended, non-instrumental explorative devices – for our knowledge processes. By opening up the craft of our research we illustrate and discuss what ‘digital ways of knowing’ – ways of knowing inspired by digital practices – might look like, and which reconfigurations of knowledge practices and trajectories they could enable.

KEYWORDS: digital practices; digital methods; prototypes; epistemic cultures; collaboration

This article reflects on our research experience during the project ‘The importance of being digital: exploring digital academic practices and methods’¹, initially aimed at investigating the role and the potential of digital technologies, social media and digital methods for academic work. During the project we organized two training activities with the aim of creating the practical conditions to engage a group of social scientists within our research and to gather – through focus groups and interviews – empirical materials to analyse expectations and utopias, anxieties and disbeliefs, regarding the contribution of digital technologies and tools to academic work and to knowledge creation.



We could have based this article on the analysis of the data we collected during the project but along the trajectory of this project, this didn't make sense to us. We don't want to suggest that the materials we collected were useless, quite the contrary, but that they worked in unexpected ways. Rather than as 'empirical evidence', they worked as 'prototypes' – open-ended, non-instrumental explorative devices for our knowledge process. Prototypes are traditionally part of the craft of design, engineering and architecture, but until recently, foreign to the 'epistemic culture' (Knorr-Cetina 1999) of social sciences. An emerging scholarship looks at prototypes as a cultural and epistemic form (Corsín Jiménez 2013; Corsín Jiménez et al. forthcoming) and as a new paradigm of knowledge production (Corsín Jiménez and Estalella 2010).

Examples include 'critical making', 'a mode of materially productive engagement that is intended to bridge the gap between creative physical and conceptual exploration' (Ratto 2011, 252); experiments with ethnographic research, such as forthcoming proposals for the re-functioning of traditional ethnography as participant observation into an exercise of experimental collaboration (Criado and Estalella forthcoming a; Estalella and Criado forthcoming b) and proposals that conceive ethnography in terms of a studio or design practice – the 'labinars' (Rabinow and Marcus 2008), with 'the intent of experimenting with the production of knowledge on the analogy of prototyping' (Marcus 2013, 406).

More than by specific digital tools or technologies, these experiments towards renewing social sciences methods and knowledge draw inspiration from digital practices – open-sourcing, hacking, prototyping – and from the modes of producing knowledge associated to these practices. In this article we would like to illustrate and discuss what these 'digital ways of knowing' look like and which reconfigurations of knowledge practices and trajectories they could enable through our different experiences as researchers in this project.

Part 1: Andrea's exploration. Engaging with digital ways of knowing: taking our research methods for a walk

One of my fieldwork activities in the project 'Being Digital' was to attend the workshop 'FAQs about Open Access: the political economy of publishing in anthropology and beyond', organized by a group of doctoral and postdoctoral students from

the Research Group of Anthropology with a Public Orientation based at Universidad Autónoma de Madrid. My attendance to this workshop put me in a strange position: on the one hand, I was attending with the aim to collect data through the recordings of the sessions and through observation (the debate was an opportunity to collect material on the epistemic utopias of academics and their views about the transformation of scholarship), but at the same time, the event also occasioned an important academic discussion with my own academic community – thus it was impossible for me to be ‘outside’ of it, to relate to it only as an ‘observer’ in the traditional sense.

To complicate things further, the workshop took place at Medialab-Prado, ‘a citizen laboratory for the production, research and dissemination of cultural projects that explore collaborative forms of experimentation and learning that have emerged from digital networks’² which is precisely the ‘house of the prototype’, according to Corsín Jiménez and Estalella (2010).

While other medialabs we knew, in particular the Medialab-SciencesPo (see Part 2), were more focused on developing digital tools for social research, MediaLab Prado’s projects explore issues of openness, collaboration, participation, bottom-up pedagogy, informal learning, experimenting with multimedia and digital tools, free culture and open source software. The possibility of approaching what seemed to us like two contrasting ‘epistemic cultures’ was exciting and thus we wanted to collect data on the different ways of engaging with the digital technologies that those two environments suggested. Thus, we saw the workshop about Open Access in MediaLab Prado as an opportunity to use my skills as an ethnographer to approach the Medialabs’ cultures as empirical material, but this plan turned into something different, as I experienced the impossibility of establishing distance from ‘data’ and from the people I wanted to extract that data from. This dilemma resonates with the debate about the ‘crisis of methods in social sciences’ (Savage and Burrows 2007; 2009), where the narrow conception of ‘social science methods as mere instruments for data production’ is being challenged (Ruppert et al. 2013) and, more specifically, with the debate questioning an extractive model of ethnographic engagement, historically consolidated as participant observation (Criado and Estalella forthcoming a). The questioning of an extractive model of knowledge is actually emerging from the challenges that new media and new digital infrastructures pose to the model of scholarship as we know it. The debate around Open Access stages some of the tensions that emerge

from the confrontation between different paradigms of knowledge production and different ways of relating to data and methods that new digital possibilities enable.

The discussion was more nuanced than simply the pros and cons of Open Access: there were different points of view on what such a change in the communication system could mean for anthropology, which exposed a whole reconfiguration of the research practices and models of scholarship. Some scholars in the debate claimed OA as a means of *refunctioning* our methodology in social sciences and as an opportunity for redesigning the political structures of academic knowledge, exploring how to convert the whole research process into a more collaborative and open kind of process. These scholars, in particular, are involved in epistemic experiments that are based on the contact with the practices of other epistemic cultures: free software, open software, open design, and open-source architecture. In the debate, they *displaced* the question of openness from a reconfiguration of the communication system to the possibilities of reconfiguring the *making of* academic knowledge. Sánchez Criado, for example, highlighted the methodological/epistemological possibilities of Open Access, suggesting the importance of doing ethnography *through* Open Access rather than ethnography *of*, while Corsín Jiménez suggested ‘refunctioning our methodology rather than (discussing OA as) just a means’ (transcriptions from the recordings of the workshop). Reacting to the reduction of Open Access to publication issues, which he sees as deriving from the dominance of the model of print culture, Corsín Jiménez stressed that Open Access should not be reduced to a shift in the communication system, but we should rather think of ‘how the academy opens access to itself?’ (ibid.), a question which in turn he relates to a difference between open-source software and open-source hardware.

(...) whereas for some digital projects opening access is tantamount to opening the sources, in the case of hardware projects, opening access and opening sources are in fact different operations. In this light, when guerrilla architectural collectives speak of open-sourcing their practice, they don’t just mean granting access to their designs. What they mean, rather, is that every stage in the process of designing and building an architectural project should be open (Corsín Jiménez, transcription from recordings of the workshop).

The ‘challenges of open-source architecture’ are the same challenges that he sees open-source bringing to the academy: ‘an invitation to rethink methodologically and epistemically what scientific research is all about’ and also ‘a challenge that invites – some would even say, presses – the social sciences to re-imagine and refunction their methodological, collaborative and epistemic equipment’ (ibid.; Corsín Jiménez 2014c).

An example of open source anthropology is Corsín Jiménez and Estalella’s *Ciudad Escuela*, a project on open-source urban pedagogy where *new forms of expertise* are being developed, based on activities that require modes of sociality strongly mediated by forms of *open* knowledge production (Estalella and Criado forthcoming a) – Corsín Jiménez reports that they ‘got to a point where to keep carrying out our work with guerrilla architects’ they had to ‘devise ways in which to collaboratively *infrastructure* [their] presence’ – that is, their ‘ethnographic toolbox and sensorium – in the city’ (Corsín Jiménez, transcription from recordings of the workshop).³

What became clear to us – and this changed the direction of our research – was that the *open-source anthropology* projects are not just a new vocabulary about scholarship nor a matter of visions nor utopias about technological transformation, but it opens an epistemic reconfiguration towards more experimental, collaborative and tentative modes of producing knowledge. More than just using digital media or developing new research tools, what these explorations suggest is the need to open the methodological aspects of research and reconfigure it, for example through the creation of spaces/infrastructures/devices for shared knowledge production. The reconfiguration of the research epistemology implies redesigning and repurposing already existing methods: an example is the proposal of *devising fieldwork* (Criado and Estalella forthcoming a), something that I ended up adopting for my future research.

Ethnography as Experimental collaborations

So I went to the workshop to collect discourses, attitudes, practices and performances about the transformations of scholarship, and I left with my conceptions of scholarship and research transformed. This example also captures well what went on with our relationship to the traditional methods that we used to collect

data for the project. Personally, I realized that I am less interested in describing this phenomenon than in experimenting with it. My plan for future research explores a different way of producing ethnographic knowledge. I am still interested in approaching medialabs as sites for the production of knowledge, and therefore I propose to do collaborative fieldwork in two contexts: Future Places, in Porto, a festival of digital culture and MediaLab for citizenship, and in MediaLab Prado, Madrid. The aim of this fieldwork, however, is not to understand those contexts and different cultures *per se*, it is to use them to experiment with transforming knowledge and creative practices both in design and in anthropology through a collaborative mode of fieldwork that goes beyond the traditional methodology of participant observation. The focus is no longer the medialab cultures, but rather an experimental exploration to discover what kind of knowledge may result from the collaborations between anthropology and design.

A key methodological concept is the idea of *devising fieldwork*. Estalella and Criado, drawing on the proposal of Ruppert, Law and Savage (2013), think of methods as devices, that is, as patterned arrangements that ‘assemble and arrange the world in specific social and material patterns’ (2013, 230). Instead of the traditional ethnographic detachment instituted by a naturalist paradigm of knowledge production, devising fieldwork is more akin to an experimental science ‘arrangement’ that ‘assembles the experimental conditions for the joint production of knowledge’ (Criado and Estalella forthcoming a, 9), where key informants are not reduced to providers of information but transformed into epistemic counterparts (Criado and Estalella forthcoming a, 5). At the same time, devising fieldwork differs from the merely activist forms of ethnography or public oriented anthropologies: it explores the possibility of redesigning our presence in the field by creating exploratory arrangements to produce knowledge.

Inspired by this methodological reconfiguration, I plan to engage in joint exploration with designers and media professionals by co-designing activities on topics of interest to me and to my collaborators. Although it’s impossible to plan in advance what these activities would be, one possibility is organizing a project together with designers/media artists/architects and anthropologists with the aim to jointly explore – and prototype – new models of collaborative scholarship. By experimenting with the proposal of collaborative ethnography – and devising fieldwork, in particular – I would contribute to the literature that calls for a revi-

talization of the anthropological methods through a refunctioning of ethnography (Marcus and Holmes 2008) into collaborative modes of fieldwork (Criado and Estalella forthcoming a) and through learning from the knowledge environments and epistemic cultures of other fields of expertise (Corsín Jiménez 2014b).

Part 2: Chiara's exploration. Engaging with digital methods

In less than one decade, starting from the pioneering Digital Methods Initiatives⁴ of the 'Web epistemologist'⁵ Richard Rogers (2013), several initiatives and research centres have committed to 'move Internet research beyond the study of online culture and beyond the study of the users of ICTs only' (ibid, 4) by developing and exploring the possibilities offered by digital technologies for social research. Among them, Médialab-SciencesPo⁶ (hereafter, just Medialab) that was founded in 2009, an initiative of Bruno Latour, who in recent years has been particularly interested in exploring the *materialization* of Actor-Network Theory (ANT) allowed by digital techniques, and in particular, reflecting on how digital traces left by actors inside newly available datasets might help the reformulation of classical questions of 'social order' (Latour et al 2012).

The *Oficinas* Digital Methods (ODM)⁷ was organized in the context of our project to provide the opportunity to engage with Médialab's researchers and methodological proposal. The ODM took place in Coimbra in Autumn 2014; its format was two, two-day workshops, held at an interval of two weeks, where fifteen researchers were invited and proposed to experiment with a set of tools on their research questions or data. What follows is an account of the digital method project I carried out during the ODM. To some respect, my engagement with digital methods is a story of a failure; nonetheless it has enabled the reconfiguration of a research trajectory.

My exercise joined curiosity for digital methods with scientific mobility, a research interest I have cultivated since my experience of political activism with the movement of Italian students and researchers that, starting from Autumn 2008, unsuccessfully tried to oppose the last reform of the national system of education and research. I became part of the *diaspora* of Italian researchers in 2011, and since then, the experience of being a mobile researcher has offered plenty of input to reflect on the dissonance between the representation of scientific mobility pro-

motivated by EU research policies and that portrayed in the scholarly literature and its practice. I decided to turn my investigation to the analysis of how scientific mobility is discursively and materially constituted in EU research policies and to this aim I collected a set of documents from EU institutions⁸, and provisionally organized them into three groups according to their contents⁹.

I started to nurture the idea of using this collection for exploring digital methods and in particular the tool called ANTA¹⁰ (Actor-Network Text Analyzer) developed by Medialab with the goal of transforming ‘a set of texts in a network’ (see Venturini and Guido 2012). While digital text analysis is not a novelty in social sciences, Medialab’s idea in developing such a tool was to ‘privilege interpretability over everything else. We wanted researchers to be able to read straightforwardly the graphs we handed them and know exactly what is in them’ (ibid, 6). For this reason, the tool focuses on two elements: documents (disregarded by most of the text analysis tools) and expressions (words or groups of words regularly occurring together as *n-grams*); the tool considers the simplest type of connection between documents and expressions: the plain occurrence of the expression in the document, in order to keep documents relevant in the analysis. In general terms, the tool is designed to automatize as little as possible the work of text analysis, leaving ample space for a researcher’s choices. On the other hand, it works with an unknown algorithm provided by a free online service called AlchemyAPI (see ibid. for details, 7): in brief, the researcher does not know exactly how expressions are identified and choices can be made only after the extraction.

To set my digital method project I gave the instructors the corpus on scientific mobility for the uploading on the ANTA platform, provisionally organized into three sub-folders corresponding to the three categories of documents (see above). The second step consisted in *tagging* the documents: while at that moment I was not totally aware of the implications of this action, I let the instructors tagging documents with the three categories I used to organize my folders, which seemed to them the obvious thing to do (fig. 1). The third step consisted in the extraction of the expressions, that in the language of ANTA are called ‘entities’; this is where the black box of the algorithm plays its part. The resulting list was huge, with more than 20.000 entities; the tool displays a distribution graph of the frequency of entities per document (fig. 2) that offer some quantitative criteria to perform the following step: selecting the entities for the analysis.

In this case, the distribution graph selected 5,000 entities, leaving out the extreme cases (a small number of entities were present in almost every document; a great number in just one document). However, I was advised that the number of 5,000 was still hard to manage and suggestions were made to reduce the number

INCLUDE DOCS > TAG DOCS > INCLUDE ENTITIES > TAG ENTITIES > EXPORT PROJECTS YOUR ACCOUNT LOGOUT

list of documents: demo

41 documents (0 - 41) [open tag panel](#)

<input type="checkbox"/>	type	language	date	title	ignore	status
<input type="checkbox"/>	plain	english	29/10/2014	Towards_a_European_research_ar ea_COM_2000__6.txt general_agenda	<input type="checkbox"/>	indexed
<input type="checkbox"/>	plain	english	29/10/2014	EUROPEAN_COUNCIL_BRUSSELS_22_a nd_23_MARCH_2005_PRESIDENCY_CO NCLUSIONS.txt general_agenda	<input type="checkbox"/>	indexed
<input type="checkbox"/>	plain	english	29/10/2014	Global_Approach_Migration_Mobl lity_COM_2011__743.txt general_agenda	<input type="checkbox"/>	indexed
<input type="checkbox"/>	plain	english	29/10/2014	h2020-eu-establact_L_347-104.t xt general_agenda	<input type="checkbox"/>	indexed
<input type="checkbox"/>	plain	english	29/10/2014	h2020-specificprogramme_L347-9 65.txt general_agenda	<input type="checkbox"/>	indexed

Fig. 1. Tagging documents in ANTA

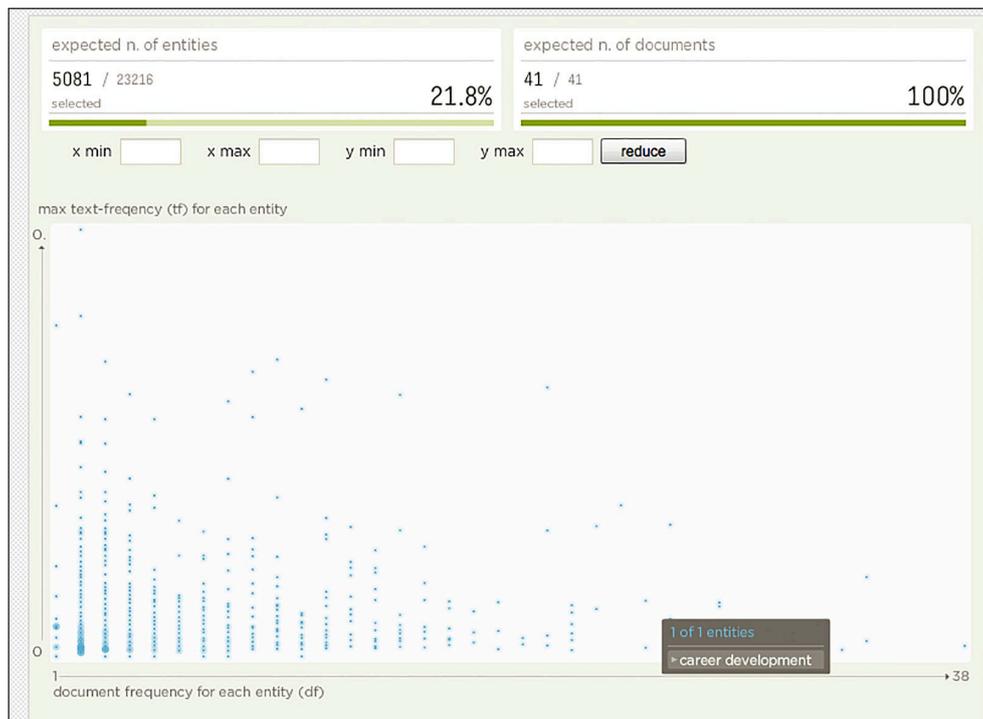


Fig. 2 Statistics about the extracted entities in ANTA

using the automatic tagging of the entities made by the tool. By admission of our instructors, this automatic tagging is of limited value for analytical purposes and should be replaced by researchers with a coding designed specifically for the research questions under investigation. Instructors suggested all the entities tagged as 'Quantity' (fig. 3) be deleted, these supposedly being non-pertinent to the analysis. However, numbers and quantity are actually relevant in the EU definition of mobility as well as in the schemes operationalizing it.

In general terms, I felt reluctant to delete entities before having gone through them, so I decided to proceed in a different way: exporting the results to visualize the network of entities and documents with the tool Gephi¹¹, designed to perform the interactive visualization and exploration of all kinds of networks and complex systems (Bastian et al. 2009), before proceeding to the necessary operation of tagging the entities according to the research questions. If in ANTA a social scientist is confronted with a selection of expressions whose rationale of extraction is mysterious, in Gephi the difficulty is quite the opposite. Despite the goal of Gephi's developers 'to provide some network analysis methods to social scientists, that would not require learning graph theory' (Jacomy et al. 2014, 1), using Gephi is challenging because it offers plenty of features to manipulate and adapt the network in order to produce a meaningful visualization. After importing a table of nodes and edges, the default visualization is a compact square (fig. 4) that needs

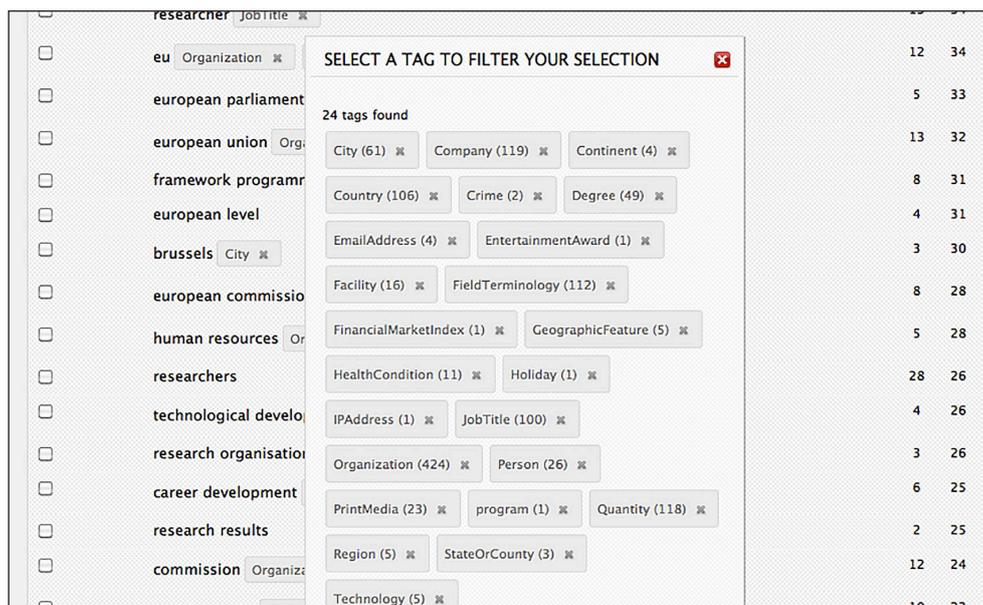


Fig. 3 Filtering entities through tags in ANTA

to be manipulated to be informative; the first operation was choosing one of the available algorithms to spatialize the graph. Instructors advised me to use *Force Atlas 2* whose operating principle is that linked nodes attract each other and non-linked are pushed apart (see Jacomy et al. 2014). This algorithm is continuous, meaning that the researcher has to decide when to stop it, depending on his/her judgement of 'satisfying' visualization.

The second operation was running the modularity algorithm, whose function is detecting clusters, groups or communities into the network. Surprisingly, the big cloud of entities somehow appears internally divided into 4 main clusters (fig. 5): three of them mostly separated, and a fourth (the green one in fig. 5) 'in between'

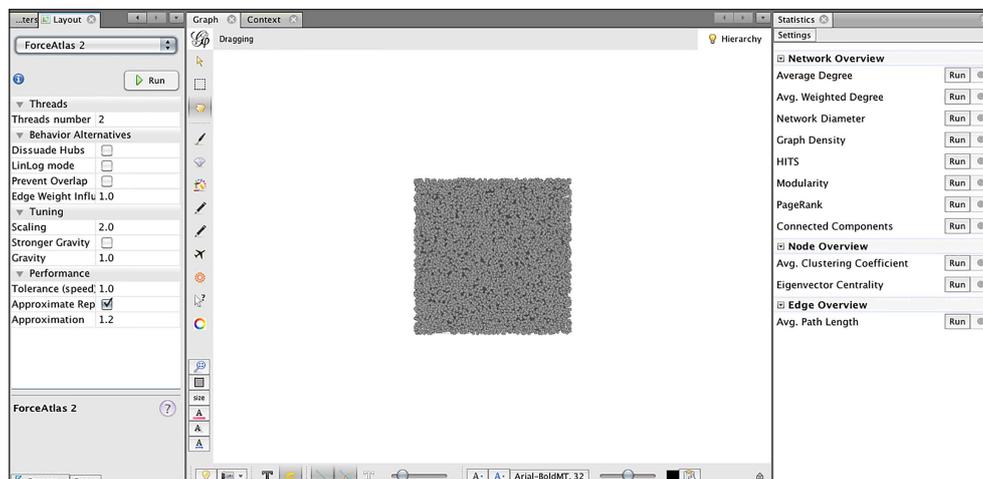


Fig. 4 Default visualization in Gephi

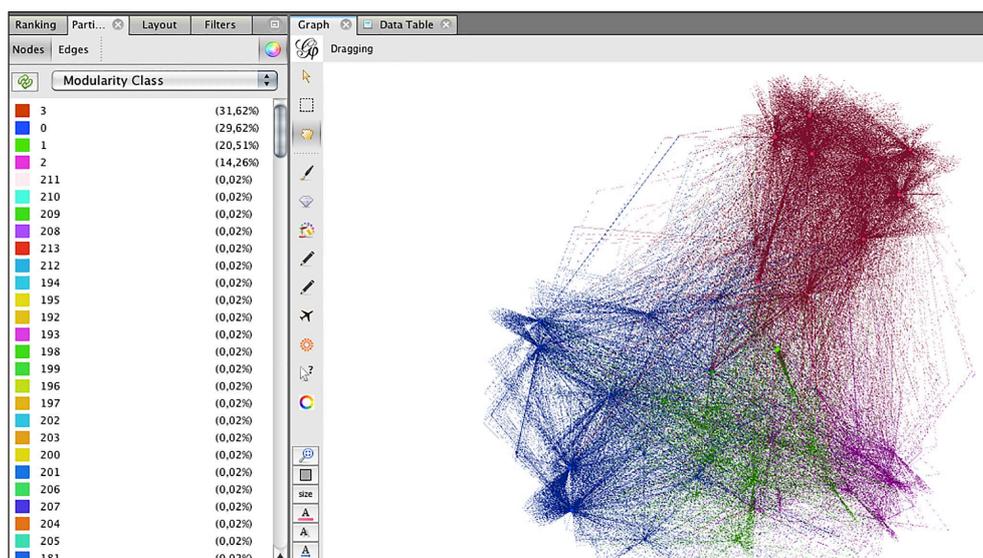


Fig. 5 The network of ANTA entities (modularity classes)

them. Reminding me that this was a bipartite network of expressions and documents (see above), the instructors interpreted this outcome as a confirmation of the homogeneity of language used by the EU across different kinds of texts (documents within the same category tend to use similar language).

As was done for each of the digital methods projects set during the first workshop, I received suggestions by the instructors about the work to be done by the second workshop (two weeks later): reading the list of all the nodes in order to ‘try to get some sense of the clusters’ and particularly of the expressions in between the clusters. This operation also involved a huge amount of *cleaning* (deciding to keep or to drop nodes and merging duplicates) and a reflexion about how to categorize the nodes to replace the tagging of the entities made by ANTA. In short, I found myself in front of a long list of expressions, many of which were meaningless or duplicated: after days of cleaning, I reduced the list to 3,000 expressions. However, the hard part was yet to come, as ‘tagging’ means being confronted with the research questions. I did not start from defined questions. My initial idea was to use digital methods in an exploratory mode, with the vague aim of identifying meanings and values conveyed by EU discourse with respect to scientific mobility. While several expressions were inspiring, I struggled to discriminate the clusters on the basis of hundreds of decontextualized expressions. During the second work-

	Employment	Training	Rights (Citizenship)	Migration
Key concepts/ policy goals/ long term (1st set doc)	- stable career path - open labour market	- fostering new skills - life-long learning	- social inequalities - social conditions ^{cohesion} - equal opportunities	- global interdependence - third country - high level researchers - global leadership - highly skilled migrants
Implementation/ Evaluation/ business ^{Programmes} (2nd set doc)	- adequate working conditions - unemployment rate - recruitment procedures	- mutually recognized research training research training - training programmes	? - health protection - women and science - from particular needs	- scientific visa directives - external security policy
Initiatives/ Rules/ Measures (3rd set doc)	↓ - Professional qualifications	- research training networks - training actions	- for additional contribution (?) - parental leave - Charter of fundamental rights	- fast track - scientific visa procedures - eligible third country

Fig. 6 One of the attempts to develop a coding system for entities, crossing kinds of documents (first column) with key issues (first row); each cell contains examples of entities from the list.

shop I focused entirely on tagging; with the help of the instructors I came up with at least four different code systems for coding my expressions (fig. 6 displays one of my attempts); none of them proved to work and with each attempt I got stacked with expressions that did not fit with the designed categories. The dataset was still unmanageable: in big data jargon, there was ‘too much noise’. At the end of the second workshop, I was the only participant without a meaningful visual output – a network – of all the work done, which was definitely frustrating. However, I would not say that my work was in vain. By going through the list of expressions several times and reflecting upon it, I acquired a certain degree of familiarity with the content of the corpus; although I was not able to turn my intuition into a coding system, I got a clear feeling that scientific mobility *oscillates* in the EU discourse between the semantic universes of ‘employment’ and ‘training’ and that the key point to investigate the discursive shift from *migration* to *mobility* is the notion of European citizenship and its reconfigurations (developed through exceptions and extensions) in the case of European and ‘third-Country’ researchers.

In this respect, I am currently planning a new kind of digital engagement: collecting stories and fragments about my daily experience as a mobile researcher in a blog, in order to reflect about how the experience of mobility intersects all the aspects of daily life including the way in which I think about the future, practice political participation and enjoy social rights. In this respect, I am interested in experimenting with blogging not as a tool for research dissemination, but as a methodological device, as ‘a crafting exercise for the construction of research questions’¹² (Estalella, MS, 7; authors’ translation). At the same time, through this blog, I intend to reconnect my investigation with the political engagement that originally motivated my interest in this topic. By exposing tentative and provisional reflections on the topic as well as fragments of personal experiences, I intend to participate in and contribute to the debate about the precarization and individualization of research work, which I feel is relevant beyond my individual experience.

As for digital methods, I realized that a substantial investment is needed not only to learn how to use the tools properly – my exploration was marked by an initial decision (how to tag the documents) whose implications were unclear to me at that moment – but also to acquire familiarity with the different logic and practice of investigation, implying a lower ‘degree of control’ over the research process than usual for social scientists using traditional qualitative methodologies. Marres (2012) has discussed the digitization of social research as a process

of ‘redistribution’ among a diverse set of agents that potentially unsettle the established division of labour (ibid., 7). Although she mainly addresses a particular kind of redistribution, namely towards *devices*, her argument also fits with the redistribution of social research among different kinds of expertise, in the sense that digital social research appears to be a collaborative endeavour involving social scientists, developers, engineers, computer scientists etc., rather than being an exclusive domain of social scientists. Medialab’s philosophy in developing tools is to automatize as little as possible the activities of the research chain: ‘social scientists cannot use black boxes, because any processing has to be evaluated in the perspective of the methodology’ (Jacomy et al 2014, 2; see also methodological considerations in Venturini et al.): as was referred to by one of our instructors during the ODM ‘computers have to do just what they are good at, which is counting’.

However, as the story above illustrates, there is a trade-off between less automatization and usability: ANTA is an intuitive tool, but researchers don’t know how the core operation of expressions’ extraction is performed, while Gephi, on the other side, is a very flexible tool, but using it properly is quite far from being intuitive. If there is no need to expect that in digitized social research disciplinary sensibilities and skills will become irrelevant, performing some kind of contamination that overcomes the divide between technology and humanities seems necessary. The concept of *interactional expertise*¹³ developed by Collins and Evans (2007) – the ability to master the language of a specialist domain in the absence of practical competence – seems quite appropriate to address such a contamination: during the ODM I worked with developers and engineers who were at ease in interacting with the methodological concerns and ways of reasoning from the social sciences and were able to provide suggestions about the interpretation of the data or the coding system in absence of a *practical* experience of social research. To become able to work with digital methods, in some way, social scientists need to go through a symmetrical kind of contamination, learning the basics of programming language.

Addressing the crucial question posed by Kirch (2014) ‘does the digital give us new ways to think or only ways to illustrate what we already know?’ the overall experience of the ODM, where several digital methods projects found confirmation of their starting hypotheses, seems to suggest that, in using digital methods, the clearer and the more delimited the research questions, the clearer the answers. However, my experience, albeit tentative, suggests another route to be explored, where digital methods were not instrumental to my research questions and eval-

uated for their potential to provide answers, but on the contrary, the questions themselves ended up being instrumental to my exploration with the methods, and the latter were appreciated for their *collaboration* in reformulating questions.

Conclusion: methods as prototypes

At the beginning of our experiments we were looking for different things: in the case of Andrea, she wanted to investigate what other *epistemic cultures* could bring to the social sciences in terms of knowledge production processes; Chiara, on the other side, started from an empirical work in progress related to scientific mobility and looked for ‘allies’ in her knowledge process. In this respect, while Andrea became interested in performing experimental collaboration inspired by digital cultures as a methodological *device* in her future research project, Chiara explored (digital) methodological *devices* in an experimental and interactive way, and at the end, the methods themselves turned into an epistemic object.

Notwithstanding the different trajectories, we see both our explorations as animated by aspects of *prototyping* as a cultural heuristic: we explored methods (both digital and traditional ones) as prototypes, allowing for experimentation and unexpected trajectories (see Introduction).

There are three particular features of the prototyping mode of knowledge production that we want to emphasize through our engagements. In the first place, the incorporation of *failure* as a legitimate and unavoidable component of knowledge processes: our explorations developed through frustrations and unsuccessful attempts, and by displaying them and the ways in which we reconfigured our trajectories, we would like to highlight both the usefulness of failures and the open and always provisional nature of knowledge production. In this perspective, research emerges as ‘a technology of question formation’ (Faubion in Marcus 2013, 400) rather than a problem-solver and as a practice-oriented more than theory-driven process (Rabinow and Marcus 2008, 84). In the second place, *expectations* played a fundamental role in our experiences: in line with the key lesson from the sociology of expectations (see Estalella 2011, 67–74) during the process we reconfigured the approach from the evaluation of the expectations of our ‘objects’ of study’ to the analysis of the performative effect of our own epistemic expectations. In this respect, expectations are used as a methodological device rather than empirical material to be analyzed. Lastly, *collaboration*. Prototyping entails

‘a shift in the experimentation as a ‘collective’ rather than ‘collected’ enterprise (Latour 2011, quoted in Corsín Jiménez 2014a, 386; Corsín Jiménez et al. 2015, 9). In Chiara’s account, digital methods were explored as active (non-human) agents that both potentiate and at the same time limit the exploration of the research questioning, whose trajectory emerged from a collective process involving methods as well as different expertise. In Andrea’s account, the ‘collective’ enterprise is instead formulated in terms of the relationships (technically mediated or not) to be *devised* through the interaction between the researcher, the experts (designers and media professionals) and their environments.

It is not our claim that experimental knowledge is a new thing, nor that the digital – per se – creates such transformation. Nor do we want to suggest that knowledge as a craft is a new phenomenon: STS has long been engaged with showing us the processes of scientific knowledge in-the-making (Latour 1987; 1999); however, embracing open sourcing, prototyping and hacking as part of our knowledge-making practices gives us new ways to perform research as ‘craft’ – research as a process of ‘making’, rather than just extracting, knowledge. Making this ‘craft’ visible is performing what we – following Corsín Jiménez’s provocation, as discussed above – understand as open-sourcing academic knowledge, beyond just opening access to its final products (texts).

To conclude, we subscribe to the suggestion of Les Back and Nirmal Puwar (2012, 10) that the social sciences need to take their research tools and devices for a walk. We believe that our non-instrumental methodological engagements – our epistemic walks with methods-as-prototypes – are already a modest contribution in that direction. Our point is that we can do it either with digital methods or with traditional ones: being experimental doesn’t depend on the methods we use, but rather on what we do with them or where we take them. Thinking of methods as devices (Marres, 2012; Ruppert, Law and Savage, 2013), two related questions emerge from our trajectories: can we think of methods as ways for social scientists to prototype their knowledge; and if so, can we think of them as social science prototypes?

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Endnotes

- ¹ The project is funded by the Portuguese agency for science, technology and innovation (Fundação para a Ciência e a Tecnologia, FCT); see <http://bedigital.hypotheses.org/> for further details.
- ² See <http://medialab-prado.es/?lang=en%E2%80%8E>
- ³ Another example is Sánchez Criado's work on a collective called 'En torno a la silla' (Around/on the wheelchair): 'a group for the joint exploration of open-source urban and personal devices for disabled people'. In order to carry out his ethnographic work Tomás also had to infrastructure his presence by turning into the community manager of the digital infrastructures of the collective' (Criado and Estalella forthcoming a, 5).
- ⁴ <https://wiki.digitalmethods.net/Dmi/ToolDatabase>
- ⁵ See Rogers' profile on the University of Amsterdam website: <http://www.uva.nl/over-de-uva/organisatie/medewerkers/content/r/o/r.a.rogers/r.a.rogers.html>
- ⁶ <http://www.medialab.sciences-po.fr/>
- ⁷ See the blog of the project for details about the event <http://bedigital.hypotheses.org/432>.
- ⁸ For details, see the presentation https://www.academia.edu/8452690/Mobility_discourse_in_the_European_Research_Area
- ⁹ The set was composed of 43 documents organized in three groups: a) general political documents defining the overall political and economical agenda of the EU; b) reports about the policy implementation of the European Research Area; c) documents related to specific initiatives.
- ¹⁰ See the ANTA page on the Github platform <https://github.com/medialab/ANTA> for a graphic image displaying the steps of the analysis with the tool.
- ¹¹ <http://gephi.github.io/> Following ANTA's mode of operation, the kind of graph that is visualized is a bipartite graph, in which edges connect nodes of different types, in this case, documents and expressions.
- ¹² "ejercicio artesanal para la construcción de problemas de investigación".
- ¹³ See the following interview of Collins for an account of the development of this concept <http://www.americanscientist.org/bookshelf/pub/an-interview-with-harry-collins>

References

- Back, Les and Nirmal, Puwar. 2012. "A manifesto for live methods: provocations and capacities". *The sociological review* 60 (S1): 6–7.
- Bastian, Mathieu, Heymann, Sebastien & Jacomy, Mathieu. 2009. "Gephi: an open source software for exploring and manipulating networks". *ICWSM* 8: 361–362.
- Collins, Harry, and Evans, Robert. 2008. *Rethinking expertise*. Chicago: University of Chicago Press.

- Corsín Jiménez, Alberto, and Estalella, Adolfo. 2010. "The prototype: a sociology in abeyance". *Prototyping prototyping*, ed. Christopher Kelty. Accessed November 8, 2014, <http://limn.it/the-prototype-a-sociology-in-abeyance/#ftn5>.
- Corsín Jiménez, Alberto, Estalella, Adolfo and Zoohaus. 2013. "The interior design of (free) knowledge", *Journal of Cultural Economy* 7 (4): 493–515.
- Corsín Jiménez, Alberto. 2014a. "Introduction: The prototype: more than many and less than one". *Journal of Cultural Economy*, 7:4, 381–398.
- Corsín Jiménez, Alberto. 2014b. "The right to infrastructure: a prototype for open source urbanism". *Environment and Planning D: Society and Space*, 32 (2), 342–362.
- Corsín Jiménez, Alberto. 2014c. "Epistemic ecologies in beta: anthropology beyond open access", Accessed March 4, 2015, <http://www.prototyping.es/uncategorized/epistemic-ecologies-in-beta-anthropolog-beyond-open-access>
- Criado, Tomás Sánchez and Estalella, Adolfo (eds.). Forthcoming a. *Ethnography as experimental collaboration*. EASA Book Series, Berghahn.
- Estalella, Adolfo and Criado, Tomás Sánchez. Forthcoming b. "Experimental collaborations: an invocation for the redistribution of social research". *Convergence: The International Journal of Research into New Media Technologies*. Accessed March 4, 2015 http://xcol.org/wp-content/uploads/2014/12/Convergence_Experimental-Collaborations.pdf.
- Estalella, Adolfo. 2011. *Ensamblajes de esperanza. Un estudio antropológico del bloguear apasionado*. PhD diss., Universitat Oberta de Catalunya. Accessed March 2, 2015. <http://www.estalella.eu/ensamblajes-de-esperanza>.
- Estalella, Adolfo. Manuscript. *Etnografías de lo digital*. Accessed March 4, 2015. http://www.prototyping.es/wp-content/uploads/2014/05/Estalella_Etnografias-de-lo-Digital-borrador-parcial.pdf.
- Holmes, Douglas and Marcus, George. 2008. "Collaboration today and the reimagination of the classic scene of fieldwork encounter". *Collaborative Anthropologies* 1 (1): 81–101.
- Jacomy Mathieu, Venturini, Tommaso, Heymann, Sebastien and Bastian Mathieu. 2014. "ForceAtlas2, a Continuous Graph Layout Algorithm for Handy Network Visualization Designed for the Gephi Software". *PLoS ONE* 9(6): e98679. Accessed June 11, 2015. DOI: 10.1371/journal.pone.0098679.
- Kirsh, Adam. 2014. "Technology is taking over English Departments: the false promise of the Digital Humanities", *New Republic*, May 2. <http://www.newrepublic.com/article/117428/limits-digital-humanities-adam-kirsch>.

- Knorr-Cetina, Karin. 1999. *Epistemic Cultures: how the sciences make knowledge*, Cambridge (MA): Harvard University Press.
- Latour, Bruno, Jensen, Pablo, Venturini, Tommaso, Grauwin, Sebastian and Boullier, Dominique. 2012. "The Whole is Always Smaller Than Its Parts: A Digital Test of Gabriel Tarde's Monads". *British Journal of Sociology* 63(4): 590–615.
- Latour, Bruno. 1987. *Science in Action: How to Follow Scientists and Engineers Through Society*. Cambridge (MA): Harvard University Press.
- Latour, Bruno. 1999. *Pandora's hope: essays on the reality of science studies*. Cambridge (MA): Harvard University Press.
- Marcus, George. 2013. "Prototyping and contemporary anthropological experiments with ethnographic method". *Journal of Cultural Economy* 7(4): 399–410.
- Marres, Noortje. 2012. "The redistribution of methods: on intervention in digital social research, broadly conceived." *The sociological review* 60(S1): 139–165.
- Rabinow, Paul and Marcus, George. 2008. *Designs for an anthropology of the contemporary*. Durham & London: Duke University Press.
- Ratto, Matt. 2011. "Critical making: conceptual and material studies in technology and social life". *The Information Society* 27: 252–260.
- Rogers, Richard. 2013. *Digital Methods*. Cambridge (MA): MIT Press.
- Ruppert, Evelyn, Law, John and Savage, Mike. 2013. "Reassembling Social Science Methods: The Challenge of Digital Devices", *Theory & Culture & Society* 30(4): 22–46.
- Savage, Mike and Burrows, Roger. 2009. "Some further reflections on the coming crisis of empirical sociology". *Sociology* 43(4): 762–772.
- Savage, Mike and Burrows, Roger. 2007. "The coming crisis of empirical sociology". *Sociology* 41(5): 885–899.
- Venturini, Tommaso, Nicolas Baya Laffite, Jean-Philippe Cointet, Ian Gray, Vinciane Zabban, and Kari De Pryck. 2014. "Three maps and three misunderstandings: A digital mapping of climate diplomacy." *Big Data & Society* 1 (2). Accessed June 11, 2014. DOI: 10.1177/2053951714543804.