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Building Digital Humanities Centers

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It is the early 1990s. In the Arts Tower at the University of Sheffield a new center has just been established called the Humanities Research Institute. It would one day take the name Digital Humanities Institute, but for now it is an office that provides desk space for two PhD students. One is studying the biblical *Book of Job* and the second is studying the eighteenth-century French *Encyclopédie*. There are also two research assistants on a new project called The Canterbury Tales Project. We are transcribing medieval manuscripts from microfilm printouts into Apple Mackintosh SE computers in order to reconstruct the early textual history of the poem. The project will produce scholarly CD-ROMs for Cambridge University Press. Every Friday a floppy disk containing the week's transcriptions is mailed to the project's head office in Oxford. We also share the office with a large desk that supports the weight of a huge machine called the Kurzweil Scanner. It is the size of an Austin Metro and we are told that it can be taught to read books. Nobody ever comes to use it. There is another office next door, unrelated to the Humanities Research Institute, whose occupants have been working away since 1989 on a project called The Hartlib Papers. The Canterbury Tales Project and the Hartlib Papers Project are examples of something new at Sheffield called *humanities computing*. But there is no director as such, no personnel directly employed by the institute, no budget, and no software engineers. Over the next twenty-seven years or so the Humanities Research Institute, the Hartlib Papers, and the term *humanities computing*—but especially scanners—will evolve into things that are incomprehensible in the early 1990s, in terms of what they do, what they mean, and how the institution uses them.

This chapter explores the institutionalization of digital humanities in the form of the "digital humanities center," drawing on my experience as director of the University of Sheffield's Digital Humanities Institute (DHI),[1] and the experiences of other center directors, past and present. It will not be representative of every digital humanities center, since there are many models, and it will not claim that the DHI's approach to digital humanities and its institutionalization is by any means the best. Further, we should acknowledge that digital humanities can be institutionalized in other ways: academic positions in digital humanities within a research-led teaching department, digitization units within university libraries, and dedicated "digital humanities support officers." Their institutional merits are beyond the scope of this chapter. Instead, we will look at how a center such as the DHI has evolved over time in response to its changing institutional role, the practical and logistical *dos* and *don'ts* of running a center, and what the future might hold for

digital humanities centers. In particular, I will argue that the institutionalization process always requires digital humanities to transform into a broader subject domain in order to increase its relevance to its institutional stakeholders: management, colleagues, and of course students.

At the time of writing, the Digital Humanities Institute has collaborated on more than 120 research projects, worked with over a hundred institutions in the UK and internationally, and developed more than seventy research resources. It maintains an online hosting and publishing presence for the majority of these resources, some of which have been "live" for more than twenty years. It has sought financial sustainability with mixed success over the years, but all its staff have open-ended contracts (albeit on professional services contracts rather than academic contracts, which imposes some constraints around promotion and research recognition). The DHI has become embedded in the research services and academic research strategies of its home institution, and it is now transitioning towards a model that is more recognizably "departmental" in its academic function, institutional status, and aspirations. I refer to this type of journey as the *institutionalization* of the digital humanities center.

WHAT IS INSTITUTIONALIZATION?

The concept of institutionalization will be familiar to anyone who has attempted to build a center, in any subject. On a simple level, it is the desire to have one's center taken seriously by the university in which it resides. On a more complex level, it means that the center develops a business operation whose activities are considered to be in alignment with the strategic objectives of the wider university. It becomes strategically important at some level within the organization, and informs decision-making in areas where it can bring value through its knowledge and expertise. Digital humanities centers usually begin life as the brain-child of one or more individuals who have a shared desire to make the practice, study and/or teaching of digital humanities a strategic activity within their institution. Typically, this reflects their view that an institutional approach to digital humanities will yield academic value, whether it be measured in the form of increased research income, tuition fees, institutional ranking, or an internationally competitive research environment. Many centers in the arts and humanities, irrespective of the subject domain, appear to start life in an ad hoc way, poorly funded and informal. Occasionally a center will be established with a generous foundation grant. Irrespective of how the center is funded at the outset, its founders have been given a moment of agency by the institution, to establish the academic value of their idea. What this agency means in practice is that the center's founders have been given a period of time (its duration dependent on the initial funding) in which to develop and demonstrate a business model that will create academic value. If successful, the center and its way of thinking will be appropriated by the institution—the institution will adopt its ideas, knowledge, and way of thinking—and the founders will have to accept that the institution will also shape the center beyond its original plan (others within the institution will be given the agency to affect this). This is institutionalization. If unsuccessful, the center will be disbanded, dramatically or quietly, depending on how much investment the institution has lost.

The purpose of all centers is to facilitate interdisciplinary and cross-disciplinary research around a subject domain that cannot be adequately represented or addressed by an individual department or faculty. Digital humanities is one such domain, for it combines knowledge, expertise, methods, and concerns from across the arts, humanities, heritage, computer science, library and information

science domains. As Patrick Svensson says, digital humanities is "an array of convergent practices" and "defies any precise definition" (2010). Historically, a center in the arts and humanities could take many forms: a web page, an occasional seminar series, a network of colleagues and projects, or an institutionally recognized unit which has an executive, staff, budget, and a physical space. Only the latter type has any possibility of becoming institutionalized, because it is the only format in which the founders are given the agency to unambiguously demonstrate academic and financial value to the parent institution through their activities and reporting. It was rare for the more informal types of centers (often termed "letterhead centers") to evolve and become institutionally recognized, and in recent years UK universities have largely forbidden their creation.

A SERVICE-ORIENTED BUSINESS MODEL

The DHI began its life in 1992 fully subsidized by the University of Sheffield. Each year it had to negotiate a small grant to cover its core costs. Initially the DHI was not concerned with digital humanities per se. Instead, it was a center intended to facilitate new ways of doing humanities research; thus the original name, Humanities Research Institute. There was a belief that these new types of projects, by being complex and process driven, necessitated a type of research that was relatively novel in the arts and humanities: collaboration between researchers. In fact, many of the achievements of the earliest digital humanities projects, such as The Canterbury Tales Project and the Electronic Beowulf Project, were as much about feats of collaboration as they were about technology in humanities research. For example, the former produced multi-authored works more resonant of scientific publications, and the imaging, technical, and editorial work of the latter was shared between transatlantic research teams.

The early years of the DHI also coincided with the creation of the Arts & Humanities Research Board (AHRB) in 1998, which would eventually become the Arts & Humanities Research Council (AHRC) in 2005. The AHRB enabled arts and humanities researchers for the first time to secure funds that were of a comparable scale to the sciences. It funded eight digital humanities projects at the DHI during these early years, including the André Gide Editions, Galdós Editions, Science in the Nineteenth-Century Periodical, and the Old Bailey Proceedings Online.[2] The DHI also benefited from the New Opportunities Fund (NOF), which co-funded Old Bailey Online. NOF was a government scheme to distribute National Lottery funds to health, education, and environmental projects. It funded 149 digitization projects between 2001 and 2004 at a cost of £50m. So it is perhaps no coincidence that the DHI evolved to focus on externally funded, collaborative research during its first ten years.

Over time it was the digital humanities component of the DHI that was able to develop a business model and an operational approach to replace its reliance on subsidization, in full or at least in part. The DHI sought to become largely self-funded by charging out its technical and project management support as a service on externally funded research grants led by academic investigators. The DHI's running costs were underwritten by the faculty, so any end-of-year surplus was reclaimed by the university, but the faculty also absorbed deficits in any lean years. Our costs were such that we could not rely on the funding success rates of academic investigators within the University of Sheffield alone, so we had to offer our services to colleagues in other institutions. The digital humanities support which we were offering was practical: grant writing, software programming, website development, data analytics, algorithm development, project management,

publishing and long-term hosting of the digital outputs. In the DHI, digital humanities has always been a practice-led domain, focused on combining hard skills with arts and humanities research questions, methods, sources, and perspectives. Digital humanities is a "big tent," accommodating pedagogy, theorization, and reflexivity as well as practice. Focusing on the practice-led approach made our business model distinctive. We were offering a service that had increasing demand within arts and humanities research, but which had low supply in terms of personnel sufficiently qualified to deliver the service within their home institutions.

This business model had a distinct advantage over models that were focused on research excellence only. It demonstrated to the wider institution that the DHI was taking its financial sustainability seriously, and was able to evidence real payment-based services, business and outputs. The digital humanities element of any research award, in terms of the DHI's technical services, is typically 12 percent of the total value of the award. So, if a center such as the DHI is required to self-fund to the tune of, say, £240,000 annually in order to cover its core costs, it needs to be involved in successful grant awards totaling £2m. In practice this means that a faculty has a center that is driven to push up grant application numbers. But in reality this means working on grant applications that are being led by other institutions; over 50 percent of the DHI's business. Further, it resulted in the DHI being able to participate in a wider range of research topics than those presented by our colleagues at the University of Sheffield.

The DHI's status became what in UK universities is called a *research facility*: a resource consisting of personnel and equipment which is available to staff using a cost-recovery model. The chief advantage of this classification was that it enabled us to charge a day rate for the DHI's role on research projects; that is, a single price per day, including all overheads, irrespective of which member of staff would be working on the project. This facility model gave us the flexibility to assign staff to projects based on their current workload and expertise, because the budget was not tied to the salary of a named individual. The alternative, of having small percentages of a member of staff's time coded to different project accounts, was unmanageable from an operational and accountancy perspective; it made understanding the center's financial position at any given moment in time extremely difficult. Tedious though all of this sounds, the facility model made it easier to seek sustainability. As a research facility we became a recognized financial entity within the university (no soft money here or funds held in another department's accounts), and the day rate enabled us to charge and retain 100 percent of the income. Digital humanities centers never fail because they are poor at digital humanities; they tend to fail because they have a poor business model and an unsupportive institution.

Nowadays the DHI's service-oriented approach is termed a *digital lab* or *digital humanities lab*, and its personnel are frequently referred to as *research software engineers* in recognition of their specialism: engineering software solutions for researchers and, in the process of doing this, undertaking research themselves. The details of the model might vary: the services might be to support research or teaching; chargeable on a cost-recovery basis or free at the point of use; and for internal or external clients only. A notable implementation of the lab model is King's Digital Lab (KDL),[3] which has done important work to improve the practice of digital humanities project management, and to professionalize the role of research software engineers through career development pathways. If left unformalized, research centers can become the domain of fixed-term or casualized staff. Some of us will remember the days of the senior academic colleague and his digital humanities assistant: a highly talented software engineer who was retained from one month to the next on what was termed *soft money*. No doubt the arrangement still exists in some

universities. A center must have a business model, or at least a strategy, that guarantees continuity of employment for its key staff. This improves institutional memory, retains skills and knowledge, and encourages long-term planning and a greater commitment to sustainability (of software and data but also business operation). Importantly it improves institutionalization, because staff are more likely to develop the deep collegial networks that help align the center with institutional cultures and priorities.

CHALLENGES WITH THE SERVICE-ORIENTED APPROACH

There are hard challenges with the DHI's business model, and perhaps with digital humanities labs in general, and over the years I have had colleagues in other universities tell me that such an approach with its emphasis on paid-for services would be unthinkable to them. They are no doubt fortunate. In England at least, where the government has removed a lot of state aid for universities and encouraged a more marketized approach through student fees, few universities would be willing to fund a research center in the arts and humanities for twenty-seven years without some form of financial return, either directly in the form of research income or indirectly through research activities that have made significant contributions to the institution's research environment. A center needs a business model that will enable it to align with the institution's own strategic priorities: world-leading research, but research that pays its own way. The emphasis towards one or the other tends to vary by institution, and even at the DHI we have always considered ourselves to be first and foremost digital humanities research practitioners but—out of necessity—with an eye on the bottom line as well.

The first problem with the DHI's service-oriented approach is the danger of only ever chasing the money, since this can result in undertaking a brand of digital humanities that is less about risk and innovation in digital research methods, and more about delivering safe, pedestrian software solutions. "Inevitably, the paradigm of funding shapes the kind of work that is done, and the tools and methods that are used" (Opel and Simone 2019). However, digital humanities is always at its best when framed as a practice within an arts and humanities subject domain, and technically pedestrian software solutions are often, nonetheless, innovative when applied to the subject domain in terms of the data-focused research that it facilitates or communicates. For example, in 2007 we published the *Sheffield Corpus of Chinese*.[4] Technically it is very pedestrian (albeit an early implementation of UTF-8), but every time we try to quietly retire the website we receive howls of protest from users around the world who maintain that their school dissertation, doctoral thesis, or peer-reviewed article cannot be completed without it. Reassuringly, content is still king, and the technically uncomplicated job of making high-quality data publicly accessible is still digital humanities' most important contribution to the academy. However, in the DHI we also try to counter the problem of pedestrianism by being proactive in project development, alongside our responsive services for colleagues: we write our own research proposals and lead or co-lead projects that have at their heart the scale of technical research and innovation that will hopefully make a research software engineer jump out of bed in the morning.

The second problem with the DHI's service-oriented approach is that it is a portfolio approach. The need to continually secure new project work, develop digital outputs (websites, apps, management systems and data), and then host the outputs over the long term (which is a key part of the service we offer) produces sustainability challenges: software and financial.

Software sustainability is concerned with hosting and maintaining (usually web-based) interfaces and data in a constantly changing technical environment. Jamie McLaughlin (2019) and Smithies et al. (2019) cover many of the challenges of software sustainability from their firsthand experience. If left unaddressed, software sustainability demands will grow at a constant rate until all the center's human resource is fully occupied in servicing existing outputs rather than working on new projects. The problem arises predominantly in relation to web interfaces rather than data, particularly legacy systems that were not written using modern software development frameworks. The DHI hosts and maintains more than seventy online resources, and so any upgrade to our servers, database software, or programming languages requires us to undertake a lengthy review of all our assets. However, from the perspective of the academy, although there is a local cost to sustaining these resources, it is more efficient and cost effective than if these resources were hosted by more than seventy individual institutions. We are confident that many of the resources would not be accessible today since most institutions lack the funding, expertise, and willpower to maintain and sustain them. Perhaps we should be lobbying more vociferously to have these costs covered. But until such a time when the academy is prepared to take these costs seriously, any new digital humanities center is strongly advised to consider the reality of sustaining its infrastructure and digital outputs over the long term, and to plan in from the outset how growth will be managed through good hosting practices, prudent technology decisions and a "take down" policy for retiring resources that have become too expensive to maintain.

Financial sustainability is concerned with maintaining a portfolio of research projects in a changing environment. The DHI's service-oriented approach is predicated on constantly acquiring new business. In UK higher education, digital humanities work is almost entirely project-based, and therefore relies almost exclusively on external funding from research councils and charitable trusts. There is funding to be had from commercial work, of course, and by re-orienting digital humanities research software engineering to capitalize on opportunities presented by industrial strategy challenges and knowledge exchange grants. However, whatever the source of funding, a center's financial planning is made challenging by the increased competition for reduced funding, long turnaround times (from bid development to award), unforeseen delays on the projects themselves, and the academy's overall reluctance to fund software development at realistic levels. I refer to the *academy* to avoid blaming funders, because as reviewers we all question "value for money" in funding bids, then complain that our own projects are not satisfactorily resourced. While the majority of time and financial resource on a digital humanities project is spent creating high-quality, open data, surprisingly little is spent on developing the interfaces that are intended to query and present the data—and yet this is the main value that a research software engineer brings to a digital humanities project, and it is often the main impediment to accessing the data in the long term.

Whether we are dealing with software sustainability or financial sustainability, the elephant in the room takes the form of a question: *is it sustainable?* The answer for both is the same: *no, not entirely*. If left unaddressed, both become impediments to the other: the need to acquire more projects produces more outputs to maintain, and more outputs need more project work to back-fund the maintenance. Both are at the mercy of changing environments: technology forces us to upgrade, whether we have the resources to do that or not, and the changing research-funding environment forces us to compete harder for work, because grant submissions are higher and awards are fewer. Both can be de-risked to a degree, and the DHI has been in the game for twenty-seven years at the time of writing, which would be impressive if it were an SME (small or medium-sized enterprise), but clearly a service-oriented model has to evolve and adapt to the center's changing environment

if it is to remain sustainable. The research environment has changed a lot in twenty-seven years. None of this is to suggest that the DHI's service-oriented model is wrong. Instead, I believe that a successful service-oriented approach which can outlive any foundation grant is necessary—at the outset of a center's life—for developing the longer-term financial sustainability that then enables it to develop academic value. But a never-ending provision of paid-for services is not where a successful center is destined to end up. Instead, we should perhaps view digital humanities centers, whatever their business model, as the nurseries for digital humanities academics and departments.

ACADEMIC VALUE AND MONETIZING THE CENTER

An important driver in the institutionalization of a digital humanities center, or indeed any digital humanities role or activity, is the academic value that it brings to the institution, as opposed to financial value. Yet the academic value of digital humanities is surprisingly hard to sell. First, the term *digital humanities* does not resonate with most people, even colleagues within the arts and humanities, and especially senior leaders within our institutions. Some institutions and centers that deliver digital humanities programs describe how they have to teach digital humanities "by stealth," by calling it something more meaningful, such as cultural studies, media studies, cultural heritage studies, museology, computational linguistics, etc. In many respects it is a victim of being such a broad church. Second, the value of digital humanities is not immediately obvious using the measures that matter to most institutions: research rankings, student numbers, and income. Often there is no digital humanities department, no fee-paying digital humanities students, and no clear idea of what the employability value of digital humanities is. As Claire Warwick says, when digital humanities pursues a specific "service computing" model it can suffer from similar cultural problems to other university services that support academic research; they are "often undervalued by the very academics that use them, because they do not generate research in themselves" (Warwick 2012, 195). Those of us that find ourselves having to articulate the academic value of digital humanities have to rely on other, indirect measures: research grant awards in other departments that might not have been made had the project not included a sound and, where appropriate, innovative technical methodology; assets, e.g., open data resources that help establish reputation while also having commercial licensing value; research environment; skills and knowledge; impact and knowledge exchange, i.e., the assumption that digital humanities is inherently impactful through its collaborations with cultural institutions and creative industries, and its focus on disseminating outputs. If none of these are persuasive, we have to resort to presenting digital humanities as something that can make the arts and humanities appear almost STEM-like in the minds of the engineers and scientists that run most of our institutions. However, the demise of the UK's subject data centers for arts and humanities in the 2000s shows that institutions can maintain most of the above—once it has been established—without the expense of retaining an actual center. Ultimately, we have to rely on influential figures within the institution being favorable towards and supportive of digital humanities when articulating our academic value. The DHI has been extremely fortunate in this regard.

At the point when a service-oriented approach becomes less sustainable for a center, institutionalization comes into play more forcibly: has the center developed sufficient academic value to be monetized by the institution, or does the institution simply close it down? By *monetized* I mean changing the center's business model to re-acquire financial sustainability, but doing so by

capitalizing on the assets (academic value) that the center has developed under the old business model. This process seems to be a trend for those digital humanities centers that started out with the service-oriented model, such as Humanities Advanced Technology and Information Institute (HATII) at the University of Glasgow, the Centre for Digital Humanities at King's College London, and the DHI. The trend can be seen with centers in other subject domains too, such as the Textile Conservation Centre (University of Glasgow)[5] and the Institute of Making (UCL).[6] What all of these centers have in common is that (unconsciously) they have used a service-oriented model for digital humanities research in order to establish themselves and develop academic value for the institution, in the form of research income, assets, research environment, skills, and knowledge. At a certain point in time the institution has then capitalized on the center's academic value by re-focusing its activities on delivering teaching and learning, which in the UK creates a much larger market for the center than research funding. But in doing so, the institution has also been required to broaden the center's subject domain beyond the scope of its founders in order to maximize its relevance.

MONETIZATION THROUGH PEDAGOGY REQUIRES DIGITAL HUMANITIES TO CHANGE

Finally, I want to explore how institutionalization favors digital humanities centers becoming more about pedagogy and less about research over the long term, and how this necessitates a digital humanities center transforming its subject domain into something that resonates more with management, staff, and especially students. It is perhaps not surprising that the older, established digital humanities centers now focus on research-led teaching, given the challenges of the research-funding environment and the opportunities afforded by domestic and international student markets: HATII, established in 1997, is now the Information School;[7] and the Centre for Digital Humanities at King's College London, established in 1991, is now the Department of Digital Humanities[8] (and not to be confused with the King's Digital Lab). The DHI has also followed this trend towards research-led teaching. Both Glasgow and King's College London have capitalized on their considerable, long-standing reputations as former centers for project-based digital humanities research when offering programs to students. And they have gone further, by becoming academic departments in their own right and delivering programs directly. Full institutionalization of the digital humanities center, in the UK at least, seems to necessitate departmentalization in order to fit in with HE's more streamlined, market-focused organizational structures. But in doing so, these centers have also changed what digital humanities is within their own institutions by broadening its scope and articulating its employability value. Both offer a Master's in Digital Humanities, but many of the programs on offer are now focused on topics that have greater resonance for industry and employability, such as media management, cultural heritage, and archives management. Their broadening of the subject domain (from digital humanities to information science with a focus on digital culture and society) in order to become an academic department and deepen the institutionalization is telling with respect to the future of digital humanities. Student registration data provided by HESA (Higher Education Statistics Agency) for 2019 shows that these types of "digital programs" recruit significantly more students than Digital Humanities MAs, across all UK institutions, not just at King's College London and the University of Glasgow.

This perhaps points towards how, today, digital humanities lies at the intersection of many subject domains that we would consider to be on trend, emerging, and distinctively twenty-first

century: data science, big data, AI, digital media, digital society and culture, etc. In its more institutionalized form, digital humanities is being taught "by stealth," by addressing these more popular, employability driven topics from an arts and humanities perspective. For me this arts and humanities perspective revolves around a deep understanding of natural language (messy data), visual culture, the selection and use of sources, and the nature of meaning. These are all key skills and knowledge that are missing from most engineering and social science approaches. This prompts a question: if a digital humanities research center is to be fully institutionalized, must it always transition away from project-based research towards pedagogy (or at least research-led pedagogy) and broaden its domain? I think this is inevitable unless research funding becomes less competitive or we develop a new way of extracting academic value from digital humanities research.

IN PRAISE OF INSTITUTIONAL SUPPORT

In discussing the institutionalization of digital humanities centers, this chapter has perhaps spoken little about digital humanities itself. So the conclusion warrants a tale about a digital humanities project which, I hope, will demonstrate the importance of institutions sustaining centers and their staff, in whatever form, over the longer term.

It is now 1996. Although The Hartlib Papers Project[9] was never a "DHI project" as such, having predated the establishment of the center by a good seven years, we consider this to be our foundation project due to its ambition, invention, approach, and spirit. Samuel Hartlib (c. 1600–1662) was a great seventeenth-century "intelligencer" and man of science who set out to record all human knowledge and make it universally available for the education of all mankind. The project's objective was to create a searchable electronic edition with full-text transcriptions and facsimile images of all 25,000 pages of his correspondence. Hartlib would have loved the very idea of this project! I recall a busy office with large, boxy computer terminals, 5-inch floppy disks and an entire bookcase dedicated to storing the ring binders that contained the user manual for Microsoft Word for DOS. The transcriptions and facsimiles were accompanied by a powerful search tool and topic modeling engine called TOPIC by Verity Inc.[10] This seven-year project culminated in the publication in 1996 of two CD-ROMs by University Microfilms in Michigan. The CD-ROMs retailed for $4,995.[11] Advance orders had been made by some of the world's leading academic institutions and libraries.

The CD-ROMs, including the TOPIC software, were designed to run on the early versions of Microsoft's graphical user interface, Windows 3.x. In 1995 Microsoft released Windows 95, which was a significant upgrade for the operating system run by most of the world's PCs at that time. One year later, after the consumer boom in buying new PCs with Windows 95, the Hartlib Papers CD-ROM was published. Unfortunately the CD-ROMs, and particularly the TOPIC software, were incompatible with the new PCs. Verity reportedly declined to upgrade the software. Destroying the CD-ROMs and reprinting them was also expensive. So institutions that had made advanced purchases received CD-ROMs that were incompatible with their new suites of desktop PCs. The British Library reportedly needed to resurrect an old PC from storage in order to make its copy of the Hartlib Papers CD-ROM accessible to the public. Needless to say, in 1996 we all learnt about the dangers of relying on proprietary data formats (MS Word) and software (TOPIC), and the wisdom of open-source standards.

An enlarged edition, incorporating many Hartlib materials from libraries around the world, was published on CD-ROM by the DHI in July 2002. The *Hartlib Papers Second Edition* cost £1,570. Owners of the original CD-ROMs were given a free upgrade. Creating this new version was not a trivial process because for a long while we were unable to open or convert the MS Word for DOS documents using the current versions of Microsoft Word. Although some proprietary file formats, such as DOC, are used almost universally, we learnt that this is still no guarantee that the same company's product will work with our data files in the future. Eventually we converted the files into XML, and generated an HTML version for display through a web browser. The entire product ran off a CD-ROM disk, so we had to deploy a small, self-contained executable to serve as a search engine. This was a Java applet called JObjects QuestAgent. It relied on Microsoft's proprietary Java environment (JVM) which was discontinued in 2003 after a dispute over IP with Sun Microsystems (one year after publication of the new edition of Hartlib). Java applets were eventually deprecated entirely due to their security vulnerabilities. So in 2003, with another defunct CD-ROM, we learnt about the dangers of relying on proprietary web technologies and old publishing models.

In 2013 we published the third and current edition of the Hartlib Papers.[12] It uses entirely open data standards and web programming frameworks. It is published online and available for free. It now looks a little dated at the time of writing, but it still works perfectly and we have every confidence that it will continue to do so. Since 2013 the Hartlib data has been shared with other research groups and integrated into other, larger online research resources, most notably *Early Modern Letters Online*[13] and our own *Connected Histories* website.[14] Moving forwards, we plan to make the entire dataset more easily accessible for researchers under a Creative Commons license, via the DHI Data Service,[15] and no doubt we will revisit features such as topic modeling. By 2013 we had learnt that web services are far more economical, sustainable, and stress-free than hard media such as CD-ROM disks; servers, delivery frameworks, interfaces, and data can be maintained with minimal hindrance and at no cost to the end-user.

The journey of the Hartlib Papers as a publication has mirrored the intellectual journey of the DHI, as we have moved (and sometimes stumbled) from the old proprietary publishing model to a newer, open model in which even interfaces for data are becoming less important. It emphasizes the durability of data. Despite Hartlib's checkered publishing history, the quality and value of the transcriptions remains undiminished. The original investment in the staff who labored to produce full-text transcriptions of more than 25,000 pages of Hartlib's correspondence was sound, and many of the staff went on to other significant digital humanities projects, such as the Newton Project.[16] However, Hartlib's publishing history also emphasizes the importance of institutional support. A second edition was made possible because there was a digital humanities center with staff who remembered and understood the value of the data that the original project had placed in their custody. The third, online edition was made possible for the same reasons. We all know that digital humanities centers disappear as soon as the parent institution removes its support, whether that support is financial or purely political, and that the outputs (data, interfaces, etc.) will continue to be maintained only for as long as they present no cost. It is unlikely that Hartlib and many of the DHI's more than seventy other resources would be accessible today had the University of Sheffield not continued to support the center and its staff. Institutionalization is both an aim and a price that we have to pay if we want to build a successful digital humanities center. We need to be given agency and support to flourish and be successful, but in return the institution will want us to evolve in order to remain valuable within the changing academic landscape (or dare I say, market).

NOTES

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