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Data, Computation and Creative Collaboration: Reflections on interdisciplinary digital design and research

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Computing and Communities of Practice

The personal computer has radically transformed a wide variety of disciplines, not only through the digitisation of processes and media formats, but also through the democratisation of production. Once-exclusive disciplines such as sound engineering, film making, motion graphics, graphic design, industrial design and architecture have been laid open to novices through the availability of accessible computer hardware and production software (McKeich & Dziekan, 2005). The same scenario has occurred in software production. Increasingly accessible knowledge and tools have allowed novice programmers from diverse disciplines to participate in software production (and more recently, in hardware production through platforms such as Arduino). In the late 1980s and early 1990s, applications such as HyperCard (1987) and Director (1988) enabled non-expert programmers to produce desktop multimedia for distribution on floppy disk or CD-ROM. But it was the introduction of the Web in the 1990s which made computer coding and software production truly accessible to a broad generalist audience. The Web's simple Hypertext Markup Language (HTML) made production elementary while the Web itself served as an open platform to a potential world-wide audience/community. Where markup language (HTML) served to introduce a new audience to the notion of working with code, it was languages such as JavaScript and Actionscript that surreptitiously inducted a broad range of generalist practitioners into the pragmatics of computer programming.

While the evolution of the Web provides a fine context for understanding how computer programming has been appropriated by a broad field of practitioners, the trend is in no way confined to the Web. Engagement with computer code and programming is at the heart of a growing field of practice sometimes referred to as 'Creative Code', with

practitioners from diverse art and design disciplines whose point of union is their use of code as a creative tool. As Reas and McWilliams put it:

> Once the exclusive domain of programmers, code is now being used by a new generation of designers, artists, and architects eager to explore how software can enable innovative ways of generating form and translating ideas (2010).

As with the example of the Web, Reas and McWilliams point to an appropriation of computer programming that challenges established professionalised and disciplined conceptions. Code, software and programming are the language, tools and processes that bind a broad trans-disciplinary creative community.

While acknowledging and celebrating expanded conceptions of computing practice it should also be recognised that computation has been fundamentally interdisciplinary since its inception; the earliest computing machines were used by physicists, meteorologists, cryptographers and biologists (see for example Dyson, 2012). In the 1950s the computer was yet to be constrained to the contemporary hardware and software that we associate with the term; it was a technology awaiting realisation. As historian of science Michael Mahoney writes of this period:

> Different groups of people saw different possibilities in computing, and they had different experiences as they sought to realise those possibilities. One may speak of them as ‘communities of computing’, or perhaps as communities of practitioners that took up the computer, adapting to it while they adapted it to their purposes (p124, 2005).

In painting this picture of the origins of the digital computer Mahoney decentres the machine and instead highlights the complex cultural interactions that defined it:

> What kinds of computers we have designed since 1945, and what kinds of programs we have written for them, reflect not so much the nature of the computer as the purposes and aspirations of the communities who guided those designs and wrote those programs (p119, Mahoney, 2005).

Recognising the protean nature of the computer, it is no surprise that narrow conceptions of computing (activity and artefacts) are today being challenged and redefined by an expanded cast of communities of practice. Computation is in a sense indifferent to disciplines, reducible ultimately to a simple set of formal operations. This is not to ignore or dissolve disciplinary differences, but to create a common ground, a machine that in its indifference fosters connections between disparate domains. Here computation is a verb, not a noun - it makes things happen. It has the capacity to link different domains and engage them in action, in joint projects and creations.

To further explore this proposition, the following discussion uses two recently completed projects (for the Museum of Australian Democracy and the State Library of Queensland) as case studies for considering how computation can serve as an interdisciplinary terrain and site for collaboration. In both instances data proved to be a highly pliable, richly interpretable shared material amongst the diverse ensemble of collaborators. With data as material, computation provided a crucial toolkit for representation, the means by which we were able to materialise data for a public audience. As importantly for this discussion, computation was also integral to the collaborative discourse; with computational prototypes fuelling cross-institutional trans-disciplinary collaboration and illuminating shared matters of concern.

THE WORKS

Discover the Queenslander

Discover the Queenslander is an online interface to a collection of around 1000 digitised pages and covers from *The Queenslander,* a magazine supplement for the *Brisbane Courier* (1899-1939). Developed by the authors and commissioned by the State Library of Queensland, this interface features a range of rich approaches to representing, navigating, curating and sharing the collection. The site uses a client-side architecture: the browser loads metadata for the entire (small) collection, and uses AngularJS to build a responsive HTML interface based on that data.

As its title suggests, the central aim of the project was to promote exploration and discovery of the collection: a set of beautiful, high resolution digital images. To fulfill this aim, we employed a bespoke design approach, tailoring an interface to the particularities

of the *Queenslander* collection. Two main views of the collection were developed: ‘Mosaic’ (Figure 1) and ‘Grid’ (Figure 2). The Mosaic view provides a succinct overview of the entire collection with each tile on the page representing a year, and tile size providing some indication of the number of records in that period. A user can navigate through the records of a particular year tile, or watch as the images cycle through automatically.

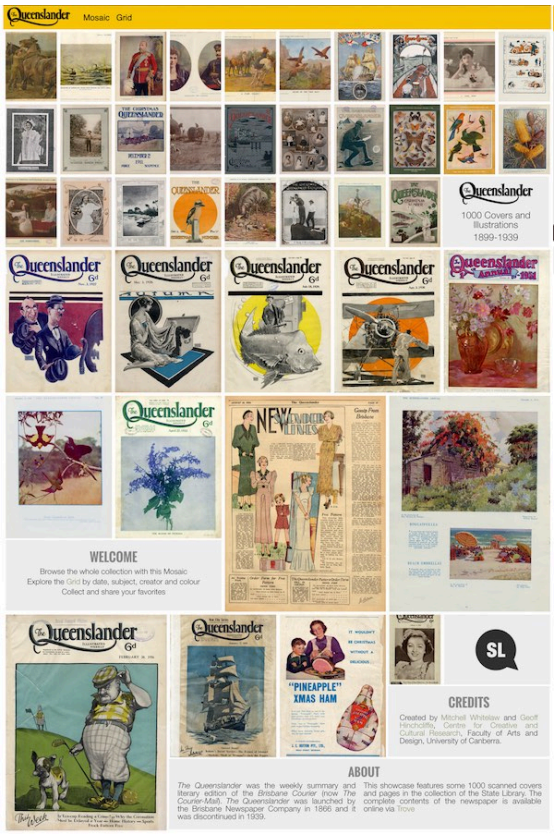

Figure 1. Discover the Queenslander’s Mosaic view

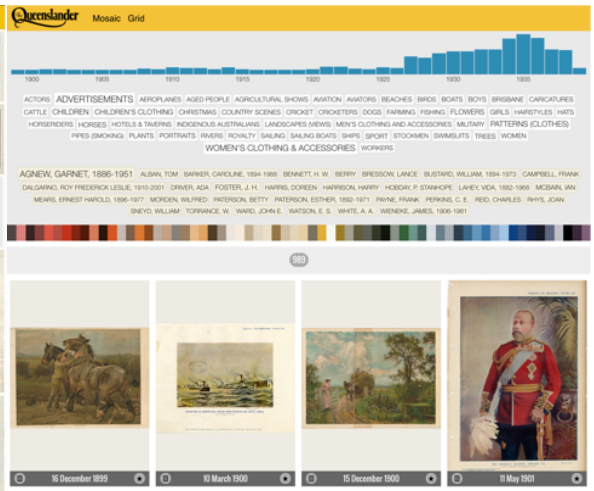

Figure 2. Discover the Queenslander’s Grid view

Where the Mosaic view is concerned with an overview, the Grid view is focused on exploration. Its header area features four distinct representations: a timeline histogram, descriptive word tags, author tags, and a colour band. A visitor can use the devices individually or in combination to explore and filter the collection. In Figure 3 the active filters include creator, year, and colour.

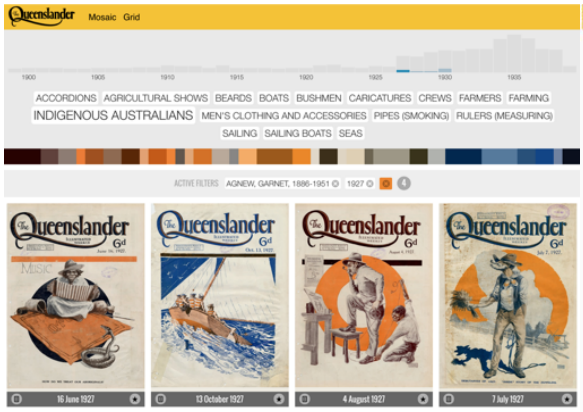

Figure 3. Collection filtered by creator, year and colour

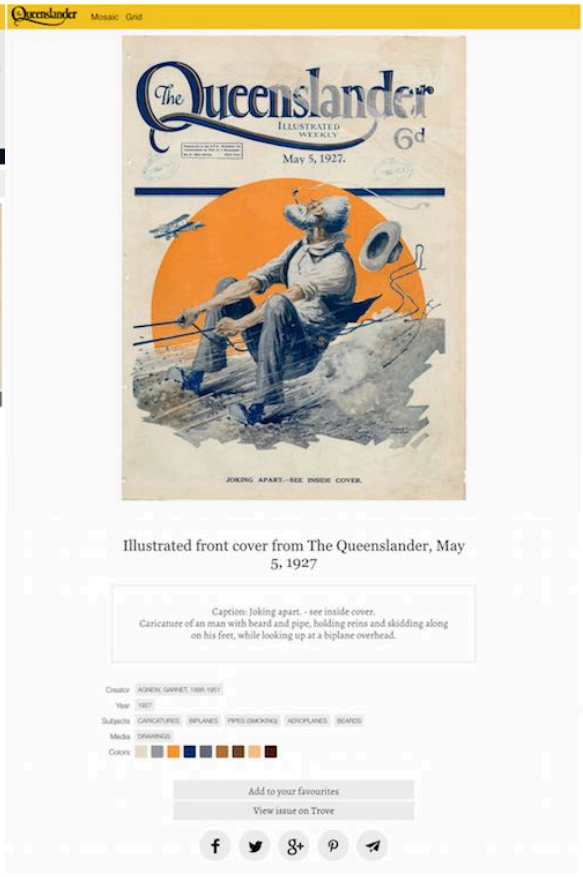

Figure 4. Presentation of an individual item

The header elements are dynamic, reconfiguring to represent the current selection of records. In this way the devices work for both visualisation and navigation. The metadata for each record can be viewed within the Grid context, or viewed as a solo item (Figure 4).

Power of 1 Voice

The Museum of Australian Democracy's (MOAD) *Power of 1 Voice* is a multi-platform exhibition program examining the state of representative democracy in Australia. A centrepiece of the production is a large survey representing the views of four generations: Builders, Boomers, Gen X and Gen Y. A dedicated website provides opportunity to participate in the survey and showcases the survey results in a series of elegant data visualisations. For the on-site exhibition at Old Parliament House, MOAD wanted to produce a compelling physical embodiment of the survey data, as well as an

engaging environment in which to keep the conversation going through inventive installation interfaces. The authors were invited to produce a tangible data visualisation of a curated selection of survey results.

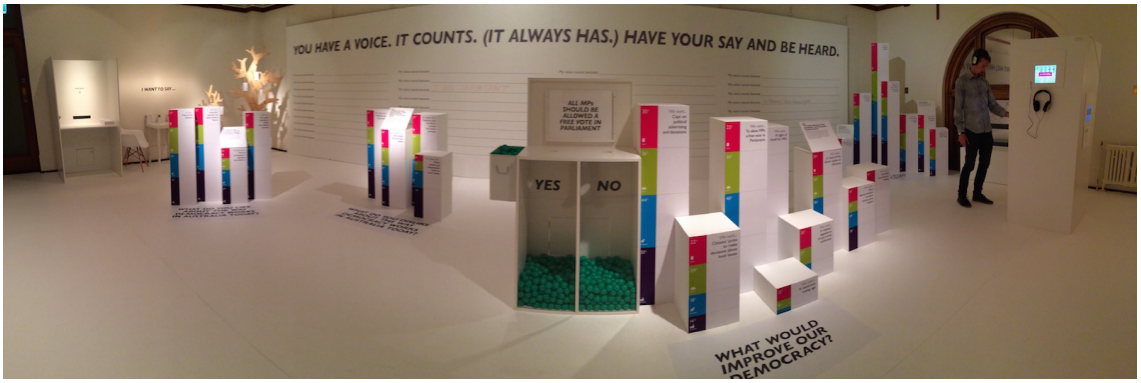

Figure 5. Data Columns installation for Power of 1 Voice at MOAD

The outcome is a landscape of ‘data columns’ (Figure 5), each representing a particular survey proposition. The coloured segments on each column indicate the response according to generation; Builders (1925-45), Baby-Boomers (1946-64), Gen-X (1965-79), and Gen-Y (1980-94). The clusters of columns are grouped according to a particular theme or question. In Figure 6 the columns relate to the question ‘Have you ever engaged with politics or society via…’.

The work makes clear reference to the column graph and the ballot box, both essential elements of the project. The columns are simple devices, yet their scale and tangibility offer a novel way to experience the survey data. The emphasis here is not only on a reading of the data but a phenomenological understanding (Dewey, 1934. Shusterman, 1992). Our proposition is that walking amongst a set of data provides a very different form of knowing to that gained from reading a chart on a page or computer screen. We draw on the emerging practice of data ‘physicalisation’ here (see for example Jansen et al 2015, Zhao and Van Der Moere 2008).

Figure 6. Responses to “Have you ever engaged with politics of society via…”

The data columns are gathered together in the ‘Generations Room’; a site representing an overview of the survey and featuring a number of interfaces (analogue & digital) for audience members to participate and share their views. In addition to the Generations Room, the exhibition consists of a custom installation for each of the four demographic groups, each themed accordingly and offering a unique mode for participating in the ongoing survey about Australian democracy.

Data, Design and Matters of Concern

Despite their differences, the common element in both projects is data. In the *Power of 1 Voice* the data is statistical and quantitative. In the case of the *Queenslander*, the set of digital image files is accompanied by related metadata: description, publication date, caption, creator, subject keywords, and media type. Without that data, the collection is an arbitrary set of images. The data tells us not only about each individual image but also about the collection as a whole; it allows us to filter and sort the records, to explore and reveal connections and qualities. Data thus has a crucial practical value: it is integral to our ability to structure and visualise the collection, and subsequently, to our audience’s ability to navigate and appraise the records. But the process of translating

data into visual form is not simple exposition, rather it is the result of a complex set of judgements and actions informed by the collaboration with our partners and our shared ‘matters of concern’.

In both these projects we design with data and computation to address what Bruno Latour calls ‘matters of concern’. Latour’s concept offers a way to elaborate on the interdisciplinary terrain outlined above, and to show in particular how design can play a crucial role. Latour aligns ‘matters of fact’ with a modernist narrative of mastery, detachment and progress, and a clear demarcation between different disciplines of knowledge. Yet as he argues, matters of fact are increasingly becoming ‘matters of concern’ — issues that are irreducibly multidisciplinary, eluding any easy reduction, and characterised by ‘entanglement, dependence and care’ (Latour, 2008). Latour suggests that design, with its attention to detail, ethical stance and collaborative structure, is well placed to contribute to such issues. These two projects offer modest examples of how collaborative digital design might deal with such matters of concern.

In *Discover the Queenslander* the key shared concern was the digital collection itself. This dataset was the product of a complex set of institutional and professional concerns and practices, ranging from the curatorial decisions to preserve and digitise the collection, to the information management practices that shaped its description and cataloguing, to the institutional drive for public engagement that motivated the commissioning of our project. This is not to mention the role of the collection content, and the nostalgic narratives of pre-War Australia (and especially Queensland) that it prompts. The data here embodies these concerns in specific, concrete terms; however at the same time as a material it is intangible and unwieldy, difficult for a non-specialist to grasp. Making this data concrete and creating explicit representations of the collection was a key step in our process. Prototype visualisations and interfaces provided formative objects for discussion and platforms to raise shared concerns and develop a shared appreciation of the collection itself. Further, these representations fuelled our own engagement with the collection, in particular its visual qualities, and led us to develop a new layer of colour data that sought to represent that character in explicit, computable form (Whitelaw, 2015). Computation is critical here: what Latour recognises as the attentiveness of design enabled us to respond to the collection images; but

computational agency enables us to translate this appreciation into explicit digital terms, and thus make it available to others.

In the case of *Power of 1*, again, the survey data was both the product of concern (specific political and institutional questions on the state of Australian democracy) and a matter of concern in itself. What did it show? How might we make it available in a public context? This project united a disparate group of collaborators. In addition to MOAD, the project involved IPSOS, SBS, exhibition designers MOD Productions, and the UC's Institute for Governance and Policy Analysis (IGPA) and Centre for Creative & Cultural Research (CCCR). Once again the discussion was cross-institutional and trans-disciplinary, and ranged from the technical to the qualitative and from the personal to the curatorial. On a thematic level, specific narratives within the data revealed points of divergence and agreement between the generations, and challenged stereotypical views of generational engagement with and participation in democracy. On a practical front we shared an interest in materialising this data, literally making it present in the exhibition space but also of revealing its inherent dramas of conflict and change, and emphasising its personal implications. Our final realisation responded to these emerging matters of concern. In line with Latour, we sought to stage the data as embodied and affective, hoping to provoke reflection on matters of concern and to 'entangle' the audience in them, rather than pursuing an idealised reading of specific matters of fact. Once again the ability to create tangible representations of abstract data was central and formative. Even though the data in this case was extremely simple, the process of transforming those values into explicit spatial forms was critical. Three dimensional sketches visualised the data 'in situ' and provided tools to structure the Generations Room, including points of interchange and integration with other exhibition elements and systems.

Conclusion

In the discussion above we pursue a vision of computing true to Mahoney's proposition of a protean practice indifferent to disciplinary boundaries, and in doing so attempt to demonstrate how such a model of computing can support and energise interdisciplinary cross-institutional collaboration. The data at the centre of both projects serves as a gateway to this vital collaborative process; a conduit for developing shared understanding of significant matters of concern. Within this process we understand and

appreciate our collaborators' views but also share their concerns. Data here is a rich cultural material, laden with matters of fact and of concern, and it is through computation that we make tangible those implicit values and qualities. Our role in this process was not that of mechanical exposition - matters of concern are not so easily reducible. Our aim was to create artefacts which illuminate shared matters of concern but which also incite an audience to discover and develop their own matters of concern.

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