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Abstract:

This article presents guidelines for developing a Critical Documentation practice; a generative approach to documenting design research which emphasises drawing out the interplay between design practice and literature/precedents, to build a 'credible evidence base' for scholarly reporting. The guidelines are targeted at design researchers – particularly students and designers new to scholarship – conducting design practice as a mode of inquiry. The guidelines facilitate capturing and critiquing four categories of research activity: creating progressive overview maps, analysis of contextual anchors (key literature and practice precedents), reflective experiment logs (of iterative design processes) and peer critique. The guidelines are contextualised within Design literature and pedagogy. A case study demonstrates how insights from a Critical Documentation practice drive both design and research agendas of a project.

In order to frame design practice as a scholarly activity, researchers must demonstrate how original and transferable knowledge has emerged through design processes. Yet documenting processes such as iterative experimentation, decision-making driven by tacit knowledge, and insights drawn from self-reflection and peer critique is difficult and, as discussed below, few models exist for systematically and rigorously documenting these activities for scholarly reporting.

Therefore, this article presents a set of guidelines for developing a Critical Documentation practice: a systematic and generative approach to capturing and critiquing design research conducted in a scholarly context. The guidelines are intended for design researchers, particularly designers new to scholarship and research students and their supervisors, conducting design practice as a mode of inquiry. The guidelines facilitate documenting four categories of research through design (RtD)[1] activity: creating progressive overview maps (ongoing articulation of the Research agenda), analysis of contextual anchors (key literature and practice precedents), keeping reflective experiment logs (documentation of iterative design processes) and peer critique of both design artefacts and research insights (formal critique and anecdotal feedback). The guidelines include considerations on how to document RtD activities (*analogue and digital tools and techniques*), and reflective prompts to help draw out the interplay between design practice and design literature/precedents, in order to build a 'credible evidence base' (Pedgley, 2007) for reporting knowledge production that results from design practice.

A systematic documentation practice may seem like common sense to established design researchers, but there are many scenarios – teaching under- and postgraduate students, as well as reporting on my own research projects – in which I have searched in vain for guidelines that emphasise documenting design practice as *scholarly inquiry*. It is important to acknowledge that designers almost always conduct research as part of their practice, but this research is generally only shared with members of a project team, not broadly disseminated as a contribution to disciplinary knowledge.

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[1]Throughout this article, I use 'research through design' (RtD) to refer design practice carried out as a mode of scholarly inquiry, a term used for more than 20 years by the community of practitioner-researchers who participate in the RTD conference series (see Wallace et al., 2015; Durrant et al., 2017). I use 'practitioner-research' to refer to practice with both design and Research agendas, as discussed further in the body of the article.

This distinction is often described as the difference between 'research' and 'Research'. Christopher Frayling (1993) categorises research with a 'small r' as research *for* design, in contrast to Research *about* or *through* design. Extending Frayling's distinctions, Interaction Design researchers distinguish between 'first order knowledge', pertaining to specific projects and own-knowledge (research *for* design), and 'second order knowledge' – how insights and understandings revealed through the design process can be articulated as generalised knowledge (the aim of research *about* and *through* design). (Höök et al., 2015; Löwgren, 2013; Bardzell et al., 2016). Similarly, practitioner-researcher Anne Burdick (2003: p. 82) recognises that while all designers engage in creative exploration, a 'design (as) research' practice involves creating work that is "intended to address both a particular design brief and a larger set of questions at the same time." Burdick emphasises the importance of critical reflection within design research practice: "Designers must be able to articulate their questions and conclusions." (ibid) In this article, a distinction is made between research activities with a 'design agenda' (*project specific research for design, conducted to extend a designer's own knowledge*) and a 'Research agenda' (*research through design, conducted with the intention to produce original and transferable knowledge*).

The guidelines for Critical Documentation reported here were developed over more than fifteen-years as a designer, researcher and educator, drawing from existing approaches to journaling and documentation in design education and literature. The first section of the article contextualises the guidelines within educational and scholarly approaches to documenting design research, particularly a framework for planning and evaluating RtD documentation proposed by Bardzell et al. (2016). The second section presents the guidelines. The third section demonstrates how the guidelines were used in the project 'Endgame: Part 1'. It concludes by evaluating the guidelines based on Bardzell et al.'s framework.

1. Documentation in design education and RtD literature

1.1 Documentation in design education
It is worth considering how *process* documentation, particularly journaling, is taught in design education, as this is where most practitioner-researchers will have first learnt to document and share creative processes. Process journals – also referred to as diaries,

workbooks, log books, sketchbooks, development folios and notebooks – are used to document the various stages of a design project. Documenting inspiration (design precedents), ideation (concept development) and iterative processes (such as design drafts, prototype and UX testing, experimentation with media and materials) as a project unfolds allows students to: share iterative development with peers; collaborators or teaching staff to facilitate critique; self-critique in order to progress toward a final outcome, and; provide evidence of original ideas or designs (intellectual property).

Process journals may be shared either in their 'raw' state during studio critique, or as an edited document submitted for assessment. For example, in the Visual Communication Design program where I lecture, students submit an edited and critically annotated process journal alongside every assessable project. Students are instructed to include only what 'tells the story' of the design process; insightful moments, not every mark made or thought had. All examples and images must be annotated to explain how included drafts/iterations or design precedents informed students' concept development and/or making. Compiling such a document requires an additional round of critical reflection to decide which process work is significant and how to organise the content so it clearly communicates an iterative, reflective process.

Done well, these 'synthesis documents' provide an evidence base by which to evaluate research, conceptual development and novel processes which may not be evident in the final work itself, allowing staff to assess innovative thinking and processes as well as the final design artefact. (Smith, Hedley & Molloy, 2009) This is worth considering in the context of design scholarship, where processes/methods and critical thinking are often reported as the research outcome; design experiments are used to better understand or frame problems rather than produce solutions to them and, therefore, the processes must be sharable as well as final artefacts. (Dalsgaard et al., 2009; Lambert and Speed, 2017)

When design students transition to professional work, many continue documenting design processes, as seen in the wealth of books and trade publications showcasing sketchbooks of well-known designers, though many of these are more intimidatingly beautiful Pinterest-fodder than instructive peeks into a replicable process. Many textbooks, such as Giorgia Lupi and Stefanie Posavec's *Observe, Collect, Draw!: A Visual Journal* (2018), Keri Smith's *How to Be an Explorer of the World* (2008) and

Lynda Barry's *Syllabus* (2014), provide creative exercises and strategies for keeping process journals to manage own practice. However, beyond these showcase and instructional books, process documentation tends to be a private practice which professional designers use to self-manage; although process work may be shared within a design studio for critique or with clients during pitch sessions, I have never heard of clients or employers requesting a process journal to reward innovative thinking not evident in final design artefacts. Furthermore, as designers develop expertise and what Donald Schön (1984, p. 24) calls 'repertoire' – the mental archive of design examples, ideas, anecdotes and images that a design professional collects through their training and experience in practice which informs a designer's 'knowing-in-action' – there may be less need for annotating ideation and experimentation as learning becomes more instinctive and intuitive. Moreover, process work is the intellectual property of the designer and unrealised ideas in one project may be used in future projects; sharing this work is not good business practice.

Graduate students and established designers transitioning to academia may arrive with documentation habits which are effective for developing own practice (design agenda), but these habits need to be reframed for scholarly research (Research agenda). To demonstrate originality, innovation and rigour in a scholarly context, the tacit knowledge and material engagement driving design thinking and making needs to be evidenced and articulated in a broadly sharable way. Where process journaling in design education or professions is used to develop 'own practice', the primary goal of Critical Documentation for scholarly research is to capture and make connections between the thinking and processes that are consciously, or could later be evidenced as, 'research data'. In other words, the emphasis is on the criticality and rigour of the process as a scholarly research method.

1.2 Documentation as a scholarly design research method
Owain Pedgley argues that in order to be distinguished from design practice, design research requires "systematic and effective methods for capturing and analysing own design activity, so that the resultant data may be used as credible evidence base for practice-led research in design."[2] (2007, p. 480) Pedgley recognises that the "autobiographical nature of practice-led research involving self-accounting and self-

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[2] Pedgley uses 'practice-led research' to describe "a mode of enquiry in which design practice is used to create an evidence base for something demonstrated or found out." (p. 463) The same activity is referred to as RtD in this article.

analysis coupled to inherently personal design processes, demands that special attention is paid to achieving methodological transparency." (ibid, p. 480) Using his doctoral research as a case study, supplemented by interviews with other industrial design researchers, Pedgley provides a detailed account of developing a diary practice to document design activity which includes both 'cerebral' and 'externally perceptible' activities. He considers whether to write entries concurrently or retrospectively (p. 472) and suggests keeping events in chronological order, ensuring entries are "intelligible, insightful and honest" (p. 473), and provides a set of 'pro forma' sheets for recording end-of-the-day diary writing and coding (analysis) suggestions. Pedgely reflects that "later diary entries were generally more detailed DNA revealing than earlier ones" (p. 480) which points to the fact that documentation practices develop over time, as the researcher gets a 'feel' for the activities involved. This important idea is reiterated at the end of this article.

Pedgley's pragmatic approach is primarily concerned with revealing 'black box' aspects of designing; processes which occur in the relative privacy of studio practice and are not visible in a final artefact. Systematically and objectively capturing such activity provides opportunities to discuss iterations, processes or ideas that were entertained but not implemented, what Pedgley calls 'design activity reportage'. In this sense, Pedgley's approach is similar to data collection in the natural sciences, where researchers strive to objectively record experiments or phenomena, so the data set is 'untainted' by the bias or interpretation of the researcher. Published or otherwise shared within a field, such documentation contributes a data set for interpreting or valuing design artefacts in the pursuit of knowledge production.

However, although widely adopted, Pedgley's approach does not explicitly prompt drawing connections between design activity and the context in which it occurs – documenting the ways contextual research or theory may inform, or be informed by, an iterative design practice.[3] It also does not prompt researchers to contextualise current

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[3] A documentation model which does address drawing connections between design precedents and design processes is Dalsgaard et al.'s 'Maps for Design Reflection' (2009). The authors propose three types of map – Overview, Strand and Focal Maps – which focus on how ideas emerge from sources of inspiration, and transform through experiments with materials, to "scaffold reflective analyses." (p. 4) The maps are demonstrated within a clear case study. There are similarities between these maps and the guidelines presented here, such their Overview Maps as an "analytic tool for finished projects" (p. 5) which aligns with the use of a refined Overview Map as a presentation artefact (see Fig. 2), and their 'Focal' and 'Strand' maps are similar to the 'Reflective Experiment Log' in that they aim to document emergence of ideas in the design process (p. 5), however the 'Log' here is more detailed in 'what', 'how' and 'why' to generate documentation, and these guidelines include explicit documentation of theory (Contextual Anchors) and significantly more detailed prompts for reflection on and for practice than their model.

practice within a 'traceable genealogy' of own practice (Brandt & Binder, 2007) or contextualise the practice with precedents from the field. Nor does it recognise the potential value of capturing 'embodied cognition' that expert designers bring to practice (Mäkelä & Nimkulrat, 2018; Groth et al., 2015), which can lead to new lines of inquiry for both practice and research agendas; an example comes from Nimkulrat's doctoral research where documentation of her process leads her to connect the tactile and emotive experience of handling material (paper threads) across two design experiments, which in turn leads to a theoretical inquiry. (Mäkelä & Nimkulrat 2018, p. 11)

Therefore, the proposed guidelines extend Pedgley's model by emphasising contextualisation of a RtD project within Design literature and design artefact/process precedents, as well as within a researcher's own genealogy of RtD practice, and encouraging documentation of embodied experience.

Recognising that systematic documentation of RtD processes is "essential for capturing and translating design knowledge into broader academic knowledge" but that such documentation has "received little sustained attention," a collective of design researchers from the universities of Indiana (USA) and Aarhus (Denmark) conducted a Design literature review of approaches to RtD documentation. (Bardzell et al. 2016, p. 96) They concluded that existing models "variously shed light on different aspects of the problem [of documenting design research], but each is also incomplete. Each struggles to support design and research equally, and each struggles to balance pushing design forward in the moment with supporting reflection and synthetic thinking." (ibid, p.97) In other words, despite the recognised value of documenting RtD processes, there is no comprehensive model for doing so.

In addition to their literature review the research teams conducted a collaborative inquiry into each other's practices, to draw out problems with and possibilities for documenting RtD practice. As a result, Bardzell et al. point to three 'key concerns' when evaluating RtD documentation.

First, the medium of RtD documentation. Design documentation generally involves different kinds of documents (images, text, audio-visual) which are captured and stored in notebooks or software, in order to be "aggregated, disaggregated, and reaggregated for different purposes (e.g. to support design ideation, to pitch a direction to a client, to

trace the emerging rationale of a project)." (p. 98). Documentation becomes *coherent* based on how well the 'research data' is captured in the first place, but also in how documents have been aggregated (edited and composed) into a particular sharable document (such as a report or dissertation) based on substantive and rhetorical purposes of that document. A key problem with the *medium* of documentation is precisely what and how much to capture; amassing large quantities of data requires time and often technical skills to interpret.[4] This is further complicated in collaborative research where multiple team members are responsible for documentation, especially when the collaboration involves people not engaged in the research agenda. (p. 103)

Second, the performativity of the documentation, or, 'documents as speech acts'. (p. 99) During the study, the authors shifted from asking what design documentation *is* to what documentation *does*: "Documentation is not merely serving in an instrumental capacity to report on facts and findings; it is also generative in that it 'talks back' to us as designers and researchers." (p. 106) Rather than 'performative', the term 'generative' is used within this article, because it aligns Bardzell et al.'s idea with Schön's framing of design practice as a dialogue between designer and materials (1983, p. 135) and Tim Ingold's 'morphogenetic making' (2013) in which he considers making as a contingent process of growth. Performed critically, the act of documenting transcends passive description of what happened, to become itself a design activity. This kind of reflective and critical documentation allows ideas to surface – and be recorded – at unexpected moments in the design process. Lambert and Speed (2017, p. 104) describe the way that "ideas tend to emerge and develop on the move" in creative research, and propose that "design researchers have the means to reposition their projects to frame premeditated research questions and objectives within their work and in some cases to apply research questions after practice has taken place." Yet in order for such research framing to not appear as 'post rationalisation' of practice, rigorous documentation is required to show the evolution of thinking through making, and where critical documentation has in fact become a design act that generates insights about artefacts, processes or theories.

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[4] See, for example, McDonnell et al. (2004) on 'video story-making' as a method for eliciting and communicating critical reflections about design experiences. While framing video story-making as a "powerful and accessible means of sharing knowledge" (p. 514) they recognise the significant time required to review and edit footage and the danger of slipping into 'passive viewing.' Similarly, Safin et al. (2016, p.25) describe a software tool designed to connect "affective experience to the very particular moment when the ideas emerge" without interrupting the 'flow' of a design process and later be triangulated with other data such as verbal analysis, however the time and costly resource allocation of such a tool renders it impractical for many practitioner-researchers.

A type of generative documentation that is not addressed in Bardzell et al. is that of capturing *peer critique* as part of design and research processes. In the two case studies cited, documenting meeting notes and conversations is mentioned but little detail on precisely what was captured or how this data was later analysed or reflected upon. In the case of Peter Dalsgaard and Kim Halskov's Process Reflection Tool (PRT), photographs of whiteboards from meetings supplemented with bullet-list and diagrammatic summaries captured conversations from some key meetings, but it was noted that in general few reflections were entered by the research team, meaning the "rich discussions and reflections in the design research team throughout the project" were not captured. (Bardzell et al., 2016, p. 102)

Worth flagging is that Dalsgaard and Halskov's PRT was initially structured around chronologically documenting 'events' (distinct activities in a design process such as meetings, workshops or experiments) and 'sub-events' (such as a complex individual item on a meeting agenda or single design experiment, referred to as 'iterations' in the guidelines below), but after testing it, they added a 'notes' section, recognising the value of capturing 'informal' parts of the process such as emails, phone calls and coffee-machine conversations. (Dalsgaard & Halskov, 2012, p. 431) In commercial practice, informal feedback in studios or with design peers – as distinct from formal client feedback or user testing – frequently progresses a design solution by bringing a fresh, expert perspective to a design problem or process, but is rarely documented. In a research context, by proactively capturing peer critique – whether in formal meetings/presentations, or informal conversations with peers and collaborators – we become actors within critical scenario, synthesising and asking for clarification. Explaining how peer critique has informed design thinking and making can help transcend the 'autobiographical' nature of design research that Pedgley, and others, flag as a potential problem for reporting practice as research, and is addressed further in the guidelines below.

Bardzell et al.'s third concern is of providing *equal support* for design and research activities, when "the particularity of design seems to be in conflict with the generalising impulses of research." (p. 99) Dalsgaard and Halskov describe 'multiple levels of wickedness' faced by RtD practitioners: "they face not only the wicked problems in the practice of doing interaction design, but also the wicked problems that exist in the

practice of doing research" and the challenge of finding "the proper balance between acting as designers and acting as researchers." (2012, p. 428) To extend the idea of entanglement, Bardzell et al. cite Basballe and Halskov (2012)'s notion that in RtD, design and research are continuously and dynamically coupling, interweaving and decoupling. Knowing how and what to untangle in order to 'report research' is indeed a wicked problem.

Bill Gaver and John Bowers (2012, p. 42) express concern that adhering to scholarly conventions – making their research contributions "look a bit more like commonly understood versions of research" – something is lost from design practice: "is the result still design, or have we lost something in the process?" However, if the research narrative is only comprehensible to a small community of experts, it shackles the potential impact and contribution of the work. Using at least some familiar conventions while reporting RtD projects in a scholarly context – such as clearly pointing to research questions, methods/processes and precedents – demonstrates the research agenda to broader audiences, including design researchers who are not themselves practitioners, and researchers from other fields. The aim of Critical Documentation is not to make design practice 'look' more like research, but to convincingly show how original and transferable knowledge has emerged through practice. If design researchers are to work collaboratively we must find ways to explain RtD processes and artefacts, so other researchers and industry partners value our contributions. Figuring out how to document both design and research activities without 'decoupling' them has been a key concern in developing the following Critical Documentation guidelines.

After proposing the guidelines and demonstrating their use in a RtD project, Bardzell et al's three concerns for RtD documentation are reintroduced, to demonstrate how the guidelines contribute to Design scholarship.

2: Guidelines for developing a Critical Documentation practice
The guidelines below are organised by four research activities – creating Progressive Overview Maps, analysis of Contextual Anchors, keeping Reflective Experiment Logs, documenting Peer Critique – with suggestions on how to capture this 'research data' and prompts for reflection that focus on drawing out connections between design and research agendas. Documenting these four activities can evidence data required for

scholarly reporting: an evolving research agenda, contextual review of literature/precedents, design activity as a mode of inquiry and evidence of peer review.

Each type of documentation is described using the frame *what* (an expanded definition of the content type), *why* (the potential value of this type of documentation) and *how* (detailed suggestions for how to conduct the documentation).

2.1. Progressive Overview Maps.

What: Regular, succinct summaries of the research foci, aims and compelling questions driving the practice; like a screenshot of current thinking/making.

Why: Regularly pulling back to 'map the big picture' – design and research agendas – of a project as it is understood at a particular moment serves three purposes. First, it helps maintain perspective 'in action'; research unfolds messily, while focusing on one aspect of a project it can become difficult to see the forest for the trees. Second, progressive overview maps capture the evolution of a project for future reflection. Reflecting on overview maps may reveal when major shifts in the focus or framing of the research occur. For example, when a reading or design experiment leads to a noteworthy shift in thinking or a substantial change in the 'design horizon'. (Dalsgaard et al., 2009; Löwgren & Stolterman, 2004) Third, these overview maps are useful tools to communicate scholarly context for a specific project, or part of a project, in presentations, pitches or critique sessions.

How: These maps can be short written statements, or diagrammatic sketches. Starting a project, plan how to create and archive overview maps. Maps may be sketched on paper or created as digital files, but each map must be clearly dated and chronologically archived in a folder, file or notebook. Schedule a regular time to map that makes sense for the particular project: daily, weekly, monthly.

To start, respond to these prompts adapted from questions posed in Boothe et al. (2003):

> I am exploring: *[A specific topic, question, phenomenon, process]*
> by doing: *[Processes and methods]*

so that / in order to: *[What will people experience/learn/do? What is the relevance of this project; how does it relate to a problem or phenomenon in design practice, design theory or the world?]*

If, at various stages of a project, it is not possible to clearly answer these questions, reflect on why.

Then, note key 'anchors' (literature and design precedents, see 2.2 below) that inform current thinking or experiments, including specific ideas or provocations being interrogated or demonstrated through the design practice, and one's own previous projects or experiments. In developing a Critical Documentation practice, researchers may come up with original prompts, questions or approaches to capturing the 'big picture' for their unique practice.

2.2 Analysis of Contextual Anchors

What: Succinct analysis of key literature (scholarly and/or other texts) and design precedents (projects, processes or artefacts) that have significantly anchored or influenced thinking and/or design processes. This includes projects from the researcher's own 'genealogy'.

Why: Tracking when, within a research project, a text/theory/artefact/project inspires a design process (design agenda), or when a design process leads to a new understanding of a design artefact or theory (Research agenda), can later evidence how practice has functioned as a mode of inquiry. This differs to keeping a library of references in software such as Mendeley or Endnote, because documenting precisely when the texts/precedents were considered in the arc of a research project can be important. A collection of texts/precedents written up in this format can be collated as an Annotated Bibliography or Contextual Review in some genres of scholarly publishing; thorough initial documentation saves time later.

In addition to the tacit knowledge which develops through design practice, this practice of contextual analysis, particularly analysing design precedents, develops what Schön calls the researcher's 'repertoire'.

How:

a) Citation details.

b) Analysis of citation / metadata. [*Noteworthy details about the author/designer's title/institutional affiliations or the publication source/exhibition venue which may be relevant to mention in publications or presentations.*]

c) Short summary of text/precedent. [*What argument/s is the author/designer making? What is the aim of the project/artefact or how does it work?*]

d) Interpretation/analysis of the text/precedent. [*Why is this text / precedent relevant to this research, what was learnt from it and, most importantly, did it lead to new questions or design experiments?*]

2.3 Reflective Experiment[5] Logs

What: For each 'iteration' within a project, keep a Reflective Experiment Log using the prompts below. An iteration is any discrete activity conducted with a specific goal or question in mind, such as: prototyping, conducting material experiments or user testing scenarios. Clearly date experiments and archive chronologically.

Why: To record aims, processes/methods and critical reflections *on* and *for* design practice that may be later used as an evidence base for scholarly reporting. Reflecting on and for practice may generate design insights (how to improve design processes or outcomes) as well as research insights (design practice may lead to new understanding of or connections between key literature, design precedents or previous own practice that can form arguments or theorisation).

How: Schedule time for documentation; plan how, what and when to capture processes and reflections, in a way that is logical and achievable. Analogue documentation (handwritten notes, sketches) is quick and requires only pen and paper, however as documentation amasses, it is difficult to search and retrieve notes. Digital documentation requires equipment (hard and software to capture and store research data and ideas) which can interrupt the 'flow' of a design process, however using software such as Evernote or Trello allows embedding images, audio-visual and web clippings and makes this content searchable and able to be aggregated in many different ways. It is possible to combine modes for capturing and archiving this activity, although be aware that testing new digital tools (off-the-shelf apps or custom-made tools) can be time

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[5] Researchers may prefer terms such as 'events' (see Dalsgaard & Halskov, 2012); the guidelines are intended to be adaptable to the particularities of one's own practice and discipline.

consuming and deficiencies in tools may only become obvious halfway through a project.

Following are prompts for what to document, and when.

<u>Before:</u>

a) Aims:

What does the experiment aim to find out or test? Why?

b) Precedents / Context:

Who has performed similar research and/or practice, or what inspired this experiment (including the researcher's previous work)? What has been borrowed from the thinking, processes or methods, and how does this experiment differ from their outcome or methods?

<u>During:</u>

c) Process / Methods:

In point form, describe the method/s and processes used, include images, video or diagrams where relevant. Clearly note where processes/methods are borrowed or original. It is essential to plan what, how and when to best capture a process before starting each experiment. What 'data' is to be collected – processes/actions, output/artefacts, peer/collaborator/user responses, or a combination of these? How will the data be captured: photograph, voice/video record, screen-grab, write or sketch notes. When will the data be captured – concurrently (while working) or retrospectively (an allocated time at the end of each work session)?

<u>After:</u>

d) Reflection *on* Action:

Review the processes and methods. In point form, reflect:

Was what happened expected; why/why not?

Did the methods/processes shift while working; how and why?

Record emotional responses to the practice; what was frustrating, exciting, disappointing, satisfying?

What insights were gained through this experiment; what is known now that was not known before?

Has this experiment led to thinking differently about the precedents, previous experiments, readings or theories?

Has this experiment shifted the research focus, aims or questions?

e) Reflection *for* Action:

Based on the reflections on action, what might be done differently or next? Use these reflections to start the next experiment log. How could the experiment be repeated or re-designed to achieve better or different results? Should this experiment be abandoned to start something new?

2.4 Reflecting on Peer Critique

What: Capturing and reflecting on peer critique such as: feedback given in studio pin-ups, conversations with expert colleagues, sessions with academic supervisors, user testing or focus groups, and critique from public lectures, workshops or conference presentations about the design research.

Why: First, receiving critique can be difficult; feedback is often missed/misinterpreted when the recipient feels defensive, overwhelmed, or is unable to follow sometimes-haphazard ideas being thrown around on the spot. For RtD practitioners, critique can be further complicated by the entanglement of design and research agendas, which can confuse both the researcher and critic. Capturing critique allows retrospective reflection in a more focused and less defensive mind-frame.

Second, significant insights about both design and research agendas of a RtD project can evolve from 'hallway conversations' with colleagues who are often experts in the field, or comments made about work presented in public lectures. The case study below includes examples of such moments. This 'informal critique' is comparable to peer-critique commercial designers receive in studio environments, and should be a valued aspect of the practitioner-researcher's process.

Documenting critique ensures that instances in which critique leads to a significant shift in the design or research agenda can later be credited; depending on the wishes of the critique giver this could be anonymous (one participant suggested X, which led to insight/experiment Y) or attributed (Name suggested X, which led to insight/experiment Y). Within academia citing the source of ideas avoids plagiarism, but is also a way to acknowledge expertise of the community of practice the work sits within and draws upon.

How: It is important to clarify what is to be critiqued – design processes and/or artefacts, research underpinning the practice, or both, which is possible when critique comes from a community of RtD practitioners. The critique process may be organised in three steps:

a) *Capture the critique*. Audio or video recording (with permission) allows researchers to stay focused in the critique session and retrospective listening may reveal further insights, but this requires dedicated time to transcribing later and may result in 'passive viewing' rather than engaged analysis (McDonnell et al., 2004). Taking notes or recruiting a scribe can quickly capture the essence of the feedback, and pausing the conversation to take notes can provide opportunities for clarification, but may result in missing or misunderstand feedback. If seeking critique on a particular aspect of a design artefact or experience, preparing materials (*surveys, maps or other documents*) for participants to fill out can help gather thoughtful responses.

b) *Critique the critique*. Read or listen to the critique, draw out what is useful for the research and/or design agendas, remembering that the critique giver may have their own, differing agenda. This may be done in conversation with a supervisor or colleague who was present, to tease out or clarify key ideas.

c) *Create 'action lists' from the critique*. How could issues raised, or suggestions made, be responded to through practice? Map or bullet point processes to test, readings to find, concepts to further develop; assign how long and when to do these activities.

3. Critical Documentation case study: Endgame Part 1

This section demonstrates how the guidelines are used to document an ongoing project 'Endgame'. The project began as a RtD experiment to get my head around Johanna Drucker's theory of 'Graphesis' (2014), by designing deliberately misleading diagrams, in order to think-through and demonstrate the interpretive bias involved in designing these pieces of visual communication. An overview of the project is followed by a description of how 'research data' drawn from my Critical Documentation practice frames the design practice as scholarly inquiry.

3.1 Project Overview: Endgame Part 1

In *Graphesis: Visual forms of knowledge production*, design and humanities scholar Johanna Drucker sets out to establish a critical frame for understanding visualisation as a primary mode of knowledge production, at a time when "graphics of all kinds have

become the predominant mode of constructing and presenting information and experience." (2014, p. 6) Recognising that information graphics originate from disciplines such as statistics and the empirical sciences which prioritise quantitative and 'factual' statements, Drucker challenges the notion that these visual forms are a priori forms of knowledge – reductive depictions of 'what is':

> "*Most information visualizations are acts of interpretation masquerading as presentation*. In other words, they are images that act as if they are just showing us what is, but in actuality, they are arguments made in graphical form." (p. 10, *her emphasis*)

Currently, anyone with basic computer skills can produce convincing-looking information visualisations. As a result, information visualisations are ubiquitous in the digital landscape, neatly summarising data sets and lending the appearance of authority to news reports, websites and social media posts. However, scholars such as Drucker warn that digital tools allow us to make and share information visualisations "without clear understanding of their rhetorical force or the suitability of their underlying semantic structuring principles to the problem for which they supposedly present a solution or transparent analysis." (ibid) In other words, we are able to quickly and cheaply generate visualisations that have appearance of meaning, without understanding how that meaning is produced. Describing data visualisation produced "as if the information merely exists and is not selected," designer and critic Paula Scher (2017) warns these visualisations "border on dangerous. It is the world's most effective form of propaganda."

To demonstrate how visualisations function as arguments, Drucker calls for design and humanities scholars to experiment with qualitative approaches to information visualisation, approaches which aim to reveal the nuance, ambiguity and subjectivity inherent in qualitative fields of inquiry: "not just because these are conditions of knowledge production in our disciplines, but because the very model of knowledge itself that gets embodied in the process has values whose cultural authority matters very much." (p. 190-191)

I began reading *Graphesis* in late 2016, as the terms 'fake news' and 'alternative facts' were being normalised in public discourse. I noticed that many visualisations wallpapering news and social media forums have 'the appearance of meaning' but, on closer inspection, reveal poorly formed arguments or a lack of comprehensible data. In

particular, articles on climate change – both advocating preventative action and denying its existence – rely on empirical-looking diagrams to communicate authority, often without communicating much at all.

Reflecting on Drucker's provocation for experimental visualisation and the proliferation of ambiguous climate change diagrams, I asked:

> *How might I design a deliberately deceptive diagram that appears to communicate something about climate change, without communicating anything at all? How might I design a diagram which renders visible my 'authorship', in order to think-through and demonstrate the constructed nature of these visual forms?*

Therefore, this project is an example of RtD as an exploratory mode of inquiry – the design practice (creating diagrams) is performed in order to interpret and demonstrate theory (an aspect of Drucker's Graphesis).

3.2 Critical Documentation in the RtD project Endgame: Part 1

3.2.1 Progressive Overview Maps

I draft overview maps in a notebook; when I have articulated the research agenda as clearly as I can, I sketch and pin them up in my workspace. I edit and add to these maps as my thinking shifts. As new maps replace old, I either archive in a specific folder, or photograph and save to an Evernote project folder.[6]

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[6] I developed this practice during my doctoral research, when I created A3 maps before supervision meetings, to keep discussions focussed on aspects of the research I needed feedback on. These maps were annotated with feedback during meetings, then I created a new map in the days following to keep me on track until the next meeting. I ended up with 83 maps tracking the evolution of my thinking and many diversions, which were invaluable during the final writing phase. (see Sadokierski 2011)
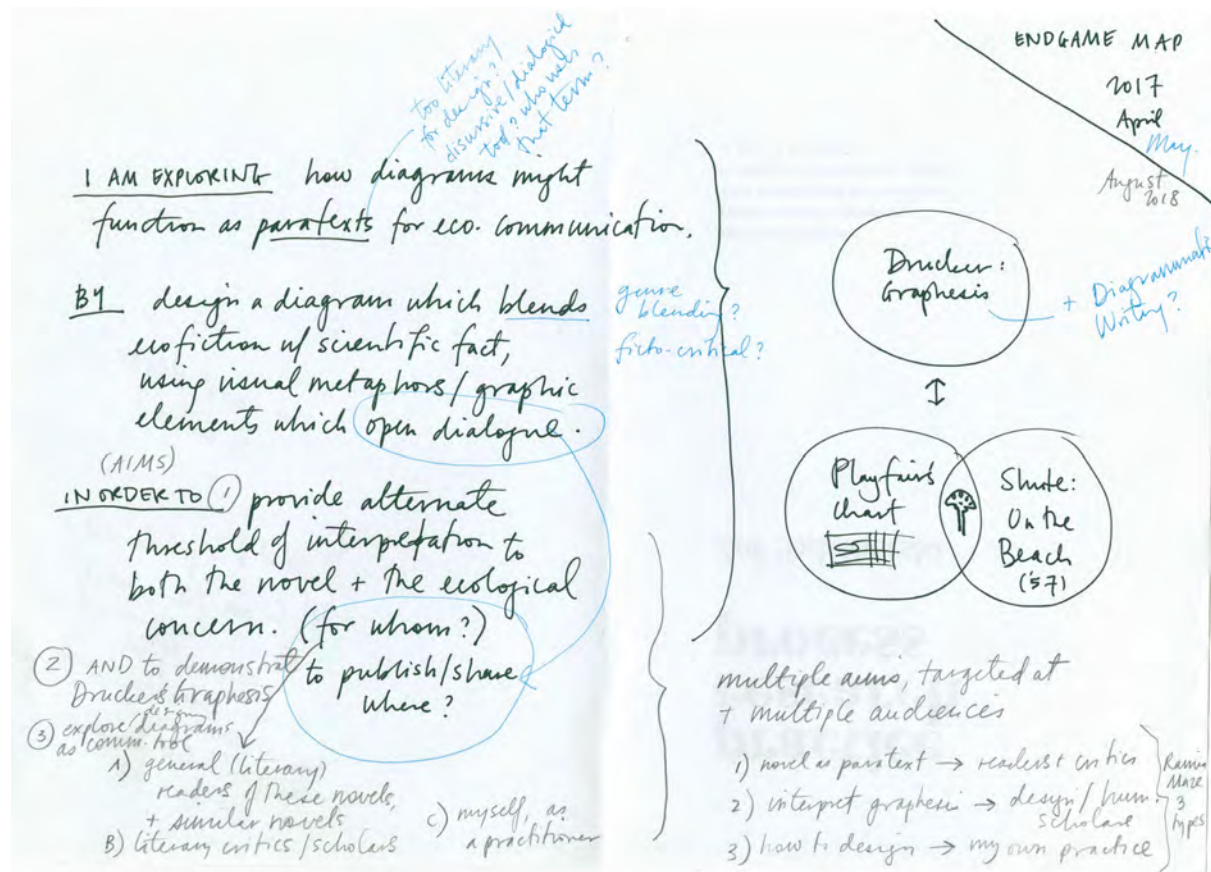
Fig. 1: Progressive Overview Map, April 2017 – August 2018

In Figure 1, three colours show different times of annotation, dated in the top right corner as April 2017 (black), May 2017 (blue) and August 2018 (pencil). Black writing on the left is a first response to the Progressive Overview Map prompts in the guidelines (see Section 2.1) and the sketch on the right maps the anchors in play at the time. Blue ink and pencil annotations record critical reflections about both design and research agendas, as they evolved over the project. For example, a note in blue (top left) extending from 'paratexts' "too literary for design? Discursive/dialogical tool? Who uses that term?" demonstrates thinking through appropriate critical language for Design scholarship, with a prompt to follow up unclear terms. The pencil notes (bottom right) show how the initial experiment evolved into a larger project with "multiple aims, targeted at multiple audiences" which include both design and Research agendas.
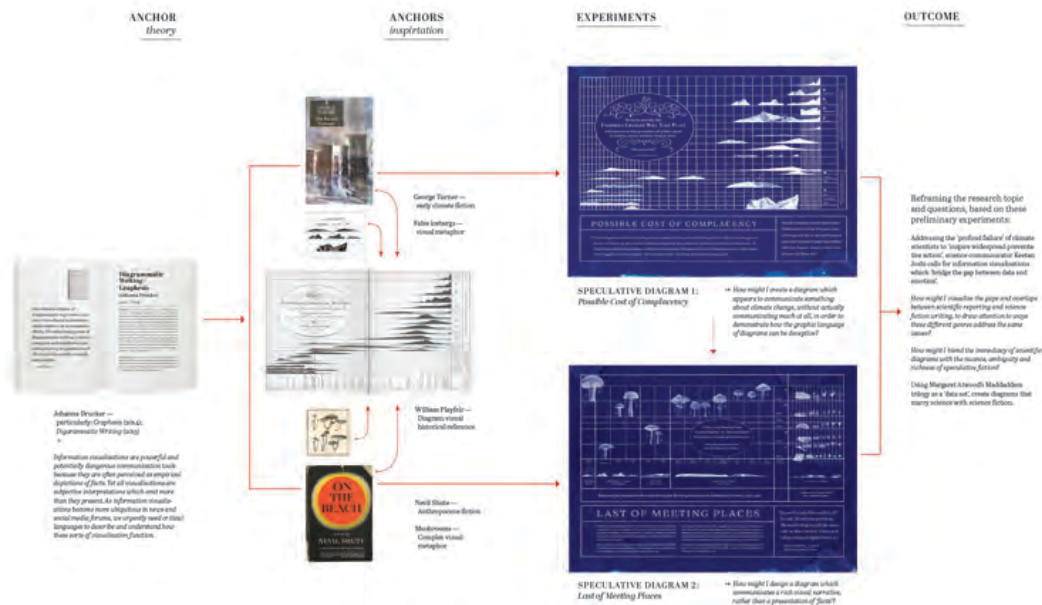
Fig 2. Overview Map for 'Endgame Part 1' (presentation tool)

Figure 2 is an overview map created to sit alongside the two final diagrams in the 'Rooms of Interest' exhibition at the RTD2019 conference, communicating: anchors – both research/theory and design precedents/inspiration; design experiments, and; research questions as outcomes of the RtD practice. This more refined example shows how an overview map can be used to communicate the research context for RtD artefact/s.
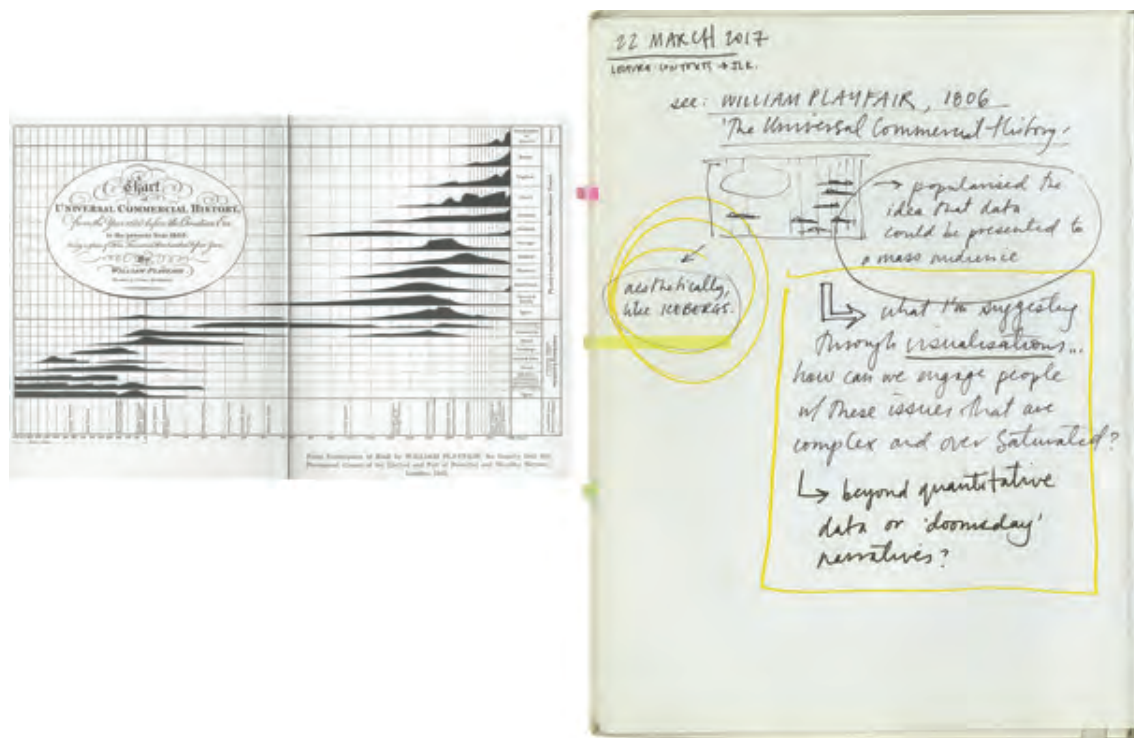
Fig. 3: Contextual Anchor (design precedent). Playfair's 1805 chart (public domain) and journal notes from a lecture in which I first connected Playfair's chart with icebergs.

3.2.2 Contextual anchors

A hasty note from a lecture delivered by a colleague in early 2017 set my design process in motion. With climate change diagrams on my mind, I noted that William Playfair's 1805 chart about distribution of wealth resembles icebergs. I wondered how I might manipulate this chart to make it appear more like a climate change visualisation, in response to Drucker's provocation. Often, I find connecting two or more texts/projects will 'anchor' the research agenda and drive a project forward; here, (see Figure 3) Drucker's *Graphesis* (research anchor) with Playfair's diagram and icebergs as metaphors for climate change (design anchors). These connections rarely happen in a neat, chronological manner, this example demonstrates that noting when contextual anchors come to one's attention within a research project is important; this documentation can later demonstrate the complex 'coupling' of practice and theory throughout an iterative design research practice.

3.2.3 Reflective Experiment Logs
Diagram 1: Possible Cost of Complacency

Fig. 4 Pages from an exhibition catalogue, compiled from my Reflective Experiment Log data, communicate some of the iterative design process and reflections from this experiment.

Manipulating Playfair's diagram, I added graphical forms which more closely resemble icebergs – Figures 4 and 5. I replaced the labels and captions on Playfair's diagram with excerpts from a novel about climate change, George Turner's *The Sea and Summer* (1987), to further suggest the diagram communicates something about climate change without using scientific data.
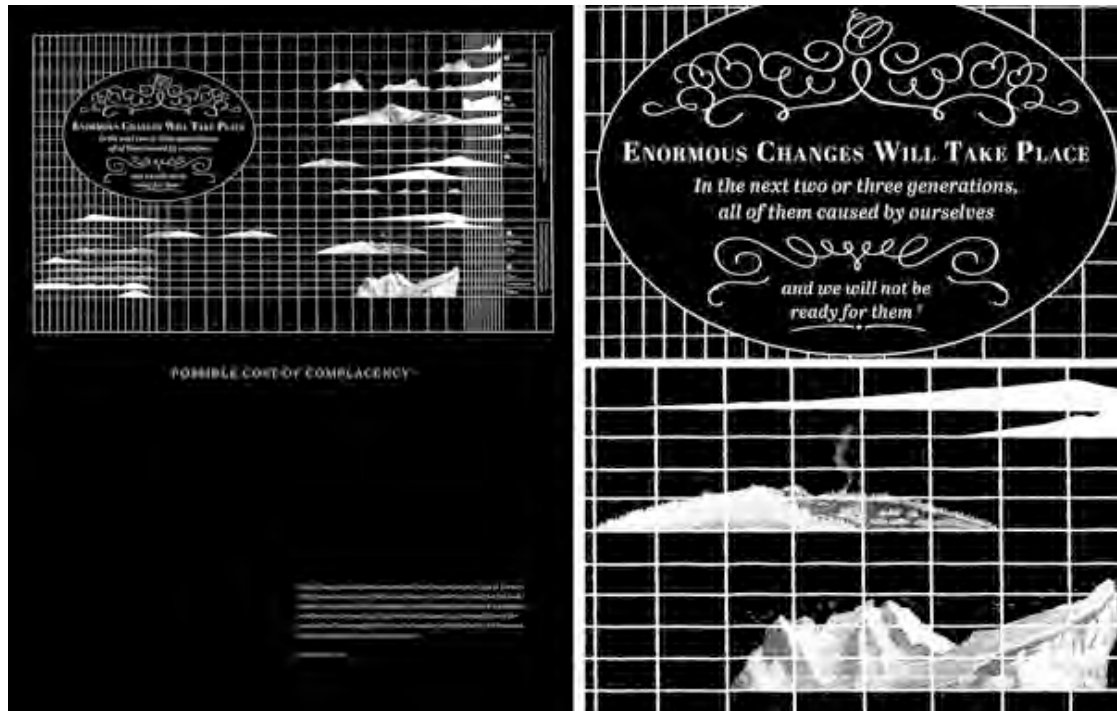
Fig 5. Diagram 1: Possible Cost of Complacency (first iteration), with detail.

At a glance the diagram appears to be a visualisation about global warming/glacial melting, but on closer inspection it reveals a confusing narrative. The paragraph at the bottom of the diagram informs viewers that this is a deliberately ambiguous image, and draws attention to the designer's 'authorship':

> The text fragments and labels in this diagram are extracted from the postscript to George Turner's 1987 climate change novel *The Sea and Summer*, in which he states that his novel explores the possible cost of political and ecological complacency: "We talk of leaving a better world to our children but in fact do little more than rub along with day-to-day problems and hope that the longer-range catastrophes will never happen. Sooner or later some of them will. Sleep well." Yet Turner denies the novel is prophetic or offered as a dire warning. This diagram is a visual interpretation of one 'major matter' Turner suggests we need to consider – the Greenhouse Effect – yet I deny that it means anything at all.
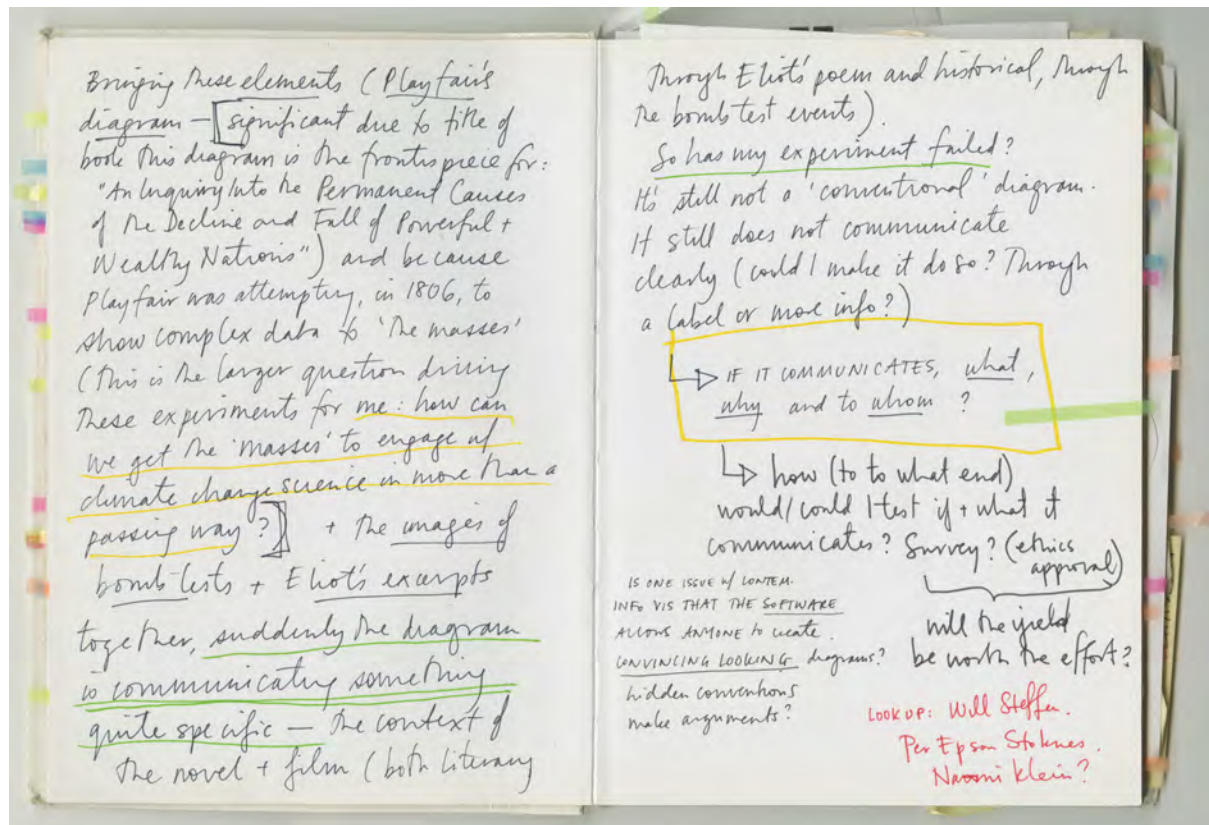
Fig. 6. Reflective Experiment Log (notebook) reflection on action after the first iteration of Diagram 1, showing my revelation that the experiment failed in its aim but opened new lines of research inquiry.

I failed in my aim to produce a diagram which communicates 'nothing at all'. Although confusing, the diagram still communicates *something*, which I came to understand is precisely Drucker's point. However, reflecting on the 'failed' experiment led to a significant insight: visualising the relationship between fiction and the context in which it was written might provide alternate 'thresholds of interpretation' (Genette, 1997) to both the novel and the social issues it addresses. This provided a shift in the 'design horizon', leading me to ask: *How might I produce a diagram which functions as a 'discursive tool'/paratext for generating conversation about ecological issues?* Through reflective documentation, the result of this design practice was not just a diagram, but also a new research question.

Diagram 2: Last of Meeting Places
The new research question – *How might I produce a diagram which functions as a 'discursive tool'/paratext for generating conversation about ecological issues?* – led to the second experiment, 'Last of Meeting Places'. This diagram blends text from Nevil

Shute's post-apocalyptic novel *On The Beach* with data about nuclear weapons testing conducted on Australian territory at the time of publication. Shute wrote the novel in 1957 after emigrating to Australia from Britain. In the five years preceding publication, the British government tested thirteen major atmospheric nuclear weapons on Australian territory. Presenting factual data about nuclear tests from the era in which this classic novel was written gives contemporary readers context by which to consider both the novel, and a devastating nuclear history that has been widely forgotten. In the process of designing this second diagram, I shifted from working with deliberately ambiguous graphic elements – icebergs in the previous diagram – to considering how I might embed graphic elements which function as a visual metaphor; the mushrooms in this diagram represent nuclear explosion.
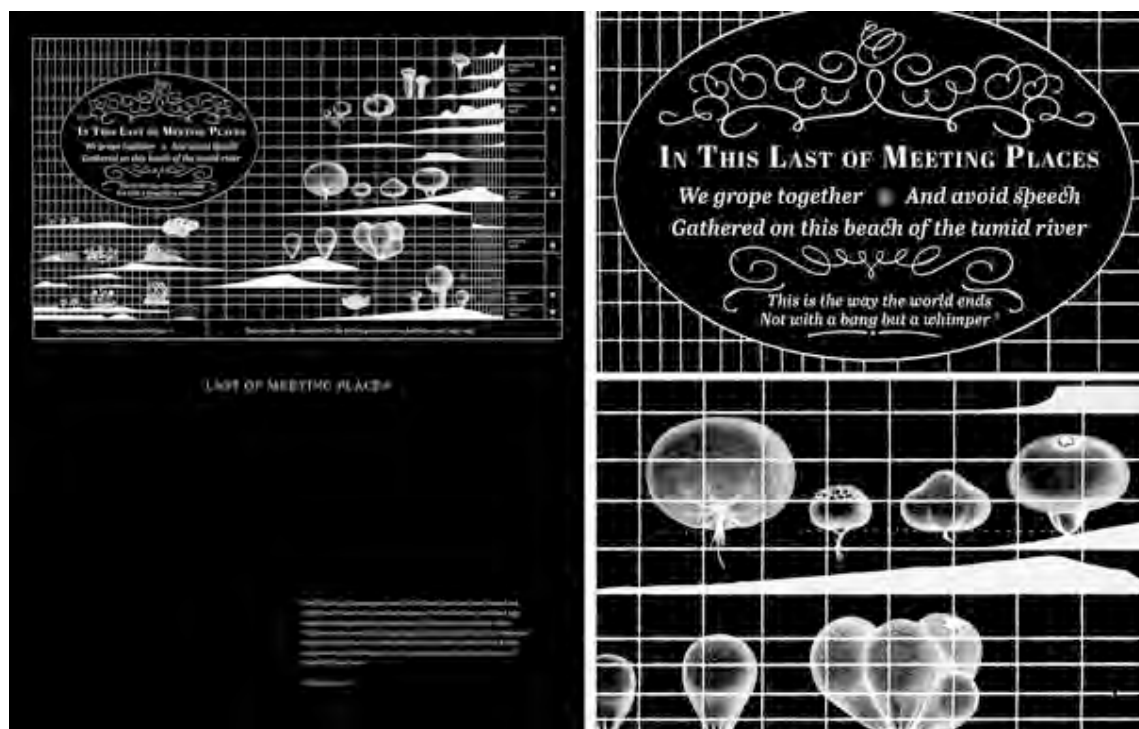

Fig 7. Diagram 2: Last of Meeting Places (iteration 1), with detail

3.2.4 Peer Critique

In May 2017, I exhibited the first iterations (diagrams) at a small gallery opposite the university; research exhibitions are a forum for inviting feedback on design artefacts. This differs from a fine art practice, in which exhibited work is usually considered 'finished'. Critique from colleagues at the exhibition and after, led me to redesign both diagrams and extend the research agenda beyond an exploration of Drucker's Graphesis.
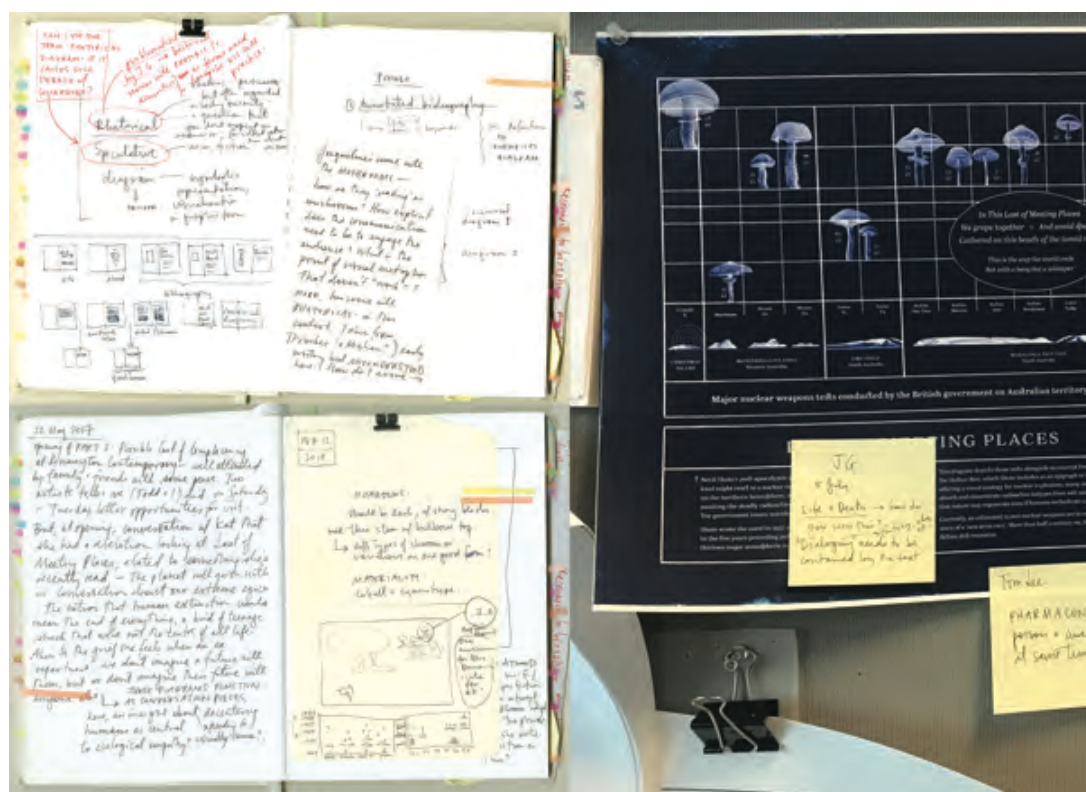
Fig 8. Capturing informal peer critique. Journal notation of conversations at an exhibition of the work (left) and post-it documentation in my office (right), from several expert colleagues.

In particular, Jacqueline Gothe, an expert practitioner-researcher in my field, verbally critiqued the diagrams at the exhibition: she felt the second was less convincing than the first because the graphic elements did not 'read' clearly enough as mushrooms, muddying the communication more than I intended, and questioned whether 'mushroom cloud' is a sufficiently complex metaphor (design agenda). She also questioned my use of the term 'rhetorical' to describe the function of these diagrams, which carries different associations in the humanities and design (Research agenda). I documented the feedback in my Reflective Experiment Log, see Figure. 8. Weeks later, another conversation in my office, where the diagrams were pinned up, allowed me to clarify Gothe's critique. I documented both our conversations retrospectively in my journal. After the second conversation, a post-it note reminded me of the critique as I periodically looked at the work; during teaching semester I pin research projects where I can see them to allow ideas to marinade slowly, while my brain is primarily occupied by teaching and administrative activity.

Almost a year later, responding to peer and self-critique from the exhibition, I redesigned the diagrams. Further research revealed that some mushrooms absorb and concentrate radioactive isotopes from soil; in addition to a visual analogy for nuclear explosions, mushrooms represent a bittersweet hope that even if humankind orchestrates a nuclear holocaust, the planet may regenerate without us. Extending the metaphor beyond the literal 'mushroom cloud' prompted me to add more contextual information (text excerpts) to offer further thresholds of interpretation.
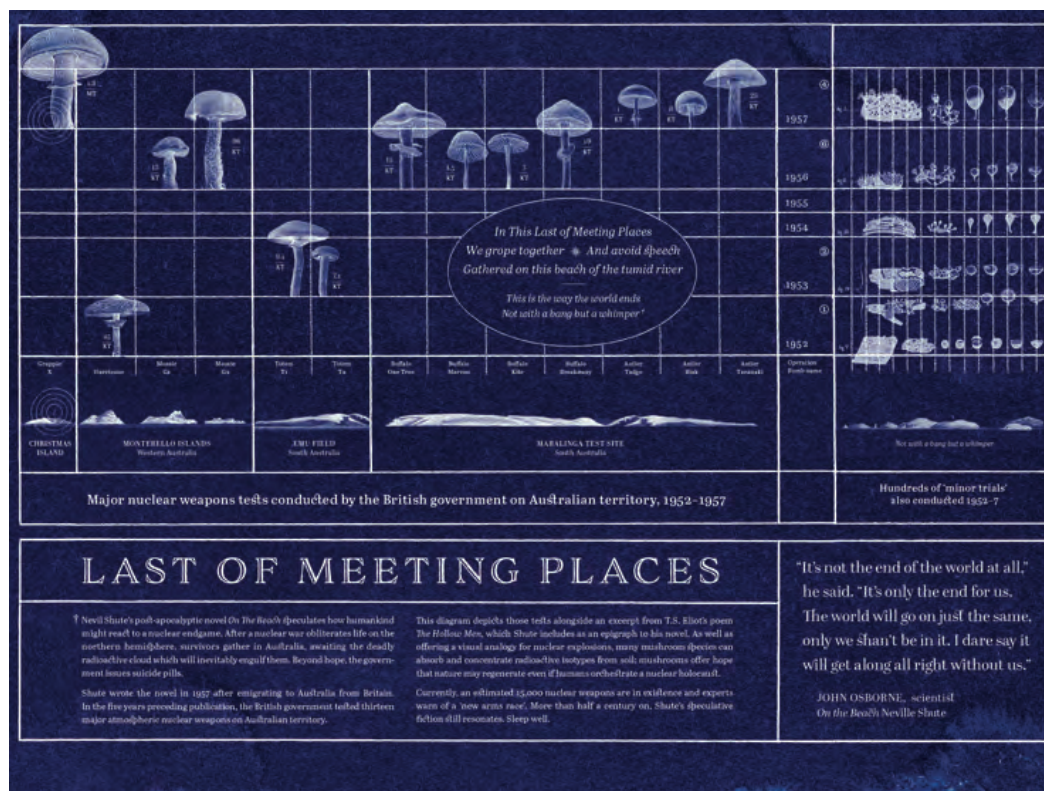

Fig 9. Diagram 2: Last of Meeting Places (iteration 2)

To provide additional 'thresholds of interpretation' for the issue this work addresses (consequences of nuclear weapons), this iteration (see Figure 9) includes factual information (mushrooms' capacity to absorb radioactive isotopes, horrifying witness accounts of the nuclear tests, and that 15,000 active nuclear weapons are known to exist today) alongside a quote from one Shute's characters: "'It's not the end of the world at all,' he said. 'It's only the end for us. The world will go on just the same, only we shan't be in it. I dare say it will get along all right without us.'"

While conducting the mushroom research (design agenda), I came across new theoretical anchors: Anna Tsing's *Mushroom at the End of the World* (2015), and

subsequent *Arts of Living on a Damaged Planet* (co-edited, 2017). These texts unfurled new research questions and objectives including: the potential for 'design fictions' to inform ecological storytelling; examining narrative approaches to information visualisation in the natural sciences; 'genre blending' as a strategy for 'futuring'. I am currently producing work for 'Endgame Part 3: Novel Landscapes', after a body of work titled 'Endgame Part 2: The Everything Change' completed and exhibited in early 2019. The Critical Documentation practice is increasingly valuable as the design practice and research agenda continue to evolve in this expanding project.

Design artefacts from 'Endgame: Part 1' have been exhibited in two local exhibitions, as well as at the 'Rooms of Interest' exhibition at the double-blind peer reviewed RtD2019 conference in Delft. A booklet documenting the research process and final artefacts was exhibited alongside the diagrams in all three venues, and is available to order via my website and on Blurb (a print-on-demand publishing service).

3.3 Reflection on the Critical Documentation practice

The case study demonstrates how following the guidelines for Critical Documentation results in an evidence base for scholarly reporting, as described at the start of Section 2:

i) generating Progressive Overview Maps facilitates documenting an evolving research agenda, including shifts in the design horizon (Fig. 1), and can communicate the research under-pinning design artefacts in pubic presentations (Fig. 2);

ii) recording Contextual Anchors, both design precedents (Playfair's diagram) and scholarly texts (Drucker's *Graphesis*) allows me to show the overlapping design and research strands of the project and forms a contextual review for presenting or writing about the project in scholarly contexts (see Fig. 3);

iii) detailed Reflective Experiment Logs document reflections *on* and *for* design practice that can evidence insights that arise through design processes and inform both the design (Fig. 4) and research (Fig. 6) agendas of an RtD project;

iv) documenting Peer Critique can provide reflective prompts that lead to new strands of research and design inquiry (Fig. 8).

'Endgame: Part 1' began as a way to interpret Drucker's theory of Graphesis, through reflective practice. Throughout her book, Drucker uses a plethora of visual examples to

both support and make arguments, in an exemplary way. However, these examples are critiques of final design artefacts (information graphics, graphic interfaces and some RtD projects); there are no examples from a practitioner's perspective. As stated above, Drucker puts forth a provocation for design and humanities scholars to experiment with ways to reveal the inherent ambiguity and subjectivity embedded in design processes; an invitation to extend her theory with case studies from practice. Together, the two diagrams and Critical Documentation of the design process for 'Endgame: Part 1' constitute such a case study, extending Drucker's theory from the experience and perspective of a design practitioner.

The case study reported here is the first iteration of an ongoing RtD project. As the project expands, the potential for both the designer's agenda (developing my own experimental information visualisation practice) and the Research agenda (interpreting and extending Drucker's theory of Graphesis from a practitioner's perspective) also expands. In other words, what is reported here is a small, initial claim to what I hope evolves into a more significant development of my own RtD practice and contribution to scholarly knowledge. The ongoing Critical Documentation practice provides a 'credible evidence base' for demonstrating how transferable original knowledge has emerged through practice.

4. Discussion

The guidelines for Critical Documentation presented here extend existing approaches to documenting design research, most notably Pedgley's widely-used diary model, by: contextualising a RtD project within Design literature and design precedents, as well as within a researcher's own 'genealogy' of RtD practice; providing prompts to elicit reflections *on* (research agenda) and *for* (design agenda) practice; and arguing that documenting expert peer critique in formal (public presentations) and informal (private conversations) settings is valuable for Design discourse.

Returning to Bardzell et al. (2016)'s three concerns for RtD documentation – medium, performativity (referred to as 'generative' in this article) and equal support of design and research agendas – the final section further argues how the proposed guidelines contribute to Design scholarship and address the aims set out at the start of the article.

'Design' is an extended family of practices – including but not limited to visual communication, product, interaction, fashion and animation – each with conventions for undertaking, documenting and sharing practice in *mediums* appropriate to the particular practice. This presents a major obstacle for creating a definitive documentation tool that suits the idiosyncrasies of all members of the Design family. Here, the emphasis is on the difference between offering *tools* to facilitate the medium of documentation (such as the previously mentioned Dalsgaard and Halskov's PRT system or Pedgley's proforma sheets), and offering guidelines for developing a documentation practice appropriate to the particular researcher.

Although there are suggestions for digital tools within the guidelines, the intention is for individuals to develop protocols for capturing and archiving content in formats and media that best suit their own practice and discipline, with an emphasis on *what* to capture over *how* to capture it. For example, the 'How' section of Reflective Experiment Logs invites researchers to consider how, what and when to document, and offers pros and cons of analogue versus digital documentation tools; this surfaces the challenges of documentation medium for the researcher to consider in relation to their own practice, rather than offering a concrete tool or solution.

The medium for documentation described in the Endgame case study may sound haphazard – combining a paper journal with apps and cloud storage for different documentation types – but it works for me. I have tested numerous digital tools and systems designed to 'streamline workflow' but abandon them when they fail to accommodate the particularities of what and how I design. Setting up a research blog using the guideline's four content types as index categories has been fruitful for my under- and postgraduate students (and during my own doctoral research), but I hesitate to tie my practice to technology that requires updating and learning new technical skills each time apps relaunch or hardware changes. Developing a documentation practice with an emphasis on *criticality* over tools allows researchers to incorporate new mediums and tools over the course of a career, or as one's work environment changes.

The Endgame case study demonstrates how the guidelines foster a *generative* documentation practice. In particular, the prompts for reflection within the guidelines (particularly in the Peer Critique and Reflective Experiment Log categories) are intended to facilitate drawing out insights that generate further design and/or research activities.

Examples from the case study are reworking the mushroom graphics (design agenda) and adding new contextual anchors (Research agenda). As a teaching resource, these prompts are instrumental in a developing students' capacity to perform self-motivated experimental/critical practice, rather than waiting for feedback before progressing. As a commercial designer who has transitioned to scholarship, I trust that following the 'Reflective Experiment Log' guidelines will capture my reflective practice as research data for scholarly reporting, which allows me to lean into the design phases of my practice with less anxiety about whether this work will amount to 'Research' at a later stage.

Therefore, these reflective prompts are also crucial for addressing Bardzell et al's third concern – that of offering equal support for the design and research agenda. In addition to the prompts in the Reflective Experiment Log and Peer Critique categories, the Progressive Overview Maps and Contextual Anchor categories facilitate drawing out how and where design practice informs, and is informed by, literature and design precedents. Documenting scholarly reading and inspiration from design artefact/process precedents alongside and amongst the design practice provides a map to untangle the coupling/decoupling of practice and research over the duration of long and often rhizomatic project arcs. This, in particular, distinguishes the guidelines for Critical Documentation from existing documentation approaches, which focus exclusively on capturing 'black box' activities.

As argued above, evidencing the role of peer critique in the research process requires more attention. The kind of peer critique described in the Endgame project is not suggested as a direct equivalent to scholarly blind-peer-review, but rather an invaluable aspect of RtD practice that deserves discussion in Design literature. Researchers often work alongside or communicate with experts in the field about the design work undertaken as part of research practice. To truly open the 'black box' of practitioner research, this discursive, community-based peer review can evidence how critique embedded within iterative design processes is integral to successful RTD practice.

Just as Drucker calls for practitioners to demonstrate her theory of Graphesis, this article calls for other design researchers to report case studies in which a Critical Documentation practice has resulted in original and transferrable knowledge. Learning to document, as well as learning from documentation, will be facilitated by exposure to a

suite of exemplars from a range of design practices. This article briefly presents a single, small-scale example of what is a highly complex zone of activity in design research. Further case studies will be invaluable for training students and practitioners new to scholarship.

Finally, design researchers should approach a Critical Documentation practice like every other practice; expertise will develop iteratively, over time. Performing documentation 'trial runs' before committing to critically documenting a large project is advisable, because figuring out what to document in a given project is an ongoing challenge. Learning to critically document one's own design practice is a first step; anticipating how to document shifts in one's evolving practice is ongoing.

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