

Creative Toolkits for TIPS*

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Abstract. We present a survey of toolkits employed in research workshop approaches within TIPS (Trust, Identity, Privacy and Security) domains. Our survey was developed within wider design research to develop digital service prototypes that support people in evaluating whether to trust that an online actor’s identity is not recently faked, and that a service they are registering personal information with is legitimate; and a subsequent project involving a tool that invites people to reflect on the cumulative risks of sharing apparently harmless personal information online. The radically multidisciplinary nature of both these TIPS projects has determined that we create a research space to promote exchange to, as design researchers, better understand the ‘opaque’ immediate and longer term implications of our proposed services and invite cross-disciplinary discussion towards interdisciplinary understandings. This paper is intended as an at-a-glance resource for researchers from a range of disciplinary backgrounds working on TIPS research to inform on various different material engagements, with research stakeholders, through creative workshop approaches. Our survey focused on the literature from Design (especially Participatory Design or PD, and Codesign), Human Computer Interaction (HCI) and cyber related security research. It comprises 30 papers or toolkit examples organised across: review papers; example toolkits; case studies reporting relevant toolkit use; applied toolkits for learning/knowledge exchange; research toolkits focused on demonstrating a methodological-conceptual approach (some problematising emergent or near-future technologies); and two papers that straddled the latter two categories, focusing on future practical application. We begin with an overview of our rationale and method before presenting each group of texts in a table alongside a summary discussion. We go on to discuss the various material components, affordances and terminology of the toolkits along with core concerns often left out of the reporting of research; before going on to recognise toolkits not so much as things that diagnose and fix things, but as a loose collection of readily available material and wider resources, used in particular participatory approaches, which together help account for techno-relational differences and contingencies in TIPS-related fields.

Keywords: Toolkits · Creative Workshops · TIPS · Interdisciplinarity · Participatory Design.

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1 Introduction

Our motivation was to synthesise the rapidly growing body of research that usefully demonstrates workshop-based design techniques drawn particularly from Participatory Design approaches. If not always explicitly presented as involving toolkits, the design tools and techniques reported employ a form of making — from storytelling and 3D modelling to role play and map making. The literature mostly presents a workshop setting involving a toolkit, or toolbox of materials and processes that facilitate creative and reflective processes to unfold. Furthermore, the workshops are conducted across collaborative (multidisciplinary), and cross-sectoral (involving stakeholders) settings. This collection of creative toolkits employs various materials, and their inherent affordances, to prompt critical thinking and identify aspects of user/stakeholder/security practitioner understandings and assessments of trust, identity, privacy and security, typically within the context of a particular digital technology. The TIPS acronym has been taken up as a neologism in UK research following two respectively named funding calls in 2015 and 2017. These invited:

co-created, novel, interdisciplinary projects that solve real problems in aspects of trust, identity, privacy and security (TIPS) in the digital economy in a responsible way. We also want to engender a sustained and collaborative approach so that these projects engage with the wider relevant sectors and disciplines ... [19]

We have been involved in projects enabled through both rounds, primarily due to their rationale of cocreating research and possible solutions with stakeholders, and their underlying synergy to research design involving participation and cocreation. These provided a unique opportunity to design, prototype and trial creative methodologies across sustained multidisciplinary research also involving ideating, prototyping and trialing a digital technology service. Our survey has uncovered earlier, including foundational, work (also generated from a EPSRC call in 2008 and a 2012 EPSRC sandpit). We position this paper as having particular relevance for early career researchers and those new to large multidisciplinary collaborative research involving participatory and generative workshops involving stakeholders in the broad area(s) of TIPS.

2 Survey of Papers

The term toolkit may suggest an off-the-shelf solution to enabling TIPS related learning or data generation. We think the term is over and often uncritically used, if nonetheless a convenient catch-all reference to a wide spectrum of practically applied and cocreative (socio)material approaches or principles. We unpick and identify these in the following sections.

2.1 Method

We discussed a number of potentially relevant papers informed by earlier work [32]. The first author conducted a broad search for papers published since 2011 focusing on, but not limited to HCI, Computer Supported Cooperative Work (CSCW), New Security Paradigms Workshop (NSPW) and Designing Interactive Systems (DIS) in the ACM and IEEE Xplore Digital Libraries, using keyword search term ‘toolkit’, extended variously through companion terms: ‘toolbox’, ‘tools’, ‘techniques’, ‘physical modelling’, ‘physicalisation’ etc., to widen the scope of the search. We then filtered the results to focus our inclusion criteria on ‘workshop’ activities, and then in turn to focus on TIPS domains: ‘trust’, ‘identity’, ‘privacy’ and ‘security’. The first author then conducted similar 6-word keyword searches to the SOUPS archives (again from 2011 to 2020). Crucially, we identified relevant texts referenced in our corpus and also used some creative licence in our final selection, to include two papers that we consider of particular methodological interest due to demonstrations of and reporting on a PD approach with an individual [31] and an apparently silly approach to critically engaging with concerns around current and near-future technologies [5]. Our final survey comprises 26 papers and four exemplar practical toolkit manuals (one is reported upon within workshop use and all four are intended for such). We categorised the papers accordingly: Review Toolkit papers (offering a broad snapshot of toolkits in the disciplinary fields relevant to our multidisciplinary research); Example Toolkits (created for application to other similar projects); Case Study Papers That Include Toolkits; Applied Research Toolkits (that address specific problem spaces); Conceptual/Methodological Research Toolkits (that offer methodological insight) and finally; Conceptual Future Application Toolkits (that, although primarily methodological, demonstrate a workshop and toolkit that is easily transferable to another application). We acknowledge that other creative toolkit papers of relevance to TIPS may exist. However, we claim that our sample serves as a representative, useful and readily applicable review of demonstrated approaches of particular use to this broad and rapidly growing field of research.

2.2 Review Papers

We selected six toolkit review papers (Table 1) that straddle the range of disciplinary fields relevant to our multidisciplinary research across HCI/CSCW, PD and cybersecurity research and practice. Two are firmly HCI: toolkits within HCI [28] and IoT in HCI [4]. The combined scope of these reviews demonstrates the substantive nature of toolkit related research in HCI, primarily in enabling and influencing foci, design and deployment of technologies and interactions. Ledo *et al.* [28] synthesised 68 toolkit papers to propose strategies for a toolkit evaluation and classification system, and offers insights into toolkits’ relative value, potential for bias and various trade-offs. This is technically focused work, following earlier interface design concept toolkits for designer-developer teams –

Table 1. Review Papers.

| Reference | Field/Toolkit | Toolkit Review |
|---------------------------------|---|--|
| Brandt <i>et al.</i> 2012 [8] | PD review of toolboxes for co-creation in multiple domains | Widely recognised approach using probes, models, games, workbooks, scenarios and mapping techniques – demonstrates availability of tools/techniques and opportunity for various combinations, adaptation and extensions |
| Berger <i>et al.</i> 2019 [4] | IoT evaluation and analysis of 3 IoT toolkits for co-designing design stories | IoT Un-Kit experience comprises hybrid and analogue methods; proposes framework to compare/assess design stories generated |
| Fox <i>et al.</i> 2018 [20] | Cybersecurity; reviews 41 public facing security-related toolkits to help achieve online security | Focuses on articulating “differential vulnerabilities” to promote understanding on security as socio-culturally situated and group specific |
| Ledo <i>et al.</i> 2018 [28] | HCI overview and discussion of evaluation methods for HCI toolkits | Analysis of 68 HCI toolkits proposing they comprise 4 categories: novel examples; replicated examples; case studies and exploration of a design space |
| Sanders <i>et al.</i> 2010 [37] | PD framework for organising the proliferation of PD tools, techniques and methods | Framework provides tools and techniques for engaging non-designers; suggests three dimensions of form, purpose and context for designing new PD methods |
| Sanders <i>et al.</i> 2014 [38] | Co-design overview of cultural probes, toolkits and prototypes in design research/practice | Offers perspectives across: approach (probes, generative toolkits, design prototypes); mindset (designing for/with people); temporal aspects (design for now, near/speculative futures) and variations in intent (to provoke, engage or serve) |

updated as more “generative platforms ...provid(ing) easy access to complex algorithms, enable fast prototyping of software and hardware interfaces, or enable creative exploration of design spaces.” (p.2) Berger *at al.* [4] focused on more creative narrative approaches involving IoT toolkits, synthesising work reporting on cocreated design scenarios, fictions and stories. These authors found that some approaches enable immediately functioning scenario development while others involve more speculative notions. Pragmatically they recommend questioning and adapting toolkit materials to support creation of under-explored design stories. The HCI literature is important in demonstrating different forms of engagement with the users of TIPS research; [33] and [45] advocate the field’s relevance for considering and improving system use for the intended user.

From CSCW we included a review of practical public-facing toolkits [20] due to its critical review of 41 toolkits available online to promote cybersecurity; defined as “online collections of tools, tutorials, and tips aimed to help individuals or groups improve their security online.” (p.2) Two overlapping categories of security toolkit are identified; toolkits in the first group address those for general use amongst nonspecific populations, such as Electronic Frontier’s Surveillance Self-Defense toolkit [1]. Those in the second group support people with a conflict or distrust of institutions (governments, device manufacturers, service providers), for example produced by grassroots, activist or other organisations to support members’ particular online security practices and to address the unique threats and harms directed at those who are on political and social peripheries. The evaluation revealed many comprised bolt-on functionality to meet specific needs of certain groups, due to the inadequacy of mainstream tools. Institutional tools (e.g. provided by manufacturers, governments) aimed to promote neutral socio-political stances and in so doing so failed to meet many groups’ needs, meanwhile also stigmatising them as “(in)secure users” (p.1). The authors build on Dourish’s and Anderson’s 2006 [14] work that called for better contextual understanding around safety, security and privacy as not primarily technological, but rather, socio-politically “entangled” (p.319).

The other three review papers represent foundational PD literature as a resource for TIPS. PD considers the socio-political contexts of technological development and deployment, with its roots in Scandinavian cooperative design — an approach engaging all stakeholders (e.g. employees, customers, trade union officials) to enable robust input into technological system design to ensure that all perspectives are considered and needs met. PD also provides a methodological foundation for toolkits within TIPS alongside practical guidance especially when approaching enhancement of usability outcomes (by improving the functional design and evaluation of user facing security technologies). Additionally PD concerns sociopolitical contexts of intended toolkit use – or technology outcomes of use. Interestingly, whilst HCI borrows heavily (if to varying levels of credit) from PD, PD is criticised from amongst its own community for its ambivalence [8] in failing to promote wider take up and use of its own tools and techniques elsewhere. This is particularly telling in areas such as TIPS with dichotomous and often competing aims and objectives (compare with [9]).

2.3 Toolkits

From the vast number of practical toolkit examples available for general use we selected four for inclusion in our sample. We considered these as exemplars, worthy of mention due to being specifically on-topic and/or comprehensive; and they are also critically framed. They are: a manual of toolkits to support the design of digital security, You Shape Security [12], which emphasises in its detailed series of user manuals the importance of collaborative “creative engagement” (p.4) to enable people within organisations to discuss their individual situations, security focus and protection practices, and to develop shared understandings of their wider security landscape. The approach assists the generation and exchange

Table 2. Example Toolkits.

| Toolkit Name | Overview | Application |
|--|--|---|
| You Shape Security, Coles-Kemp <i>et al.</i> 2018 [12] – TIPS | Three manuals outlining toolkit principles, materials and processes | Security practitioners; designers and managers of technical security approaches in organisations |
| Unbias Fairness Toolkit, Lane <i>et al.</i> 2018 [26] – TIPS | Handbook, awareness cards, trustScape, metaMap, value perception worksheets, facilitator booklet | Promotes awareness of algorithms, trust, bias and fairness to stimulate civic dialogue |
| Co-Creative Methodology Workshop Handbook, Stembert. 2017 [40] – TIPS | Bring together multiple stakeholders to co-create IoT in a couple of hours | End-user engagement toolkit on how to organise, facilitate, analyse and document a co-creative Workshop |
| Participatory Methods Toolkit Slocum. 2003 [39] – PD Methods | Manual includes 10 in-depth fiches and overviews 38 participatory methods and techniques | For starting up/managing participatory projects in organisations |

of learning around the hazards and risks of day-to-day information security. This represents a “radical departure [from] affirming the principles of technological security through compliant practice” [13] (p.10) and provides a platform that enables participating communities, and indeed those who do not engage in security programmes, to enter a dialogue of security concerns. The second example is a toolkit of participatory methods – a comprehensive document of PD methods and materials aimed more at practitioners [39]. Third is a co-creative toolkit and handbook to help IoT teams and end users identify and discuss TIPS barriers to IoT adoption [40]. And finally, the Fairness Toolkit [26], from an EPSRC funded project “UnBias: Emancipating Users Against Algorithmic Biases for a Trusted Digital Economy” uses cards, mapping and facilitation techniques to promote awareness and civic dialogue about algorithmic systems, trust, bias and fairness. All four toolkits have been structured and compiled to be used beyond the workshops they were created for, each having application beyond the specific problem space applied to. All four also provide off-the-shelf guidance on workshop facilitation, toolkit materials and frameworks to support others’ use; one comprises a

PD guide [39] with the other three [12] [40] [26] more focused towards supporting research within TIPS domains.

2.4 Case Study Papers

Table 3. Case Study Papers That Include Toolkits.

| Ref. – TIPS | Toolkit Overview | Toolkit Findings |
|---|---|--|
| Dunphy <i>et al.</i> 2014 [17] – Trust – Identity – Privacy – Security | Focuses on under-represented groups: 80 somethings; an international women’s centre and an under-resourced community | Introduces notion of experience-centered privacy and security; advocates engaging users in sharing experiences of privacy and security; demonstrates a range of mixed creative methods |
| Jensen <i>et al.</i> 2020 [23] – Trust – Security | Geographically, socially and culturally diverse communities of: seafarers; Greenland residents and North East unemployed; uses a wide range of creative methods and information gathering | Ethnographic/conversational approach to solicit plurality of voices/experiences (around liminality and social isolation linked to security and technological innovation) |

Further, we selected two papers that report on a number of different case studies – some of which are more relevant to TIPS than others, but which valuably synthesise, analyse and contribute critical insights into methodological approaches, with particular [17] or broad [39] relevance to TIPS.

2.5 Applied Research Toolkits

The remaining papers in our survey report on a focused study involving one or series of related workshops/participatory activities involving to different extents design, demonstration and evaluation of toolkit approaches in a particular TIPS problem space. We further clustered this large group between reported research that was explicitly applied to exchanging knowledge, encouraging critical reflection on personal or collective practices towards supporting safety amongst particular participating groups; these papers are discussed in this section; the others are primarily methodological and conceptual (despite some claiming practical application/impact). A further three papers fall somewhere in between, in that they clearly offer future applicability to addressing a particular area of concern. These three groups of papers are discussed in turn below.

Table 4. Applied Research Toolkits.

| Ref. – TIPS | Applied Toolkit/Workshop | Guidance/Application |
|--|--|--|
| Bowyer <i>et al.</i> 2018 [7] – Trust – Privacy – Security | For system designers and policy makers on range of privacy, security and social justice issues relating to family-oriented data; involving cross-generational families | Offers principles on rights, control and visibility over civic data handling and involvement of families in decision-making |
| Coles-Kemp <i>et al.</i> 2012 [11] – Privacy | Support privacy and consent decision-making and promotes methodology in future oriented privacy and online awareness; focuses on hard to reach groups excluded from privacy design | Offers a range of domain specific participatory methods guides |
| Coles-Kemp <i>et al.</i> 2020 [13] – Security | Security design for security practitioners and healthcare service providers | User guides comparing top down and bottom up perspectives with related discussion aiming to share understanding from alternative security perspectives |
| Heath <i>et al.</i> 2019 [22] – Trust – Security | Security focused offering guidance for smart technology adoption amongst community/resident groups | Suggests actions towards enabling a successful community-focused outcome |

The applied toolkit texts focus on sharing principles, guidelines and frameworks, grounded in empirical work that demonstrates particular creative approaches used in specific user contexts. Coles-Kemp and Ashenden are leaders in devising novel creative approaches to engaging stakeholders in debates and knowledge exchange about online security, including to humanise what otherwise is often highly technical, while also emphasising finding practical ways to vitally enable different voices and points of view. This marked a paradigm shift towards human centredness for privacy and security research. Early VOME (Visualisation and Other Methods of Expression) work over a 4-year period applied and demonstrated its ‘community-centric engagement’ approach, which informed contribution towards a multi-disciplinary methodological framework. The specific papers included here consider designed interventions to promote privacy awareness both on and off-line [11].

Table 5. Conceptual/Methodological Research Toolkits.

| Ref. – TIPS | Toolkit and Workshop Overview | Approach |
|--|--|---|
| Blythe <i>et al.</i> 2016 [5] | Demonstrates participatory critical design fiction approach informed by Magic Machines [2]; with interdisciplinary research team and older community | Critical design and unuseless designs towards an anti-solutionist methodology |
| Blythe <i>et al.</i> 2018 [6] – Privacy – Security | Constructive criticism through practical provocations approach to data post-privacy, with HCI specialists (Mozilla) and a social work professional | Exploration and creative design with/in post-privacy space |
| Clarke <i>et al.</i> 2019 [10] – Trust | Critically investigates sociomaterial trust in design workshop methods to investigate trust-related perspectives towards particular people or institutions; with a low-resource community organisation | Articulates significance of material use not just as a workshop topic but in building or unsettling trusted relations between researchers and participants; broadly based beyond digital contexts |
| Durrant <i>et al.</i> 2018 [18] – Identity | Investigates how UK citizens at 3 life-transitions create and manage their online identities with young adults; new parents and recent retirees | Ethnography/experience-centred design to “inform policy-making and service innovation for enhancing digital literacy in online self-representation” (p.122) |
| Gatehouse <i>et al.</i> 2018 [21] – Trust – Security | Creative HCI design approach to enable and communicate trust/mistrust and LGBTQ identities in the context of hate crime reporting with young people and community police | Informed by Magic Machine approach [2] to challenge conceptualisations of LGBTQ young people’s vulnerability by designers, and to lesser extent, criminal justice workers |
| Khairuddin <i>et al.</i> 2019 [25] – Trust | HCI tool to engage participants in designing trust protocol in blockchain with experienced bitcoin users | A toolkit for visually materialising and discussing non-visual blockchain phenomenon relating to transactions and trust |
| Light <i>et al.</i> 2011 [31] – Identity | HCI approach to investigating user vulnerability focusing on one older person’s experiences | Improvisation performance experiment to investigate personal transformation through experiential learning through participation |

Table 5. Conceptual/Methodological Research Toolkits Continued...

| Ref. – TIPS | Toolkit & Workshop Overview | Approach |
|---|---|--|
| Maxwell <i>et al.</i> 2015 [34] – Trust | Design-HCI approach to informing blockchain enabled platform service design using peer-to-peer validation with students, designers, tech start up reps. and bitcoin users | A ‘tangible interactive workshop’ invited participants to enact trusted transactions as though on a Blockchain, with Lego |
| Mathiasen <i>et al.</i> 2011 [33] – Security | Participatory and experience-driven design using prompted exploration workshops/acting out security techniques with professional typesetters and senior citizens | Explores space between security experience and expectation and participants’ changing strategies different security situations. |
| Sturdee <i>et al.</i> 2016 [42] – Identity | HCI approach to exploring value of creating fictional research worlds involving conference Workshop participants | Design fiction, imagined future interactions and online identity |
| Vines <i>et al.</i> 2012 [44] – Trust | PD workshops soliciting older olds’ experiences of banking | Concept cards, design sketches and brief outlines of concepts to solicit ideation around new financial services with/for the older old |

2.6 Conceptual/Methodological Research Toolkit

The conceptual and methodological texts demonstrate, trial, evaluate and critique various multi- and interdisciplinary research design approaches or methodologies. In total these comprise 11 papers, by some measure our largest category within the review. Some of the research reported is intended to challenge and provoke thinking and discussion around current, emerging and future technological systems and our attitudes as both designers and users of these systems. Blythe *et al.*, used an imaginary design workbook [6] approach with industry partner Mozilla and a social work professional to promote critical envisioning around (post) privacy and the surveillance potential of home-hub technologies “that record the minutia of our lives” (p.10). The experimental design workshop process demonstrated one approach to enabling HCI to better “engage with political, ethical and legal issues” (p.10), yet also questioned whether HCI design researchers actually want to engage or not. Blythe and colleagues also adopt ‘silly’ design fiction magic machine-making [5] to unsettle researchers’ relationship to technological solutionism – the critique of trends towards delegating human agency and morality to technology – as posited by Evgeny Morozov [35].

The resulting “unuseless, partial or silly objects” [5] (p.4977) created are illustrated in the paper to problematise surveillance by stealth potential of urban data capture. Blythe is one of a number of UK and wider researchers extending Design Fiction – associated with Critical Design and typically accredited to Bruce Sterling in 2005 (see [41]) to envision plausible near-futures. This body of work aims to provoke a sense of discomfort through recognition of one’s role in co-constituting unwelcome technological outcomes.

Several of the papers clearly demonstrate a particular methodological approach within or that came out of TIPS research with particular user groups; 80-somethings and trusted banking using ‘questionable concepts’ [44]; investigating older people learning about the potential of digital technologies through props and performance over several sessions [30]; making workshops with LGBTQ young people and community police to surface attitudes from both groups on aspects of hate crime and hate crime reporting, to inform design for particular groups and their needs; workshop outcomes were then adapted as design materials in a public intervention [21]; a generative workshop approach, “Blockit”, to support understanding of blockchain and cryptocurrency [25]; socio-material aspects of workshop materials and their interpretation and use (or non-use) by particular groups building or negotiating mis/trust, both amongst researchers and workshop participants and between participants and (in this specific case) local officials [10]; didactic approaches to understanding ‘opaque technologies’ [34]; and using an illustrated guide in supporting people undergoing life transitions [18]. Some of these involve different user groups while others, as with [5] and [43], involve hosting conference or university workshops to explore and/or demonstrate an approach for take up and use by others. Mathiasen *et al.* is worth noting in that [33] explores the spaces between participants’ security experiences and their expectations of a new working system for typesetters.

2.7 Conceptual Future Application Toolkit

This final group of three papers highlights the potential future application of creative making workshops in knowledge exchange activities with end-users [16] (one toolkit from this wider study is included in Table 2 Example Toolkits [40]) of InfoSec practitioners [29] and cybersecurity practitioners and policy makers [3]. These papers fell between our conceptual and applied categories, yet are clearly motivated to provide a workshop method of clearly explicated relevance to TIPS practitioners towards their understanding the operational context of different professional roles and related stakeholders, such as policy makers. We suggest these three toolkits are adaptable or easily re-appropriated to future projects in related fields.

Table 6. Table of Conceptual Future Application Toolkits.

| Ref. – TIPS | Toolkit and Workshop Overview | Approach |
|--|---|---|
| Ashenden <i>et al.</i> 2013 [3] – Privacy – Security | Toolkit and approach to expand the boundary of the currently held mental models of risk and security; with cyber security practitioners and policy makers | Critical design - creating speculative scenarios suggested as a research technique for imagining future cyber security risk |
| Drajic <i>et al.</i> 2019 [16] – Trust – Privacy – Security | To engage end-users in large scale pilot design. Living Labs, Games, co-creative workshops for end-user engagement and personal data protection. | To improve the effectiveness, trust and adoption barriers of IoT development processes. |
| Lewis <i>et al.</i> 2014 [29] – Security | Toolkit for InfoSec practitioners to better understand other user communities and their security practices; with InfoSec practitioners | Suggested as an approach for security training and awareness programmes to understand operational contexts of differing professional roles, for planning exercises around professional roles needed for particular security tasks |

3 Discussion

Socio-technical design is increasingly concerned with critically considering the impacts on society, citizens and non-human actors of current or near-future technologies. While current and emerging technologies have enormous societal potential, including through providing enhanced online privacy and security, their design involves many operational challenges including their immaterial illegibility; challenging understanding by even technologists that help create them [32]; but certainly the multiplicity of stakeholders who commission, promote, benefit or otherwise from uptake and use. Concerns include the increasing ‘reach’ of data-generating technologies as they encroach across every aspect of our everyday lives [32] [36] [15] [24].

So, across multiple intersecting concerns and contexts; what makes a good toolkit? The survey covers a number of creative participatory workshop approaches – designed for a specific purpose and group(s) of participants. Our review papers comprise many materials, devices and props as described by their authors and available in Appendix A (see link at the end of the paper). Crucially, these are used in particular research approaches in different ways, with different groups. We have categorised approaches broadly across five themes: storytelling and reflective annotation; visual and 3D modelling; improvisation, performance

and roleplay; games and cards and finally; landscaping, problem setting and mapping. These are available in Appendix B as a set of creative approaches for soliciting research information.

We caution, however, that there are crossovers and overlaps between the approaches; Lego bricks are readily assembled into physical interpretative models that in turn invite articulation and dialogue. Storyboarding [29] lends itself – beyond soliciting and giving form to immaterial ideas, understandings or experiences of its creator – to the visual construction of narrative, which in turn can be shared and made sense of, including through discussion. Often, the narrative arc afforded by provision of particular individual or combinations of toolkit assets invited or scaffolded particular approaches to storytelling. Landscaping, problem setting and mapping were all used in various combination of the selected papers to explore a problem space, promote participants’ ideation and envisioning and collectively organising new approaches that went beyond researchers’ expectations. And it is often mentioned that in tandem, toolkit development was informal and/or iterative involving a pick and mix of materials and approaches.

Analysis of applicability of the toolkits and methods to specific TIPS design projects is difficult. This largely relies on the participants and facilitation process, along with the contextual and problem space setting. Coles Kemp advises amongst her four principles of creative engagement to:

Cede control to the participants to create a form of engagement where participants are able to negotiate the terms on which the engagement takes place. [12] (p.3)

One vital component involves pre-engagement in order to select relevant toolkit materials and identify topics and benefits for participant engagement. Therefore, while this paper offers a list of previously used materials and categories of approaches, meaningfully expediting any of the toolkits and workshop approaches involves research workshop design and appropriate participant engagement and facilitation. However as previously outlined in Table 2 Example Toolkits, [12] [40] [26] offer facilitation guidance, and are intended to be used off-the-shelf by other researchers in focused TIPS domains.

Essentially, workshop facilitated toolkits used in TIPS problem spaces can provide a vehicle to displacing singular viewpoints. The toolkits reported here often identify and bolster ‘ground up’, multi-perspectival, experience-centered information and thus insights. The benefit is this avoids, and challenges a generic, universalising mind-set. Notably [35] offers a collection of tools – in order to question the meanings of security within a given setting, alongside an opportunity to converge on, and then respond to that set of understandings. We suggest the applicability and strength of the toolkit approach is a resource for creative questioning and a useful ‘off the road’ addition to the rigour and testing of compliant practice.

4 Summary and Conclusion

It is apparent from the survey that this multiplicity of different and largely inexpensive and readily available materials have different physical affordances. LEGO bricks afford their assemblage. Similarly, pieces of clothing invite role play, individual expression and the trying on of possible future identities. Following Le Guin [27] we suggest that these various toolkits are not about their physical properties, but about their collective and generative affordances. Le Guin argues that our technology should not be discussed and understood in terms of its techno-heroism, as she puts it:

We've all heard all about the sticks and spears and swords, the things to bash and poke and hit with, the long, hard things, but we have not heard about the thing to put things in, the container for the thing contained. [27] (p.151)

Tools and technologies have historically invited narratives based on weaponry, that poke and prod and potentially maim. Le Guin goes on to suggest technology is better and more accurately conceptualised as a container into which often mundane necessities are collected; the humdrum but essential function of many technologies remain largely absent from technology's dominant *heroic* narrative. Relatedly, the survey comprises a container of toolkits; we are not prescribing a toolkit's contents but demonstrating how a range of associated materials and approaches can be brought together in research design to address human challenges of TIPS research. Crucially, we have selected papers that include the quite technically focused [28] while also offering a richness of demonstrated creative design methodologies.

We research in interesting times when the perception of technological complexity raises many salient societal questions. Le Guin highlights it is not about promoting compliance amongst citizens and users of technologies, but also taking better care to understand different groups' characteristics, abilities, needs and values. Containers, or toolkits, within this mindset could be more fully exploited. We consider them at their best as a pre-production or engagement resource that facilitates exploration, ideation and negotiation of trust, identity, privacy and security within the research process itself, not merely its final object(ive), enabling multiple different realms of social, relational contingencies and dependencies. These toolkits comprise a pragmatic design resource or approach for current and continuing TIPS researchers to not so much aim for others' compliance but through which to engage critically, offering a vantage point from which to consider the unstable, unseen, and differently-abled experience-centred factors; all much needed in TIPS research.

Survey spreadsheet with additional detail Appendices A and B at
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H. Collard and J. Briggs

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