A Load of Cobbler's Children: Beyond the Model Designing Processor

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Abstract
HCI has developed rich understandings of people at work and at play with technology, moving beyond users' minds to their moods, buddies and bodies. However, understandings of designers remain trapped within the information processing paradigm of first wave HCI, remaining focused on minds that execute design methods as if they were computer programs, and producing the same results on a range of architectures and hardware. Designers are people too, with minds, moods, buddies and bodies, which all interfere substantially (generally to good effects) with the 'code' of design methods. We need to take full account of designers' humanity when assessing design and evaluation methods. This juried alt.chi paper moves from critique to a logocentric proposal based on resource function vocabularies as a more appropriate basis for understanding and assessing methods.

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Introduction

HCI research has several main foci, including the nature of human interaction with computers, the quality of innovative interaction designs, and practices that should result in high quality designs and interactions. Much research on the latter focuses on support for design work via methods, tools, techniques, guidelines, heuristics and other forms of design knowledge. As with any claimed research contribution, these must be assessed in some way. This could relate to the impact on the design process, the resulting designed artifact, or both: one or both should be better as a result of using innovative design practices from HCI research.

Assessing research in support of design work thus logically requires some notion of what *better* means in the context of Interaction Design. However, evaluation criteria are often introduced that do not relate to improved *design* processes or outcomes. The next section critiques such inappropriate requirements.

How is this a Good Method?

The goodness of interaction design practice innovations within HCI is assessed in many ways in my experience. Some of this is based on published literature (e.g. [15]), but far more is based on 15 years of experience of relevant reviews as an author, journal editor, and conference programme committee member. Too often, papers are rejected for reasons that have no basis in scholarly values, but instead are the result of personal subjective confusions that have not been exposed to extensive discussion across the HCI community.

This paper starts such a public discussion, and proposes a novel position on ways to understand, assess and create design and evaluation methods. It first examines a range of common positions on key evaluation criteria that mis-assess isolated methods in terms of originating rationales, usage accuracy, causal roles, the easily measured, and the best of breed, often brushing major methodological challenges under the carpet.

What Problem Is Being Fixed?

The misconception here is that design and evaluation methods must be responses to known user needs: a human-centred design position. Alternatives are possible. The HCI community should be open to taking them seriously. Verganti's Design Driven Innovation [20] rejects the need for primary research evidence of user needs and wants. Instead, his primary research evidence focuses on organizations' successful design innovation irrespective of underlying design paradigms. Verganti has identified several design-led organisations (e.g., Apple, Alessi) where market success is not the result of user-centred methodologies. Verganti quotes the chairman of Artemide, an innovative lighting company: "Market? What market? We do not look at market needs. We make proposals to people…"

While possibly heresy to the human-centred, this position is well established in the millennia old Applied Arts design paradigm [7], where design purpose comes primarily from design teams and not from primary human research data. Similarly, in the Engineering Design paradigm [7], design purpose may be expressed in terms of improving an existing artefact, rather than users needing or wanting these improvements.

Design is thus not just about problem solving, and even when it is, problems do not need to be grounded in primary user data. While CHI is an advocate for human-centred design, this conference community has

Re-use Globally, Complete Locally

No published method is complete. All design and evaluation methods have to be filled out in practice.

Building on Hornbæk's critique [15], collaborators from the MAUSE project (www.cost294.org) identified elements of usability practice that must be provided locally and cannot be provide globally as re-usable resources [22]. Global methods can only prompt where local resources are needed. Ones for user testing practice include:

1. *Test Participants*, who need to be recruited and screened locally, based on project specific criteria
2. *Test Tasks*, which need to be selected and designed locally, based on project specific needs
3. *De-briefing interviews,* which must be designed and piloted locally to gather required data.

never validated the universal superiority of its preferred design paradigm. Of course, we all have anecdotes and evidence of creative or technically driven design failing due to inadequate consideration of human factors, but creative and technological colleagues can just as readily share evidence of human-centred work that has failed creatively or technically. Balance is what matters [7].

Human-Centred Problem Solving is one conception of design. It is not the only one, nor does it have a monopoly on effective use of human insights in design: selective human-foci do not imply human-centredness, (strictly only the human sciences may be so centred, since design must ultimately centre on designs).

Novel design and evaluation methods can thus arise from creative opportunities (e.g., personas [11]), or because of technical opportunities (e.g., server log analyses, physiological sensing, eye tracking, pico projectors, tablet computing, mobile technologies). There is no need to establish needs here. What matters is the effectiveness of new innovative design practices. Their originating intellectual contexts do not determine their success. Insisting that new methods address known empirically grouded problems allows dismissal of new methods without reference to their details.

Practitioner reviewers often reject papers on innovative methods because they see no need for them, which may tell us more about the quality of their practice than the need for a new method. Human science reviewers often reject papers on innovative methods because they see no evidence of need for them, which may tell us more about their understanding of the realities of design and innovation than the validity of the method. Such disqualifications before any evidence of success is considered are profoundly unreasonable, as well as grossly unscientific. Hypotheses and conjectures should never be rejected on the grounds of their origins and rationales, but only on the basis of evidence. Disproof must be as competent as proof.

Could People Use the Method Correctly?

The next confused evaluation criterion is accuracy of method use. Hornbæk identifies this as one aspect of his third dogma for assessment of evaluation methods, i.e., that *usability evaluation proceeds as prescribed* [15]. Here, the quality of the means takes precedence over the quality of end results. Worse still, correct use is typically impossible as most published methods contain extensive gaps that must be filled by local resources (see sidebar for user testing examples).

Accuracy of method use should not be a primary evaluation criterion. It could be useful diagnostically to understand why methods do not perform well in some circumstances, but the causal relationships must be established. They cannot be assumed. In fact, misuse of Heuristic Evaluation is the *only* possible explanation for some successful usability predictions [8] (perversely Hornbæk cites research in [8] as an *example of* this dogma, rather than clear *evidence that it is* dogma).

This second bogus evaluation criterion treats method use as if designers were model human information processors, accepting no input beyond the method, and executing it perfectly to inevitably produce high quality design or evaluation results. In reality, high quality results are high quality results, regardless of how they were produced and what motivated this. The quality of the results of design work can and should be judged without reference to process or method rationales. Poor

The Model Designing Processor

Hornbæk's [15] and the MAUSE [9] critiques apart, critical reflection on the conduct of design and evaluation method has been dominated by a focus on methodological flaws (e.g., [13]). This implicitly accepts an insidious construction of designers and evaluators as method execution devices. Such *Model Designing Processors* seek out best of breed methods for guaranteed design and evaluation successes. They are passive consumers who receive all that they need to know about design from commoditised methods.

Prior knowledge, expertise, skill, and experience, along with other local design team and project resources, are treated as experimental confounds that the best methods will overcome, producing identical quality performance from the same methods in different interaction design settings.

quality results may suggest poor process or rationales, but they automatically imply neither. A process that is judged to be poor in execution or origin can still result in outcomes that someone with no knowledge of the process or methods would judge to be of high quality.

This criterion elevates an abstract Model Designing Processor above the quality of knowledge, expertise, skill, judgement and achievement of design teams. It fetishises correctness over effectiveness. Human scientist reviewers often criticise design or evaluation work because what they see as relevant research methods have not been used, or have been used poorly by academic standards. However, there is no automatic link between method quality and outcomes in design. Designing is not a garbage-in garbage-out activity. Designing is a self-monitoring, self-regulating process (i.e., a second order system), where flaws introduced via an earlier activity can be caught and corrected. Any (loose) use of human science research methods in contextual research should thus not be reviewed as if it was a contribution to archival knowledge, since it is not. Instead, it is one of many inputs to design work, and should be only judged by the quality of the resulting design direction and influences.

What is Responsible for Results?

The second aspect of Hornbæk's third dogma for the assessment of evaluation methods is that *evaluation directly identifies usability problems* [15]. As with the previous evaluation criterion, this elevates process over outcome. If design teams systematically get results from methods, the actual causal relations here only matter if we assume designers are Model Designing Processors, who design or evaluate on the basis of the method, the whole method, and nothing but the method. The reality is that design processes substantially augment primary and secondary data with local resources from the design team and project setting. It is simply not possible to isolate methods from their surrounding human contexts in design work. Once again, inappropriate assessment criteria arise when aims or process take precedence over outcomes.

This is why Heuristic Evaluations can predict problems with no applicable relevant heuristic [8]. However, given that it is only methods in use that achieve anything, we can only judge methods *in use*. Isolating direct causal factors at method use level may be impossible. Even where this is not the case, if methods routinely bring additional benefits, then in practical terms, the method does have value, even when causal relations are indirect and even weak. We must expose and abandon hidden assumptions about the role of design teams in design work. We need to move beyond the information processing models of first wave HCI [3] and bid farewell to the mythical Model Designing Processor (sidebar to left) as the fabulous beneficiary of scientifically validated methods.

What Results Matter?

Hornbæk's first, fourth and seventh dogmas [15] focus on the *results* of method use, rather than on process or rationale. Each is specific to usability evaluation, questioning the use of counts of usability problems, their use as the unit of analysis, and the assumption that they exist. Thus even where evaluation criteria are focused on results, these may not be the results of most value, but instead intermediate results that are easy to measure or count.

Personas?
Never heard of them, we're a scientific conference you see.

Personas originated in practice [11], were brought from Interaction Design into HCI via the small DUX conference [18] and given rigour via a practitioner book with extensive input from the user experience community [17], plus the occasional astute design research contribution (e.g., [21]).

It took a decade from personas dissemination by Cooper [11] for full papers on personas to reach CHI. One of the most significant and extensive method innovations in Interaction Design had originated, and remained, beyond the reach of acceptable CHI research until professional practice became so well established that CHI publications would have limited influence.

Similarly, apparent misuse first made cultural probes a valid CHI focus [2], rather than meta-analyses of successful use.

More Method Validation Dogmas
Hornbæk's second dogma is also specific to usability evaluation, and concerns methodological problems associated with matching difference instances of the same usability problem [15]. This more subtle dogma, when generalised, lets researchers sidestep major challenges to rigorous credible assessment. This matching problem is rarely addressed in usability method assessment (some years ago, a positively-reviewed CHI submission on this was rejected).

Hornbæk's fifth and sixth dogmas are at a high level of abstraction; with the former referring to the tendency to *assess methods in isolation* outside the context of realistic design work, and the latter referring to the *search for a best method*. Both generalise to all design and evaluation methods. Both are wrong.

Summary
Hornbæk's critique of research assessments of usability evaluation methods [15] is a starting point for a re-evaluation of how design and evaluation methods are assessed as well as created in HCI research. Soon after its publication, Hornbæk collaborated with colleagues from the European MAUSE COST network (www.cost294.org) to align his critique with insights from the MAUSE project's critique of comparison studies of usability evaluation methods [9]. This formed the basis for a new perspective on evaluation methods [22] that has since evolved into a framework for understanding, assessing and improving design work.

Most of Hornbæk's dogmas generalise to design method assessment, highlighting the lack of a focus in HCI research on what makes design and evaluation methods *practically* worthwhile. Instead, assessment of isolated methods misfocuses on design intent (was it properly human-centred?), correct use (did designers stick to the method?), monocausality (did the method alone produce the results?), intermediate results (whatever's easiest to measure) or consumer advice (this year's best buys from the method supermarket).

The consequences of inappropriate evaluation criteria for method assessment, as applied by journal and conference reviewers, are evidenced in the exclusion of the most influential methodological innovations from major HCI research venues until their ubiquity makes them impossible to ignore (e.g., cultural probes and personas – see sidebar to left).

The Cobbler's Children

"The Cobbler's Children Have No Shoes", a saying of unknown origin, refers to the tendency of skilled workers to reserve these skills for their clients, to the neglect of the needs of themselves and their families.

Designers are the cobbler's children of HCI. HCI's ever extending richness of understandings of users has not been extended to interaction designers.

Early ('first wave') HCI focused on cognitive psychology and its computationally influenced information processing model. As with technically driven innovation, informational processing models were explored because they existed, not because there was an obvious human need for them. Computational models from Hard AI (Artificial Intelligence approaches that made claims for realism) offered new ways of understanding human-computer interaction. Card, Moran and Newell's *Model Human Processor* [3] applied a range of computationally inspired concepts to HCI.

Don'ts and Dos of Method Assessment in HCI Research

Methods don't need to be:

1. human-centred in origins or values.
2. applied mechanically and uncritically, without local adaptation or extension.
3. validated in isolation by what is easy to measure, with easily hidden methodological flaws.
4. demonstrably superior to all alternatives all of the time for everyone.

Methods must be assessed:

1. in realistic design settings, in combination with complementary methods, with respect to achieved design value.
2. as the achievements of design work, not as context free inert deterministic inputs to it.
3. in terms of the roles of a method's resources, both re-usable and local.

Within a few years, the context free Model Human Processor was challenged by Suchman's situated constructive account of technology usage [19]. Settings and social action experiences were seen as critical to understanding human interaction with computers. Over a decade later, Dourish [13] combined social interactionist perspectives with the embodied nature of human action. Our corporeal and social contexts combine to produce and guide meaningful experiences with interactive technologies. A few years after this, McCarthy and Wright [10] extended user experience to include consideration of emotion and volition. Within two decades, users had become situated, embodied, affective and motivated. User's first wave HCI minds were thus augmented by second wave buddies and third wave [1] bodies and moods.

Designers and evaluators in contrast remained method processors, albeit with poor reliability [14]. Working in splendid isolation, one-on-one with their method of the moment, designers' and evaluators' bodies, colleagues, collaborators, emotions and motives were irrelevant. Unlike users, they did not benefit from Third Wave HCI [1] and its ultimate embrace of our whole humanity. Users had minds, moods, buddies and bodies, but designers remained model mental processors.

Enough is enough. Designers and evaluators have knowledge, expertise, skills, bodies, emotions, motivating values and social contexts. We need to understand, assess and create support for design work that exploits all Third Wave HCI perspectives when constructing designers and evaluators. Human Designing Processors have to be replaced with *Human Designing Explorers*, who bring their knowing, feeling expert bodies and buddies to design settings. Good method support quickly become integrated into existing work practices. The most successful methods disappear after several uses, working invisibly and imperceptibly (to the inexpert eye) to empower designers and reconfigure their work.

To be effective in Interaction Design, methods do not need to meet the four requirements opposite (upper sidebar). An alternative approach is needed.

An Alternative Approach

Hornbæk's collaboration with colleagues from the European MAUSE COST network forms the basis for an alternative approach to method evaluation (lower part of sidebar). Methods are constructed in use from re-usable resources that must typically be modified in actual project settings to carry out design work.

Re-usable resources may be grouped and commoditised as named approaches (branded methods), but such approaches can rarely be applied 'as is'. The vast majority need work to get them to work. We should thus not assess approaches for how well they work, but for *how well they get worked*. Designers work to turn approaches into methods. Success here depends on how well approaches' resources deliver on their functions. Approaches should thus be assessed relative to the functions of their combined resources.

In the MAUSE project, resources were thought of as having *types* [9,22] (sidebar overleaf). Design and evaluation approaches could thus be assessed in terms of how well each resource supported the design work indicated by its type. *Scoping* resources indicate the coverage of an approach (e.g., technologies such as mobile, desktop or ambient, user groups such as

Evaluation Resource Types [22]

1. Scoping
2. Axiological
3. Instrumentation
4. Procedural
5. Expressive
6. Knowledge
7. Process

Revised TwinTide Resource Function Names

3. Harvesting
4. Directive

As well as two name changes, process functions became a form of scoping, resulting in six resource functions. Resource functions were also found to correspond closely [6] to *meta-principles for designing* [5], with some of the latter also renamed to reduce bias towards human-centred design [6]. Some renaming responded to design values, and further renaming from different connotations across national dialects of English.

children, the elderly or disabled, application domains such as games, e-learning or health information). *Axiological* resources indicate the values motivating an approach (e.g., accessibility, value-sensitivity, discount methods). When approaches are not used as intended (e.g., cultural probes [2]) this may be due to inadequate scoping or axiological resources (e.g., limited communication of situationist values [2]).

Instrumentation resources collect evaluation data (e.g., logs, timers, video, eye trackers). *Procedural* resources direct evaluations, and are often regarded as *the* core of methods (series of steps). *Expressive* resources communicate evaluation findings (e.g., presentations, reports). The success of evaluation approaches thus depends on the appropriateness of what is measured (*instrumentation*), how data is collected and analysed (*procedure*) and how results are reported (*expression*).

Knowledge resources underpin other resource types, and may, for example, be conceptual, factual, or relational. Approaches will perform poorly when designers focus on procedural and expressive resources without fully understanding the knowledge that underpins them. *Process* resources relate approaches to embracing design processes, e.g., to a specific stage such as problem analysis or design.

The initial typology worked for evaluation methods. However, when extended to design methods [6], two changes in vocabulary were needed to generalise over design and evaluation methods (bottom of sidebar, 3 and 4 renamed). It was also recognised what was being named were not types, but *functions*, since one resource can have multiple functions without this resulting in multiple types. Sketching for example does not simply have an *expressive* function, but it also has a *harvesting* function (as an ideation technique) and also a *directive* function (in the way that sketch sequences develop through refinement, discarding some options, and triggering new directions). Refinement draws on knowledge resources that guide improvements to the 'finish' of sketched elements.

Analysis of the functions of resources of an approach can quickly reveal gaps that must be filled by local resources in specific design settings. Alternatively, re-usable resources can be designed to fill gaps, or complementary approaches can be added to achieve coverage. Analysis can also reveal duplication and related ambiguity, redundancy and complementarity, which could support approach simplification by removing and/or replacing resources.

Resource functions are thus a *vocabulary* that supports understanding, assessment and improvement of existing design and evaluation approaches, as well as targeted creation of new ones (on the basis of conceptual analysis and not demonstrated need). The underlying concepts thus have extensive valuable practical applicability.

Firstly, resource functions focus studies of design and evaluation methods that expect approaches to interact extensively with local resources in project settings. Such studies accept alternative axiologies to human-centredness, approaches without directive resources (and thus no prescribed 'method' to follow), and expect no deterministic relationship between re-usable resources and design outcomes. Resource functions can also explain method misuse, e.g., axiological resources for cultural probes can be easily overlooked [2].

Extended Resource Function Vocabulary, with increased challenge
(but helpful glosses)

1. Adumbrative *(rough outline of an approach's scope)*
2. Ameliorative *(an approach's guiding values)*
3. Inquisitive *(finds stuff out)*
4. Directive *(systematically guides design work)*
5. Expressive *(gets stuff out)*
6. Informative *(puts stuff in)*
7. Performative *(spreads stuff out)*
8. Invigorative *(spurs things on)*
9. Protective *(keeps things right)*
10. Integrative *(pulls stuff together)*

Directive functions are only one form of design support, and require many local resources if unsupported by other approach resources.

Secondly, resource functions are a basis for design teams to audit and improve their own practices. For both applications of resource function vocabularies, it is important that researchers or practitioners have a good grasp of the meaning of each function. Experiences with the changing names of resource functions [6] and meta-principles [5] suggest that no single stable vocabulary may ever be adequate. For example, the *Receptiveness* meta-principle [5] was originally referred to as *Sensitivity*, but this was too soft and personal for some British Ears. Receptiveness in turn was too passive for some designers' ears, and thus became *Acquisitiveness* [6], but that was too greedy for some American ears. It is now currently *Inquisitiveness*, proactive without voracious personal touches, but potentially lacking empathic sensitivities and a hunger for a full menu of richly sourced design inputs. We may need all these names, and more, not just one of them.

Taking Language Seriously

Words matter. Key words matter more. They are how we communicate and discuss the foundational concepts in any discipline. They are contentious, and evolve in disciplinary discourses.

Words are the elephants in Scientism's room, which commits technical writing to writing out writing [7]. Clarity, precision and simplicity are valued, and ambiguity is to be avoided. Technical writing attempts to tame language, but may only achieve this through extensive disabling of language's finest capabilities.

Vocabularies for resource functions and related meta-principles for designing present substantial challenges, even for native English speakers. These challenges increase as new resource functions are identified (7-10, sidebar to left). For example, embodied emotional and social aspects of design work require further resource functions. The TwinTide project (www.twintide.org) list on the previous page (1-6) is mostly cognitive, and ignores resources that boost design work emotionally (*invigorative* function), and ones that keep design on the rails, pulling teams back from impasses and conflicts (*protective* function). Similarly, the expressive function does not distinguish the *cognitive* needs of designers' solo work from the *social* needs of stakeholder engagement. Expressive functions can thus be restricted to informal records, with additional *performative* functions communicating the current state of thinking behind a design to a group of stakeholders.

Each new function risked additional naming challenges and endless cycles of renaming. However if the current vocabulary was only one of many, then its challenging nature could become a virtue through refusal to engage in Scientism's hopeless battle with unruly language [7]. Words are bigger than all of us, so we need to embrace what they are and what they can do though a logocentric strategy that accepts the power of words, rather than tries to attempts to neuter them.

This is not new a strategy. Challenging neologisms were used deliberately for Cattell's 16PF traits [4], which originally had names such as Protension, Autia, Parmia and Premsia. Cattell deliberately chose these to stop people equating his personality traits (as revealed through factor analysis) with everyday common sense terms. However, these did eventually gave way to everyday English [10] (i.e., Vigilance, Abstractedness, Social Boldness, and Sensitivity for Protension etc. above). Both vocabularies are now used together.

Everyday Resource Function Vocabulary

1. Limiting
2. Valuing
3. Sourcing
4. Steering
5. Recording
6. Telling
7. Sharing
8. Energising
9. Caring
10. Linking

Technical Resource Function Vocabulary

1. Utilisation
2. Prioritisation
3. Investigation
4. Instruction
5. Registration
6. Education
7. Presentation
8. Acceleration
9. Correction
10. Co-ordination

Why stop at two vocabularies? Why not have one that challenges, one that you can use anywhere, one that sounds technical, and others that inspire, puzzle and evoke? To explore possibilities here, five experimental vocabularies for resource functions have been developed. The first existing challenging vocabulary [6] has been made more challenging, in the spirit of Cattell, and is shown in the previous page's side bar. Functions 1-6 correspond to the TwinTide names [6,22]. Functions 7-9 were introduced above to cover social and emotional resources. The tenth *integrative* function extends the mapping in [6] to complex meta-principles such as *inclusiveness* and *improvability* [5], but covers them all in one function with a scope that can vary across design paradigms [7].

A second everyday vocabulary has been developed, and is shown at the top of the sidebar to the left. A more formal but neutral technical vocabulary appears below it. While the primary aim of multiple vocabularies is to provoke creative developmental reflection for designers and researchers, it is possible to use different vocabularies in different settings. Research papers could use either the challenging or the technical vocabulary depending on the audience. The everyday vocabulary can be used to explain design thinking to clients and other project stakeholders.

Other vocabularies may be best restricted to consenting adults in private. Both those on the sidebar overleaf are poetic. The first uses colour analogies to suggest resource functions. The second is wilfully exotic, based on a list of historic occupations, to stretch imaginations (www.rootsweb.ancestry.com/~usgwkidz/oldjobs.htm). There is not enough space to fully explain their rationales here, indeed readers should work out possible associations for themselves, using imagination, the above web address, and *clues* in the last sidebar.

Summary

The Model Designing Processor implicit in much HCI research on methods (and more explicit in reviewing of research submissions) results in inappropriate criteria for assessing innovative design and evaluation methods. An alternative conceptual framework focused on resource functions within approaches allows more realistic assessments of the influences of named approaches, with their incomplete re-usable resources, on the quality of design outcomes.

Five experimental vocabularies have been developed to avoid the limitations of a single set of clear and simple terms. Instead, different vocabularies have been developed to apply creative uses of writing within HCI, complementing my recent use of parody [7], with the aim here of developing rich productive understandings for designers and researchers through multiple connotations and associations. This is motivated by the need to take language seriously as the medium through which we develop fundamental understandings of interaction design work. The use of a range of vocabulary styles breaks away from the technical writing preference for precise definition at the expense of rich connotations. Design is not concerned with how the world is, exactly, but how worlds could be, imaginatively. Vocabularies must support creativity.

The vocabularies will be seen to work when their application makes designing better, where 'better' spans improvements to resource functions that are adumbrative, ameliorative, inquisitive, directive, expressive, informative, performative, invigorative,

Colour Vocabulary

1. Grey (*cloudy*)
2. Gold (*valuable*)
3. Brown (*fertile*)
4. Black (*formal*)
5. Green (*first shoots*)
6. Yellow (*illuminating*)
7. Purple (*opulent*)
8. Orange (*fiery*)
9. Blue (*cooling*)
10. White (*mix all colours*)

Archaic Jobs Vocabulary

1. Ostiary (*minds doors*)
2. Assay Master (*ensures value*)
3. Mudlark (*scavenges*)
4. Apparitor (*calls witnesses*)
5. Scrivener (*makes notes*)
6. Book Holder (*prompts actors*)
7. Bard (*celebrates*)
8. Stoker (*tends fires*)
9. Palister (*keeps safe*)
10. Piecener (*ties broken threads together*)

protective or integrative. The vocabularies can focus design research and practice on specific resource functions, pinpointing areas of design work that work well, and those that need attention. Language thus provides lenses through which to see how re-usable resources support design, where to make better use of what we have, where best to direct our efforts to either improving existing resources and approaches or creating new ones, and where best to leave designers to rely on resources local to teams or project contexts.

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