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The Politics of Materiality: Exploring Participatory Design Methods, Tools & Practices

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Abstract: As participatory design approaches (PD) become incorporated into mainstream organizational practice, it becomes increasingly important for designers to consider how can participatory design tools, methods and practices be made more accessible, understandable and engaging for a broader audience. This paper presents a descriptive analytical framework that explores the materiality of artefacts used in PD, through various studies of the interaction of material and relational considerations and the implications of these interactions on design outcomes. We develop this framework by drawing lessons from (1) existing frameworks on materiality and PD tools; and (2) a series of empirical studies exploring materiality through a suite of artefacts, across different contexts and studies. We highlight the utility of this framework as a tool to reduce barriers for participation in design activities and increase participant engagement.

Keywords: materiality; design methods; participatory design

1. Introduction

The materiality of design tools, techniques and methods plays a central role in determining how effectively non-designers can be successfully engaged in design practice. The thoughtful consideration of materiality enables the structuring of democratically oriented environments, with direct influence on the social roles, agency and influence of both participants and designers within the design process. This has significant impact on the flow of an activity, as considered selection of materials of design allows for establishing equitable power distribution where the dominance of participant groups is moderated (Björgvinsson et al., 2010); however, if left unchecked, the lack of consideration of materiality may also lead to unintended consequences such as privileging certain participant groups and/or disenfranchising others. Therefore, it is imperative that designers are cognizant of the material choices, their consequences on participation, and how materials can be politically

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valenced in facilitating the use of tools and practices in collaborative design spaces. This can be done by a critical appreciation for the materials of design tools, their users (both designers and non-designers), as well as the intended social context within which they operate.

Design is epistemologically distinct from other disciplines because it is principally concerned not with certainties or even probabilities, but with an open texture of possibilities (Gaver, 2012). For this reason, design can pragmatically operate across ontological and disciplinary boundaries, creating value for stakeholders from different backgrounds, functions, and perspectives. Over the past three decades designerly practices have infiltrated mainstream organizational contexts (e.g. innovation, strategy, marketing, product development, customer research etc.); disciplines which have shown an increased interest in user-centred approaches. In such circumstances it becomes increasingly important that the tools, methods and practices that enable design collaboration are easy to understand and assimilate for non-designers. In this way the tools themselves act in a manner analogous to ‘boundary objects’, bridging participants across different social worlds (Star & Griesemer, 1989). Brandt, Binder & Sanders (2012) contend that the selection of appropriate tools and techniques must be grounded in the context of the design; hence it is important for participants to understand what can be accomplished when both selecting and using design tools. In order to maximise the value of designerly activity, participants should ideally be equally placed in terms of their understanding of design tools and methods, the affordances, capabilities and agency they provide, accompanied by a participatory mindset (Sanders & Stappers, 2008) when using them in practice. There remain open questions regarding the precise nature of the roles of the materials of these activities in achieving their participatory aims.

Materiality is an increasingly influential perspective within design research. Jung & Stolterman (2011) state that “through the lens of materials, design can be considered as a process of creating meaning with proper materials based on exploratory practice with them.” This derived meaning is heavily contingent on how materials interact with their environment, which changes how they are experienced, used, socially understood, and owned. It is hence important to be mindful of the accessibility of the tools and techniques designers develop, because even though skilled design practitioners may be able to appropriate tools to different contexts, this can still pose an entry challenge for novices and non-designers (Brandt et al., 2012). So, there is a need to explore how our choices about materiality can act as democratic mediators among participants in design activities, levelling social hierarchies and domain expertise, and distributing more equitable agency, influence and control over the process for all participants.

Prior work has been done to study the purpose and contexts of PD tools and techniques (Sanders et al., 2010). However, providing the scaffolding to novices or non-designers to achieve a ‘participatory mindset’ remains a challenge (Sanders & Stappers, 2008). If the use of tools and methods does not align with the participants’ motivations for using them, e.g. if participants are only using a ‘journey map’ because it was prescribed to them by a consultant, and do not fully understand, agree with or have purchase over its purpose, the

value discerned from its use is diminished.

We argue that the materiality of design tools, methods and practices have dimensions in addition to their material properties i.e. normative uses, social conventions, prior associations, that can leverage political agendas of participation to augment how designerly practices are conducted. This research explores whether – and how – it may be possible to shift participants into more participatory mindsets during design processes by facilitating more considered reflections on the material nature of the tools we use and their applications; possibly making the resulting value of those activities more apparent. We present a descriptive analytic framework, to explore material and relational considerations of different design tools, methods and practices. We draw upon (1) literature on materiality in design and PD tools – and (2) findings from empirical studies conducted to explore materiality across a broad suite of tools and methods. The framework maps out a set of dialogic relationships between different elements of materiality (material considerations) and their consequences on participation through possible emergent applications, providing a practical aid for informing how to effectively engage non-designers in design practice.

2. Materiality and Design

2.1 Perspectives on Materiality

Materiality plays an active role in the creation of meaning through the design process. Jung and Stolterman (2012) critically reflect on user-centred design, suggesting a move from functionality as a determinant of form and aesthetics, to their proposal of a ‘form-driven’ approach to interaction design research, that emphasizes form and materiality. Schön (1984) was one of the earliest to stress the importance of the thoughtful consideration of how materials ‘back-talk’ to the designer as a means of understanding the practice of design itself. Wiberg (2014) notes how Schön’s (1984) use of a vocabulary that acknowledges material artefacts as conversational objects highlights the dialogic nature of design practice and the materials of design. Wiberg (2014) contends that the “back and forth between wholeness and ideas about design in relation to its practical manifestation including materials, textures and details needed to be carefully crafted to reach the desired outcome” (p. 626). This argues for the thoughtful consideration of the materiality of the tools we use in design practice and the dialogue they have with the users of those tools. The materiality of the tools, methods and practice, should be able to talk back to the user – irrespective of their level of expertise or familiarity to design. Materiality has always been a core aspect of traditional design, influencing both the functional and aesthetic properties of systems (van Kesteren et al., 2007) while also embodying social and economic values (Jung & Stolterman, 2011). Wiberg (2014) suggests this shift of focus to the material can also be seen as a return to the foundations of design as in the sciences of the artificial (Simon, 1968) where materials are seen as a basic constituent of design.

2.2 Materiality of Methods and Participation

There has been significant discourse around design and participation over the years. The Design Research Society (DRS) has had significant interest and influence in shaping the role of design tools and methods over the years, with its formation being the result of the success of the first conference on design methods in 1962 (Cross, 2007; Jones & Thornley, 1963). The interest in the notion of making design more inclusive and participatory within the DRS community can be found as early as 1971, with the theme of the second DRS conference on design participation (Cross, 1971). Concurrent movements in user-centred systems design occurred in Scandinavia, where a ‘work-oriented’ approach to design had emerged out of pioneering collaborations between computer scientists and workers’ unions (See e.g. Ehn, 1988; Floyd et al., 1989; Kyng & Mathiassen, 1979). Over time the practices, tools and methods from PD found their way into mainstream business practice. A revived focus on design within contemporary organizational practice emerged under the banner of design thinking – designerly practices packaged for non-designers. Design is seen to create value as a competitive advantage (Borja de Mozota, 2002; D’Ippolito, 2014; Drew & West, 2002; Heskett, 2009, 2017; Roy & Riedel, 1997; Verganti, 2008; Walsh et al., 1988), a strategic instrument to negotiate wicked problematics (Braga, 2016; Buchanan, 2015; D. Dunne & Martin, 2006; Johansson-Sköldberg et al., 2013) and increase market acceptability for innovations, when co created with participants (Björgvinsson et al., 2010; Buur & Matthews, 2008). Due to its influence spanning across a broad spectrum of domains and contexts - the tools, methods and practices of PD have origins across different worlds; all contributing to the rich repertoire of tools and techniques of design in community-driven, commercial and research applications (Carroll, 2003; Kaptelinin & Nardi, 2006; Rogers, 2004; Sanders et al., 2010). Central to these tools is their materiality i.e. their material properties and affordances which break barriers to participation and act to provide shared understandings between sometimes diverse participants.

There is, however, significant criticism to how design has been used practically, specifically under the guise of design thinking (Khan, Snow, & Matthews, 2020; Khan & Matthews, 2019a; Kolko, 2018), and particularly in versions where it is supposed that anyone can effectively design simply by taking up the methods and tools, whether or not they are using them in their intended spirit. A criticism to the use of design in business is how the tools and practices are packaged under glossy frameworks, toolkits and ‘recipe-like-solutions’ (Orlowski et al., 2016) which only superficially engage with the practice and inhibit design to perform in how it is originally intended. Similarly, Gray’s (2016) study of practitioners, contends that design in practice is more of a mindset than a method, which echoes Sanders and Stapper’s (2008) sentiment; and so the intentions behind using designerly tools become increasingly important to address. Yet common to these approaches are the ways in which they organize participation through socio-material means – physical materials, turns, rules, goals – which we analyse for how they can be leveraged as political artefacts (e.g. constrained output forms such as using brick-based tools to ensure output quality cannot showcase difference in skills, or using materials that can only be used as collaboratively due to properties such

as scale or weight). In turn, this opens up possibilities for materiality to be employed as an active agent in making design more accessible in practice.

2.3 The Politics of Materials

The interest of design research towards materiality extends beyond material dimensions in design itself, but also in how materiality can be an analytic lens (Wiberg et al., 2013, 2014). This draws upon critical reflections of how materiality impacts participation with and use of design tools. The vernacular around materiality has emerged within a post-phenomenological (e.g. Verbeek, 2011) perspective, in which it makes sense to speak of material artefacts having morality, as actors¹, and being politically valenced (c.f. Winner, 1980). In these cases, interaction with materials are strongly influenced by the relationships we have with them and the social systems in which they play. Critical design uses design outputs to provoke reflection on our current societal practices (A. Dunne, 2008; A. Dunne & Raby, 2001); however reflecting on the materiality of the methods, tools and practices of how we get to those outputs, can also be of significant importance as designers.

Much of the prior work focuses on material-centred design as a whole; our present aim is to take a more targeted approach that explores materiality as related to the choice of design methods, tools and practices used in PD. Wiberg's (2014) methodological framework acts as a guiding tool for exploration of materiality within interaction design research by exploring methods to study materiality. Our stance is positioned slightly adjacent to this. We contend that attention is required into the materiality of design methods, practices and tools of design to uncover design possibilities and implications on participation. That said there are considerations to materiality that Wiberg's (2014) methodology presents which can still be incorporated in our approach. Extending the notion of exploring materiality related to design methods, tools and practices, we can consider how to make design as a whole more accessible to a broader audience, and in doing so make its value more explicit. Our study of the materiality of the methods used to bring participants together provides the opportunity to understand how we can reduce the barriers to participate and engage with design processes. Aspects such as familiarity, agency, and understanding become important to consider when exploring this space.

2.4 Theoretical Grounding

In order to understand how materiality interacts with participatory design practices we draw upon the frameworks of (1) a methodology to study materiality (Wiberg, 2014) and (2) organizing PD tools and techniques (Sanders et al., 2010). This underpins our framework which situates lessons from these two frameworks and adds empirical data from our own interventions to exhibit how materiality influences design to produce more democratically oriented environments.

1 We are cognizant that Latour's and colleagues' (Latour, 2004) notion of 'actants' might also be a lens to explore the political agenda actioned through materiality, however would require a very different standpoint, the inclusion of which would be beyond the scope of this paper.

Methodology for Materiality - Wiberg (2014)

Figure 1 Wiberg (2014) Methodology for Materiality Framework

The purpose of Wiberg's (2014) framework (Figure 1) is to serve as a guide for methodological explorations in material-centred interaction design research. The framework is organized as a dialectic among four lenses: materials, wholeness, texture and details and their further sub categorizations. We also draw on Sanders et al.'s (2010) framework for organizing tools and techniques of PD (Figure 2) as a complement to this. The aim of Sanders et al.'s framework is to provide the PD community a means to discuss relevant applications and to identify potential areas for further expansion of PD within organizational and research practice. The framework is organized along three dimensions: form, purpose and context.

Figure 2 Sanders, Brandt & Binder (2010) Framework for Organizing Tools & Techniques of Participatory Design

Both of these frameworks are very useful in their own right, with Wiberg (2014) presenting a detailed perspective with how to approach materiality at a broader scope, and Sanders et al.

(2010) encapsulating the overarching structure of PD tools and techniques. The framework we outline later aims to build on both these structures.

3. Materiality Studies

3.1 Materiality of Methods - A Research Program

We present findings from a series of experiments conducted in a variety of distinct, specific contexts to explore materiality as part of a broader program of research. The overall project takes on a Research through Design (RtD) approach, where the individual studies are inspired by Binder and Redström's (2006) exemplary program of research. The experiments and explorations range across a spread of materials, some popularly used in design practice e.g. Lego, Design Cards, Sticky notes, (Christensen et al., 2019; Frick et al., 2014; Roy & Warren, 2019) and other more unconventional materials, that may be more familiar in everyday life to non-designers, and more ubiquitously accessible (Rubik's Cubes, Dice assortments, Playing cards). The aim of using familiar artefacts within a designerly context is to study how prior associations with the tools that are conventionally not a part of mainstream design, may influence participation, i.e. can it yield greater understanding, control and agency for non-designers to participate? The programmatic nature of these explorations employed a broad range of materials in diverse contexts to explore how the materials influence the design process irrespective of the intended outcomes. Each exploration is set as an 'ultimate particular' (Stolterman, 2008) self-contained within their contexts and instances – a composition of the system as well as the organization around it. This allowed for a thoughtful appreciation of the role of that the materials play, what kind of political agenda can they bring to a design process, abstracted from specific use cases. This also acted as a small-scale proxy for how participatory design methods and tools are also employed in situ in different contexts, setups, with various participant types and objectives. Our conceptualisation of materiality refers to: (1) properties internal to the material (i.e. scale, size, shape, colour, weight etc.); (2) actions the material affords (e.g. movement, arrangement, annotations etc.); and (3) the social meaning, presence and value of the material when it interacts with people and the context (prior associations, conventions, invitation to use, value, novelty etc.) Materials can be digital and/or analogue in form.

Figure 3 provides a high-level overview of the various activities undertaken as part of this program of research, covering aspects such as context within which the activities were deployed, participant count and types and a thumbnail of all the materials used within the sessions as well as their description. The facilitation structure is highlighted to provide context, coupled with top-level findings across the various activities. The studies were set across a wide gamut of contexts (See: Khan, 2020; Khan et al., 2019; Khan, Snow, Heiner, et al., 2020; Khan & Matthews, 2019b) to explore patterns and concepts that emerged in different domains and contexts of the program, as characteristic of strong concepts (Höök & Löwgren, 2012). The lessons from these studies are detailed in the composition of the framework and discussion further. The studies involve participants from four groups: design

educators, students, and design and non-design practitioners. The challenges faced in design pedagogy to students or novice designers are similar to those of teaching design to non-design practitioners. This participant mix provides a range of the considerations we might encounter across the board in industry and educational settings.

MATERIALS

A
Lego Classic Kit (303 bricks); text & visual prompts (cards & digital)

B
Bespoke design cards (12); written narratives;

C
Rubik's cubes: standard, mini, and mega; blank coloured cards (54); Coloured paper; sticky notes; various bespoke design cards; permanent & dry erase markers; cutting tools

D
D6 dice (10); yahtzee travel 5 dice set; 7 Dungeons & Dragons polyhedral sets (D4 - D20); blank wooden cubes (10); blank cardboard cube; sticky notes; permanent & dry erase markers

E
Printed paper based prompts; pens and pencils

PARTICIPANTS

19 participants
(non-design practitioners & students)

9 participants
(non-designers)

11 participants
(design practitioners & design teaching staff)

8 participants
(design teaching staff & students)

5 participants
(design teaching staff & practitioners)

FACILITATION STRUCTURE

Workshops
(face-to-face & online)

Probes
(online)

Workshops
(face-to-face)

Workshops
(face-to-face)

Probes
(paper/take home)

TOP LEVEL FINDINGS

- Low-fi structures forced reflection on meaning of form
- Metaphors used to cater to material constraints (structure, form, colour)
- Quantity (assortment) sometimes problematic, but the modular nature of Lego allowed reuse
- Familiar form, low learning curve
- Colour used to form meaning when form failed e.g. green represents 'softness'
- Low social peril, as no expert skills needed or Hi-fi outputs
- Playful elements; lots of tinkering and friendly competitive banter
- Easier to communicate through the creations

- Material form easy to shuffle and lay out based on prior understanding of cards
- Easy to understand format (similar to Cards Against Humanity)
- Narrative forms positioned as fiction stories, easy to consume, comprehend and provoke reflection
- Specific and precise tools - did not require much effort to engage with
- Could not be annotated due to colour and coating of cardstock

- Novelty sized artefacts command attention in the space (Mega Cube)
- Solved states of the cube intimidating to change
- Participants reluctant to write on blank cards (thick card stock and rounded corners) because of perceived effort in preparation; comfortable to write on coloured paper
- Sticky notes used to annotate large cube
- Participants developed various rules, and conditions of using the materials e.g. to make personas, to brainstorm
- Card conventions such as fanning & laying them out like poker, observed

- Affinity towards wooden cubes because they can be annotated
- Preference to form of the small wooden cube vs. large cardboard cube - parallels drawn to the size of a 'tennis ball' for handling
- Various application contexts considered - dice to dictate 'thinking hat' condition
- Value seen in material artefact as a social focal point for communication
- Articulation of the novelty of form - adding an element of quirkiness to context
- Seen as a way of catering to paralysis of choice and distributing onus of responsibility

- Participants found completing all the tasks challenging
- The material form was seen as 'not designed' - as rationale for rushed responses citing font selection and paper thickness
- Task Fatigue - as prompts required similar output as a drawing for different contexts
- Different techniques employed to articulate journeys (flowcharts, icons, lines etc.)
- Different forms and levels of annotations made across various participants
- Struggle with open-ended nature of task i.e. blank canvas

Figure 3 Summary of Research Program Studies

4. Materiality Politics Framework

Our framework (Figure 4) is designed as an abstraction of a complex design process; it in no way means to oversimplify the considerations that go into the design – but presents a structure for the considerations, that can help designers understand how the material and social aspects of design tools, methods and practices can be best leveraged within their own contexts, to influence and improve participation.

* The presented considerations are generated from the empirical studies, but are intended to be illustrative, to showcase the interaction between the different elements of this structure. The elements of these considerations should not be limited to the ones presented here, but contextually relevant to the materials being explored.

Figure 4 Materiality Politics Framework

4.1 Understanding the Framework

The framework presents a dialogic interaction among *purpose*, *material considerations*, *relational considerations*, *staging* and *emergent applications & agendas*. Purpose refers to the actual setting of the problematic, i.e. users and contexts, which is the prerogative of the

designers who use this structure as they are best placed to consider where the tools can be applied and who the intended participants are; this is informed by Sanders et al. (2010) purpose and context stages. *Material considerations* are properties and characteristics inherently available within the materials, which can impact participation. These are closely tied to *relational considerations*, the way in which participants intersubjectively perceive the *material considerations* – and so there is a dialogue between these two facets of the material and the social. The considerations used in the framework are meant to be illustrative of the types of considerations that may be relevant in a design context, the ones described in Figure 4 emerged from the empirical studies conducted. The interaction of the *material* and *relational considerations* can be illustrated through the example of *fidelity & social acceptability*: engaging with materials that are constrained to lower fidelity, allow for less social consequence of skill deficits within individuals when used, and so can have a positive impact on greater participation. This dialogue serves as an extension of Wiberg’s (2014) model. Thereafter comes *staging*, a very important aspect of any PD work –the facilitation structure, rules of engagement, tasks, sequences, intended goals etc., aspects which are very contingent upon the context of use. We do not neglect the structure of facilitation, as the non-material aspects of participation structures play a significant role in shaping the flow of activities and their resultant outcomes, however the focus of this particular framework is to map how the material properties and considerations can influence participation. Beyond this we place our material artefacts, irrespective of whether they are physical, tactile materials, or intangible methods or practices. The way in which different political agendas are materially influenced are represented as *emergent applications* and their resultant *political agenda*. These are derived from observations specifically grounded in the empirical studies we conducted and are by no means an exhaustive list. They do however act as exemplars of the breadth of functions different material and relational considerations can serve, and how they can be ‘designed’ towards specific socio-political outcomes.

5. Emergent Applications & Discussion

5.1 Political Agenda in Emergent Applications

Understanding that material artefacts are morally and politically valenced (c.f. Winner, 1980), provides a lens through which we can trace certain aspects of the dialogue between the *material* and *relational considerations*, in light of possible applications. For instance, if the onus of a decision must be shared amongst a collective, exploring what aspects can be offloaded onto the *dialogue of relational considerations* (e.g. social acceptability, open-ended nature, ambiguity of form, and imposition of conventions associated with the materials) with *material considerations* (e.g. a mix of the quantity, scale and modularity of the material) – an outcome that results in a ‘random’ a decision, might be the most optimum use of the materials. This creates the ability to *delegate agency*, where the arbitrariness of the outcome of the material defers any accountability, i.e. no need to justify the decision and take on responsibility, with the potential for positive social consequences to obviate

conflicts within a team setting (as well as post-hoc finger pointing). Similarly, if one wanted to deconstruct how to disenfranchise a certain group – choosing tools and materials that are contingent on high proficiency or skill, ambiguous in form and can generate high fidelity outputs, can be employed e.g. drawing tasks on blank canvases, where the skill of the participants is very evident in the product of the exercise. Flipping this over – ensuring the fidelity of the material is constrained so the output cannot go beyond a certain detail, renders proficiency of skill level immaterial e.g. it would be impossible to create a realistic car, with 4 Lego bricks.

Figure 5 Montage of Material and Relational interactions: 1. Externalising dialogue using die as a communication tool; 2. Exploring scale of different cube materials; 3. Building modular structures and scribing perceived challenges; 4. Participants creating a card-based game through materials, not writing on the actual card because of perceived material ‘value’; prior association of fanning cards; 5. Lego constructions used as complimentary artefacts; 6. Co-located Lego workshop setup; 7. Using sticky notes and puzzle cube for idea generation, where each cube-side represents a different design consideration;; selecting one note from a side as prompts for creating a concept; 8. Rotating novelty sized puzzle cube collaboratively.

We present below examples of four discrete political agendas for participation that can be structured by studying the dialogue between the material and relational considerations:

AGENDA #1: A LIMINAL SPACE – SUSPENDING ROLES, RULES & CONVENTIONS

If leveraged well, materiality can play an active role in reorienting participants from their traditional organizational roles to ones where they adopt a participatory mindset. We can achieve something akin to what anthropologists refer to as liminal space – a state where conventional practices and orders are suspended and replaced by new rites and rituals, situated within that particular context (Czarniawska & Mazza, 2003; Turner, 1969). Some materials are able to achieve this by mere presence within an atypical context, e.g. bringing a giant Rubik’s cube (C) or Lego (A) into a boardroom disrupts conventional norms of materials you would find in that ecology. If such materials are able to find a way into uncommon environments - their play element fractures existing conventions and is able blur hierarchal lines and role structures of participants; immersing them within the material and domain

(P2B), putting them in the ‘mindset’ (Gray, 2016; Sanders & Stappers, 2008) of participation.

AGENDA #2: A MEDIUM FOR EXPRESSION – LEAVING CONVERSATIONAL CUES

Materiality can also play a significant role as *medium for expression*. Schön (1984) contends, materials are dialectic with designers; however as artefacts also provide the affordance for use as props for dialogue, from their material character (M1B). Materials can be pointed at, used as descriptors through ostensive definitions (1965); inherently reducing the burden on the participants to think in abstract ideas when speaking, to offloading meaning that is embodied in a shared focal point, that can be spoken through (M3A). This was observed across a range of studies – In study (A) participants assigned meanings such as ‘fragrance’ and ‘opacity’ to plastic bricks, structurally conflicting properties; yet this was a very effective use of metaphors embodied in the material to communicate to a group. In study (C), the Rubik’s cube took on the role of a talking device - any participant who held the cube was named ‘*the cube master*’ – and was the only one who could talk, hence delegating turn-taking in conversation to the material artefact, which could be moved around and shared amongst the collective. In study (D) participants highlight that the novelty of the form of the dice would allow navigation through some of the challenges the participants uncovered with communication (cultural barriers, communication breakdowns, varied language proficiencies). In doing so, material properties can actually be leveraged in a purposive manner – where in the case designing PD tools – circumvent the challenges of communication by attending to the details of quality (M4B) and expression (P1B, P1C) to better articulate their experiences (P2C).

AGENDA #3: A REMEDY FOR INACTION – LOWER BARRIERS TO PARTICIPATION

As active proponents in design materiality can also be mobilized to cater to challenges for participation such as low engagement or being overwhelmed by choice; this can be catered to by exploring how the materials in themselves can be a remedy for inaction. One of the contextual challenges discussed in in Study (D) was that when novices trying to navigate complex contexts, may be paralysed by inaction, due to uncertainty of knowing what the ‘right’ thing to do is. Materials, if positioned strategically can help cater to this, by inherently nudging participants action along. This can include aspects such adding constraints, as observed in Lego (A), where participants were challenged by brick colour, count, assortment constraints, or the Rubik’s Cube (C) where participants used the 3x3 grid to map out a finite number of possibilities to a dimension; but this can also be made even simpler by eliciting very basic, explicit outputs – such as the roll of a die (D) as an instructive step. Structuring the material to embody a directional set of options that is agnostic of the order or sequence of what is done next. This is leveraging the material character (M1B) and makes a very tangible (P1A) and playful (P1C) way of diffusing an otherwise daunting decision.

AGENDA #4: A SOCIAL INTERACTION STRUCTURE – FACILITATING COMPETITION & COLLABORATION

A core aspect of participation in most design contexts is having participants engage with one another. There is a degree of social peril that may be associated with interactions

with others, for which exercises such as icebreakers have become a normative part of collaborative work. An emergent application that was observed and can actually be leveraged through the facilitation structure as well as the materials themselves is the use of *competition and collaboration*. In study (A) participants developed complimentary responses to prompts e.g. a participant designed a soap form, and the other designed a soap dish. Participants were also seen to share access to materials (e.g. bricks of specific colours), however in more contrasting instances participants attempted to sabotage their peer's work (stealing bricks, invoking rules, physically intervening) as well as introduce friendly banter. Participants even used materials as means to interject conversations (D) to draw attention towards themselves. In study (C) participants had developed their own version of a design card game (completely abandoning the core material – the cube) – however they very quickly got into discussions over what the rules of using the materials were - dominant participants interjected, moving out cards laid by other participants. This emergent behaviour is difficult to locate within the materiality framework – but would most likely be situated in (M3B) – relationship between materials, material composition and appearance. Some degree of the generative nature of coming up with participants' own 'house rules', might be placed within (P2D) of the PD framework, and some of this is context dependent (P3C), however it cannot be more meaningfully located within the literature. It is interesting because the affordances of being able to control the shared space, and access to materials becomes an interesting element to play with when trying to explore how to bring in levity whilst maintaining agency and not marginalizing others within the design process.

5.2 Utilizing the Framework

Figure 6 Mobilising the framework - structuring two emergent applications / political agendas: A. Expression Mediation; B. A Liminal Space

Our discussion highlights a series of different observed patterns from the interactions between the *material* and *relational considerations*, grounded in the literature. However, the real pragmatic value of the work comes to light when we start tracing pathways of *materiality* from the *emergent applications* to the *material considerations*. In doing so we can start to uncover what aspects of the considerations can be leveraged through their political affinities, to pathways that are beneficial to the study and participants at large. Figure 6 illustrates two different paths that are meant to act as a possible mechanism of operationalising our framework. We map out the framework by providing a *purpose* of use,

putting the material of design at the start and then mapping out the *material considerations*, *dialogue*, *relational considerations*, and *emergent applications and agendas*. The boundary between the relational and material considerations is marked specifically for aspects that lie at the fringes of both these considerations and to reiterate the dialogic nature of this exercise. We propose (1) placing the material artefact (which in this case is the novelty cube) as our starting point, after defining the audience and context. This draws attention to the material, and allows us map out a path from the material considerations to how it is understood in context by people and what relational considerations come into play (See: Figure 4). The idea then is to (2) map out different aspects of considerations within each layer and exhaust them. The considerations in our framework may only serve as a starting point, and can be modified and supplemented with provocations and questions in the dialogue. Thereafter considering (3) what aspects of emergent applications are best suited to the context and mapping it at the far right. In our example we have mapped out two paths: (A) Expression Mediation and (B) A Liminal space. If we focus on the path B, *Liminal Space* then becomes the point from which we work backwards, spatially reorienting the different considerations to follow a path that best serves this motivation. Other modifications which can be made to supplement or add richer understanding could be using tokens or placeholders for participants or contextual factors, where we can present a different pathway which explores mediation of expression (communication) between participants through the materiality reminiscent of Schön's (1984) articulation of material artefacts as conversational objects and Wiberg's (2014) notion of the dialogic nature of materiality.

6. Looking Ahead

We have presented a descriptive analytic framework, that explores the material and relational considerations of artefacts that can be used across different design tools, methods and practices. Materiality is key to participation. While considerable attention has previously been given to PD methods and techniques, as well as materiality as a whole, our framework has been developed by extending the frameworks of Materiality (Wiberg, 2014) and PD Tools (Sanders et al., 2010) that cater to these areas specifically, in conjunction with a series of empirical explorations that together bring a new perspective on participatory design tools, methods and practices in light of materiality. Using the framework, we aim to enable creating a more level playing field for participants, through materiality that engenders a more participatory mindset and results in better outcomes for participation in design processes. We demonstrated how placing material artefacts through this analytical lens allows us to uncover pragmatic possibilities of our tools, methods and practices – and challenges us as a community to explore how to create more participatory access points for design. This is one of the first studies to specifically address materiality of PD methods. Our aim is to extend our understanding of how to reduce the barriers to participation and increase engagement within design processes through materiality as a core proponent, and encourage further work in this space to make design methods, mindsets and practices more universally accessible and actioned in their intended spirit.

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