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Using material properties to understand and shape relationships in public and social services.

Manuela Aguirre and Adrian Paulsen

Introduction

Public and social services are becoming more relational and less transactional (Muir & Parker, 2014). As we evaluate different public services on a complexity spectrum, those who rely on human and interpersonal skills - like healthcare, education, ageing, and immigration – depend on the relational capacity of service providers and the relational support from family and peers. When attempting to deconstruct social systems in its basic elements, we have nodes and relations between the nodes. Specifically in social systems, nodes represent actors or institutions where these become more evident than the connections between them. This also characterizes how the complexity of systems has been historically mapped in two dimensions. The representation of hard systems, like in systems dynamics (Jay Wright Forrester, 1989) and in soft systems, like rich pictures (Checkland, 2000a), has given more attention to the nodes than the relationships between the nodes. Giga Mapping (Sevaldson, 2011) draws attention to this and created a color-coded topology to classify systemic relations (Sevaldson, 2013). Inspired on this topology, we design a three dimensional tool that uses physical material properties – like yarn, stainless steel, and rubber elastics – to understand and shape relational public and social services. We used this tool at a workshop at RSD3, where we explored the relational properties of different materials, we compared relational mapping in two and three dimensions and experimented with the format of group facilitation. The output was a relational-material vocabulary for each of the three-public and social service challenges presented. The relational-material vocabulary allowed teams to granularly define the properties of the relationships between the actors in a socially complex public service setting.

Relational public and social services

Public sector systems are becoming more complex. Solutions are dependent on strengthening human relationships. We need to see public services as interconnected systems where a relational government can better facilitate interpersonal relations (Muir & Parker, 2014). The systems thinking world is beginning to shift its attention from nodes to relations. (Glanville, 2014; Sevaldson, 2013) Governments are transitioning from being a passive deliverer of transactional services to an enabler and facilitator of relationships. (Muir & Parker, 2014) Services are also becoming more relational (Cipolla & Manzini, 2009), specially in the social innovation space. *Designing for services* (Kimbell, 2011) may involve "an exploratory, constructivist approach to design, proposing and creating new kinds of value *relation* [emphasis added] within a socio-material configuration involving diverse actors, including people, technologies and artefacts." (Ibid, p. 42) Lastly, the design field has moved from products, to interactions, to services, to organizations (Jones, 2013), and we propose that it's a new wave of relationships now.

We need to see public services as interconnected systems. There needs to be a bigger role for communities, service providers and individuals. At all these levels, we need to foster deeper relationships. (Muir & Parker, 2014) As shown in Figure 1, public services may be organized on a spectrum of two axis: the horizontal one from simple to complex and the vertical axis from transactions to relationships.
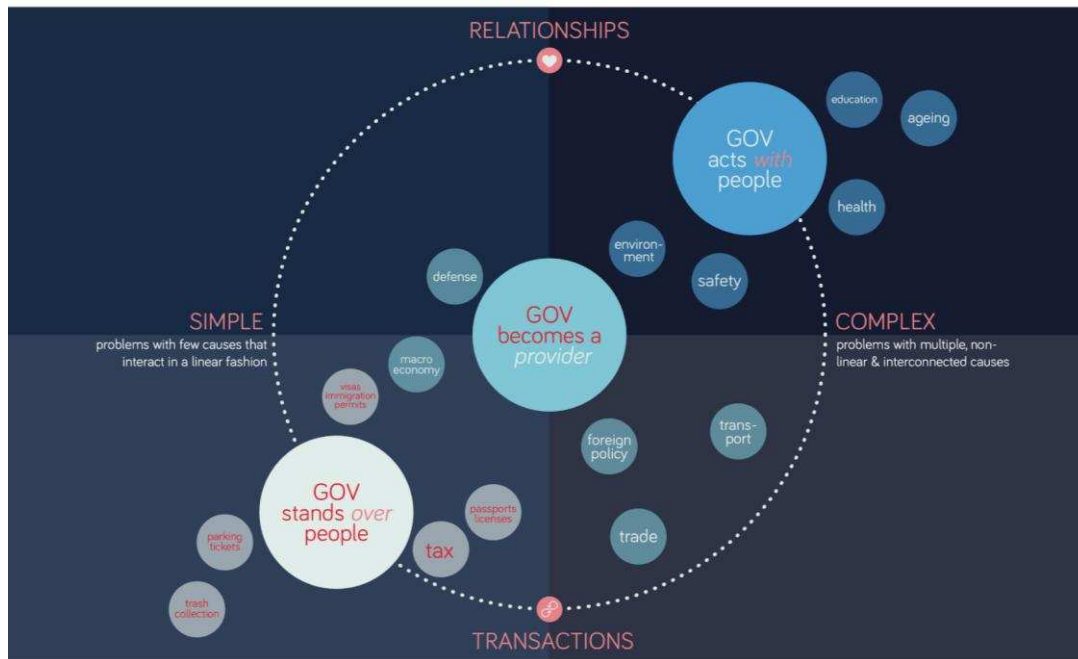
Figure 1: Relational Public Service Spectrum adapted from Muir & Parker 2014.

This diagram interprets research from the UK´s Institute for Public Policy Research (IPPR), which envisions a government that acts together with people. There is evidence that relational social and public services are much more effective, however when designing for them, we don´t have a shared relational taxonomy. For these reasons, we introduce a systemic tool that uses multi-sensory approaches for public servants and designers to explore systemic relationships. This tool can be used to examine existing relations in complex public and social systems, and also design ways to strengthen them.

Systemic Design used to understand and shape relations
Design is a process that bridges the material with the immaterial (Freitas, 2008). The Systemic Relations Social Tool allows people to understand interpersonal or systemic relationships better by using sensory material properties. It also allows to design better relationships that can potentially transform a social system, a social service or public sector interactions. From now on, and for the purpose of this context, we define relations as those *invisible forces that enable or inhibit social interactions*.

The workshop got started by involving the participants in the makeup of the space. We had three areas, one for having conversations as a big group, the second one to do task-driven drawing activities, and the third one for the material library and the project workspaces. This last one was the most interesting. The material library was in a tall round table in the middle of the space. For each of the three project spaces there was a long rectangular table facing the material library. All of this created a concentric environment, where in the middle there was materials, in the peripheries the project tables and then at the end of each project table there was a computer set up to capture in video all the interactions that occurred during the project.

Mapping relational complexity in 2D and 3D
"Complex systems exist at different levels of organization that range from the subatomic realm to individual organisms to whole populations and beyond." (Mazzocchi, 2008, p. 12) One of our epistemological tools for understanding complexity is representation. By modelling, sketching,

mapping and diagramming, we construct simplified views of the world. Thus based on Systems Architecting, the *Systems Oriented Design* (SOD) also uses visualization tools for its "potential for being a central device in generative and creative work" (Sevaldson, 2011, p. 3) At its simplest, complex systems are usually represented by boxes and lines (or arrows) between them – where the *boxes* simbolize *nodes* and the lines allude to the *relations* between the nodes. When comparing cybernetics to systems thinking, Ranulph Glanville claims that cybernetics is the dynamic complement of systems. When systems people are interested in the boxes (or nodes), cybernetic people are interested in the arrows (Glanville, 2014).

Over the last decades, systems thinking worldviews have populated many fields – from engineer to social sciences –with the intention to understand our own complexity, the complexity of our environemnt and the artificials we create. Some take a reducitonist approach, like analyzing the parts of systems to understand the whole, while others a holistic approach; by looking at how the `whole` system relates to its components. Also, some fields want to predict how systems will behave before they are constructed (like systems engineering), while others claim that social systems have been designed mainly using debate and intuition (Jay Wright Forrester, 1991). Even though systems thinking approaches have been extensively applied to many contexts, we often see a lack of *relational thinking*. When understanding, representing, or designing complex systems, relations are often opaqued by the dominant nodes.

Relationships, as opposed to entities, behave different in mechanical or social systems. Systems engineering or systems dynamics are often associated with hard systems thinking, where the relationships between the elements are measurable and almost predictable. Stocks, inflows, outflows, regulators, buffers and taps typify the vocabulary that represent Systems Dynamics (Figure 2).
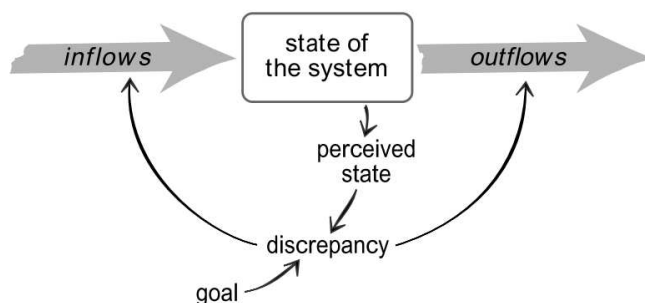
Figure 2 Meadow´s basic illustration to explain stock,
flows, feedback, etc. (Meadows, 1999, p. 4)

Following this reductionist line of thought, in artificial systems *design* can be seen as a problem-solving process where problems are decomposed into smaller units before solving them (Kimbell, 2011; Simon, 1996) The study of social systems attempt to understand soft, fuzzy and illdefined structures, with emergent, adaptive and self-organizing properties. "Self organizing systems spontaneously arrange their components and their interactions into adaptive structures with emergent properties." (Mazzocchi, 2008, p. 12)

According to Checkland in his Soft Systems Methodology (SSM), "hard" and "soft" systems are usually differenciated by their systemic characteristics; e.g. hard systems are technical and defined, while soft systems are fuzzy and illdefined. Even though he believes in this dichotomy, for him, the most significant difference is ontological. Hard systems look at the world as it contained inherent

systemic properties (e.g. health system, transportation system) while SSM sees that the systemic atributions we give to the world are constructed by our process of inquiring about it (Checkland, 2000b). "[…] social reality is no reified entity `out there´, waiting to be investigated. Rather, it is to be seen as countinously socially constructed and reconstructed by individuals and groups" (Ibid. p. 24)
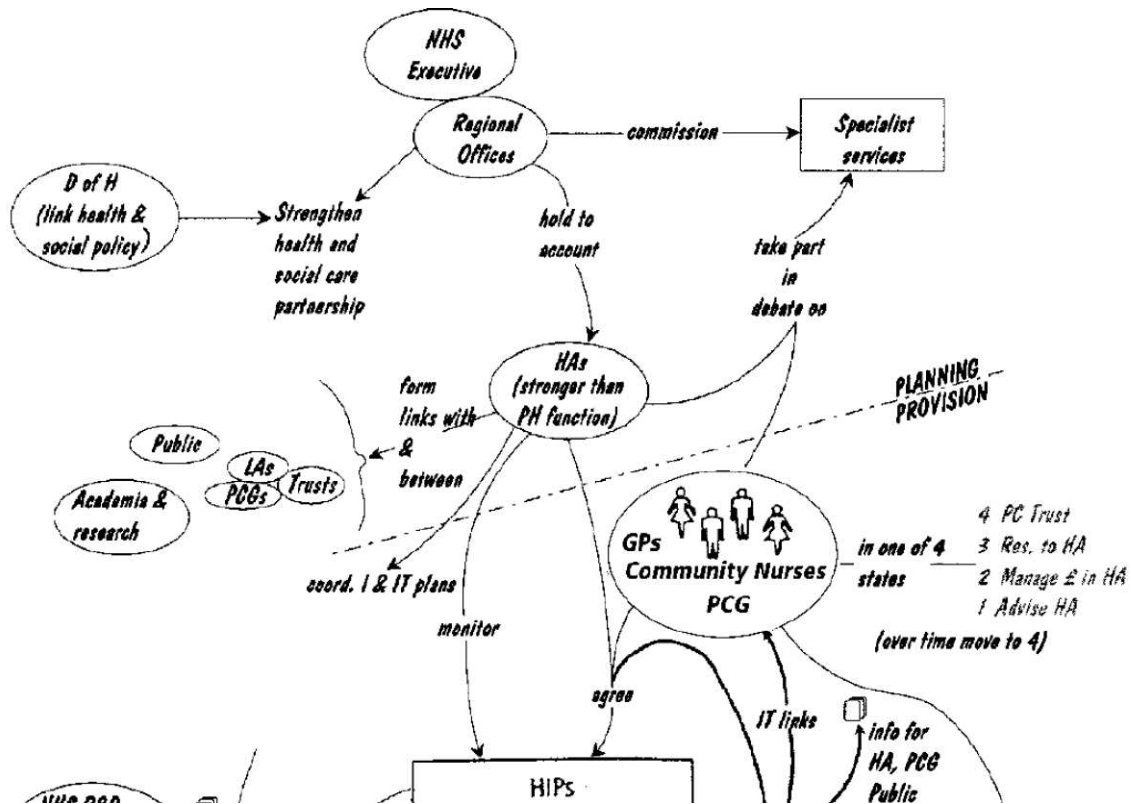

Figure 3 An extract of Checkland's Rich Picture of the National Health System in the UK
(Checkland, 2000 p. 24)

In Meadows model (Figure 2) flows –or relations- are represented merely by arrows where Checkland´s *rich picture*[1] (Figure 3) verbally describes the characteristic of the relationship, where almost every interaction is unique.

Bela Banathy interprets how social systems relate to design: "social systems are characterized as *purposeful* systems in which creative design can *guide* evolution and *direct* social and societal development [emphasize added]. Therefore, design becomes the central activity in social systems, and competence in design becomes a capability of the highest value." (Banathy, 1996, p. 15) I would argue that design rather than guide and direct societal developments, it helps *envision* and *facilitate* societal change by *mediating* different points of views.

REPRESENTING THE *IN-BETWEEN*

Visual thinking becomes key when attempting to construct our own interpretation of a complex system. Designer´s ability to sketch, prototype and simulate complex social interactions allows us to create a shared understanding between multiple disciplines. "Visual artifacts or representations can be a platform for the negotiation of meaning between different professionals" (Miranda-Mendoza,

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[1] Rich pictures are "flexible graphical techniques […] to represent a situation, problem or concept." (Horan, 2000) It has good communication properties and low threshold since it encompasses few rules.

2011, p. 4). In SOD, *Giga-Mapping*[2] has become the central tool when collectively designing our systemic understanding of a complex field or challenge (Sevaldson, 2011).

A visual language supports the representation of complex social systems is needed; however to envision the dynamic and interacting properties of systemic relations becomes difficult. "Our dominant mode of communicating — words — falls short when used without the corroboration of other means of representing complex, dynamic entities." (Nelson & Stolterman, 2012) Maybe even visual fall short. The following section compares two modes of visually representing a complex system (Jay W. Forrester, 1995; Tundheim, 2013). The former stresses nodes, where the ladder is a great attempt to giving relationships the importance needed.
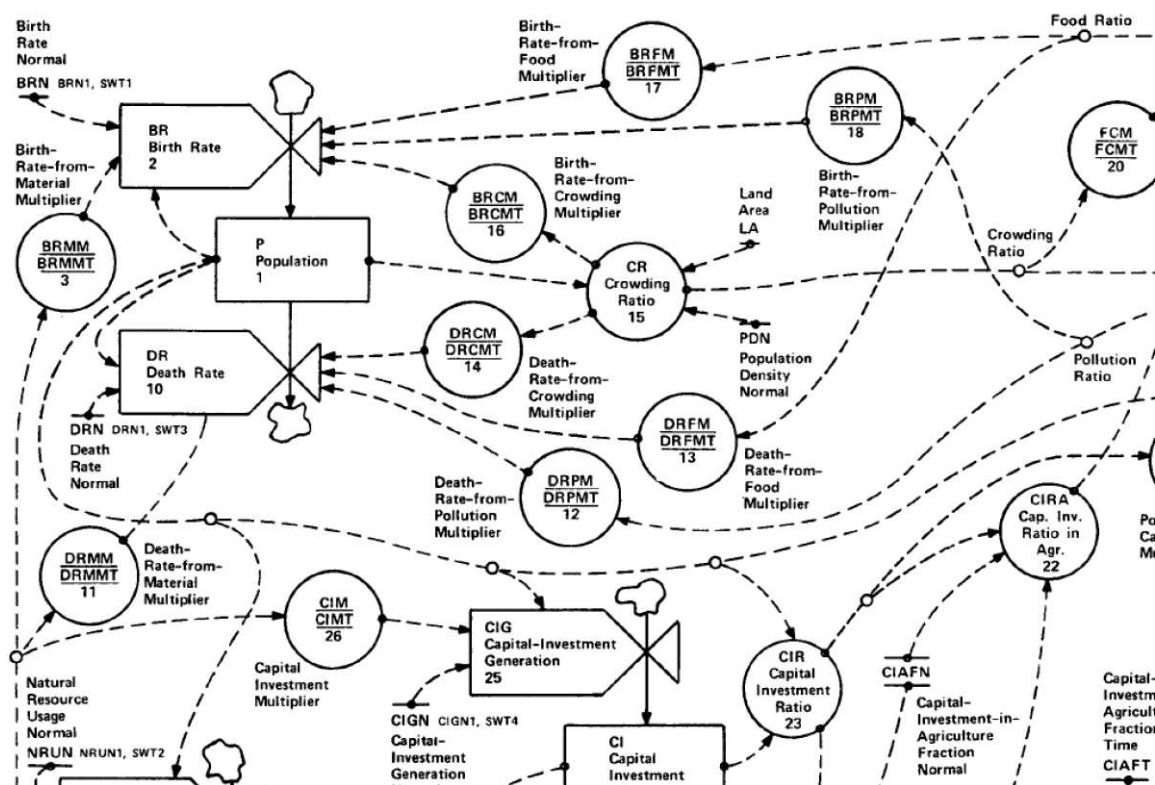

Figure 4 A section of Forrester´s model of the world that relates changing population to economic growth (from 1971 to 2021). It shows the interrelations between population, capital investment, natural resources, pollution and agriculture. (Jay W. Forrester, 1995, p. 13)

Almost fifty years ago, the founder of Systems Dynamics, Jay Forrester, used visual models to illustrate the interrelations between population and economic growth that would occur over time (1971 – 2021). This model (Figure 4) used different visual techniques, like big rectangles to represent the five "systems" levels (population, capital investment, natural resources, pollution and aggriculure), where each rectangle had an inflow and an outflow that were depedant on the circles, which represent the concepts that control the rate of each flow. The directions of flows are represented by the arrows on the dotted lines. This model simplifies reality, and each relationship alludes to an individual perspective which may be contraversial, nevertheless, it is "far more complete […] than the mental models that [were] being used as a basis for world and governmental planning." (Jay W. Forrester, 1995, p. 15) In his model, *flows* (or relations) behave mechanically, and

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2 Giga-Maps are "rich multi-layered design artifacts that integrate systems thinking with designing as a way of developing and internalizing an understanding of a complex field" (Sevaldson, 2011, p. 18)

that allowed Forrester to predict to some extent what could happen to the world over the next 50 years.

In complex socio-technical systems like healthcare, social relationships may determine a person´s wellbeing. Health is not seen as the absence of disease but the adaptability to thrive in life. In this Giga-Map, the MA design student Natalia Tundheim explores the relationships between a patient with cognitive difficulties and a its social ecosystem (Tundheim, 2013). As you can see in Figure 5, the relations are emphasized over the nodes, where the student pin-pointed out the most significant relations like feelings, knowledge, resources, money and then added a scale to represent the intensity of the relationship between the actors.

Figure 5 An example of what Sevaldson calls *Giga-Maps*, in which you design your interpretation of the system (Sevaldson, 2011). This Giga-Map (Tundheim, 2013) emphasizes the relations in the system by color-coding them and using a scale to represent their intensity.

Feelings and knowledge (as opposed to resources), are complex social relations. They are hard to describe because there is no consensus, since each individual social interaction depends on intrinsic variables and extrinsic forces, which makes every relation unique in place and time. Sevaldson has started a comprehensive list on types of systemic relations, where he establishes a color code for each relationship category. Structural and hierarchical relations are green, representational relations blue and social relations yellow, just to mention a few (Sevaldson, 2013). Inspired on Sevaldson´s systemic relations list, we decided to explore other means to represent complex social interrelations that enable/inhibit social interactions.

Using 3D physical materials to shape social and public relationships
Our goal was to create a tool to experiment and shape with social relationships as a design material and increase awareness of our relational literacy. When researching and designing in complex social systems, like governmental institutions, health care environments, or in the provision of social

services, these spaces are immersed with formal or informal hierarchies, power structures, taboos, cultural norms, discrimination, social standards, political agendas, conflicts of interest or simply, people just not liking each other[3] (Authors #1, 2014). These matters are part of everyday life, but they not easy topics to address.

We introduced the tool in a design conference. Participants came from government, public mental health institutions, academia and research, design practitioners as well as PhD candidates and master students in design.

The fourteen materials (Figure 6) were presented to the participants while sitting in plenum. These included elastics, rubber, natural hemp, nylon, yarn, stainless steel, and gold/copper/silver coloured wires. We started tossing these materials randomly at participants and they had to share with the group what properties their intuition associated each material with.

Figure 6 An overview of all the different materials that could be used to represent abstract social relations.

VISUAL EXPLORATIONS
Following the material exploration, we designed an exercise to form groups and get to know each other. This was oriented around drawing relations (on paper) that existed within the teams (most had limited or no previous personal relations). They had to discover and visually represent all the types of relationships among them. They where provided with a standard circular actor map and markers. This material and the experiences where also discussed in a group session, adressing observations from both the process and results.

USING PHYSICAL MATERIALS TO SHAPE SOCIAL RELATIONSHIPS IN PUBLIC SERVICES AND SYSTEMS
Then we transitioned over to workstations where the "materializing relations" kits where mounted. The kits were designed with the intentions that the relations to were highlighted over the nodes, since everything except the relations was made of transparent acrylic (Figure 7).   The materials where selected for their uniqueness and clear emotional properties.

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[3] These examples of invisible forces that enable/inhibit social interactions were formulated in a workshop (Authors #1, 2014).
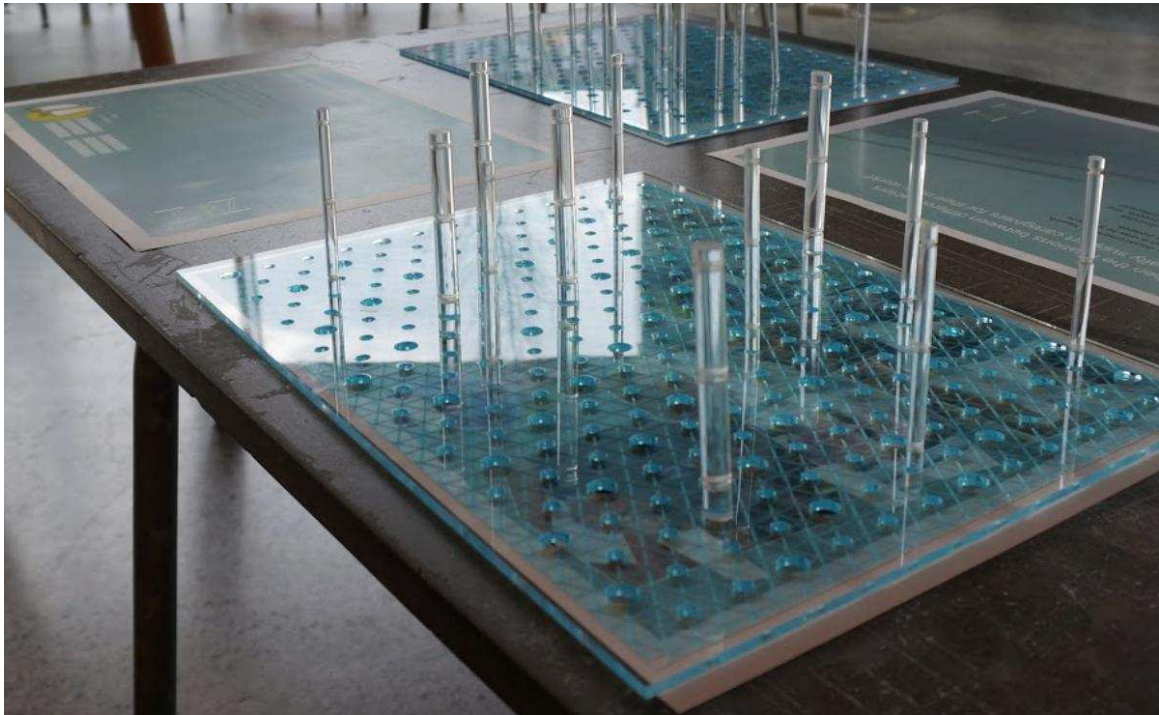
Figure 7 *Systemic relations tool* showing only the nodes and surface, which are both made out of transparent acrylic in order to emphasize the relations that will be added later.

The briefs where printed out and mounted underneath the surface. The brief was presented on two different levels : one being a the service level, with rich photorealistic imageries of individual actors. The second being on the systemic level, with abstract representations of institutional actors. Only one rule was added to the kit to describe if relationships had a directional property, or were balanced (Figure 8).
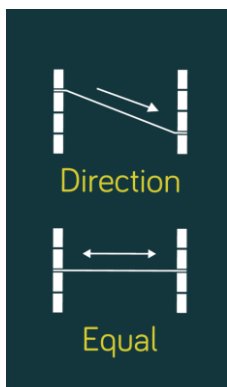
Figure 8 The only rule for the relationship structure. From top to bottom indicates direction, and horizontal placements mean balanced relations.

The arrangement of the space played an important role in enabling collaboration (Figure 9). Each group had its own table where they addressed the particular challenges. In the middle, there was a round table with all the materials. We filmed the whole sessions by using computers that were placed at the outer end of each table. The filming mainly captured the hands of the participants and their conversations while working on the kits.
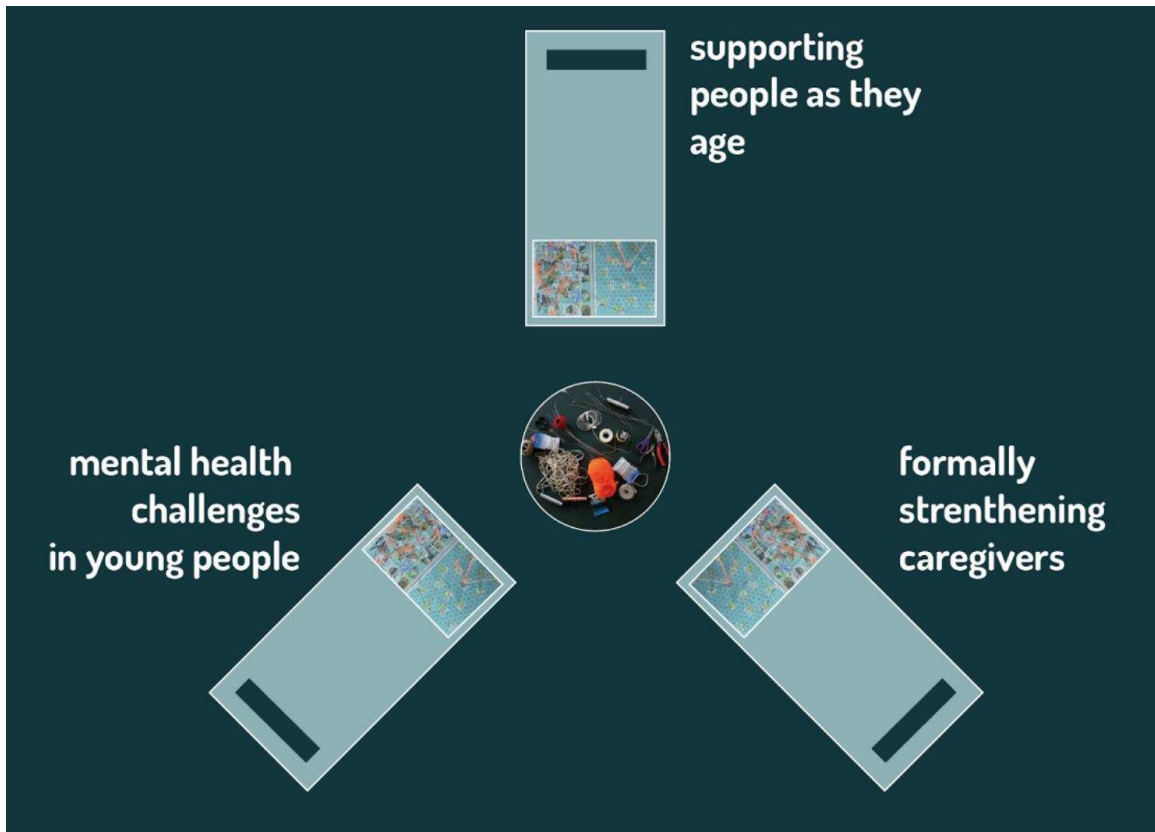
Figure 9 This is the configuration of the tables, with kits on them. It the middle the material library is located.

The participants started by creating a shared relational vocabulary (Figure 10). Then the symbolic or abstract associating given to each material were constructed by the team. In other words, the team had to agree on what type of relation each material represented before starting to work with them. Each vocabulary was particular to the context they were working within. This was continiously iterated during the course of the activity.
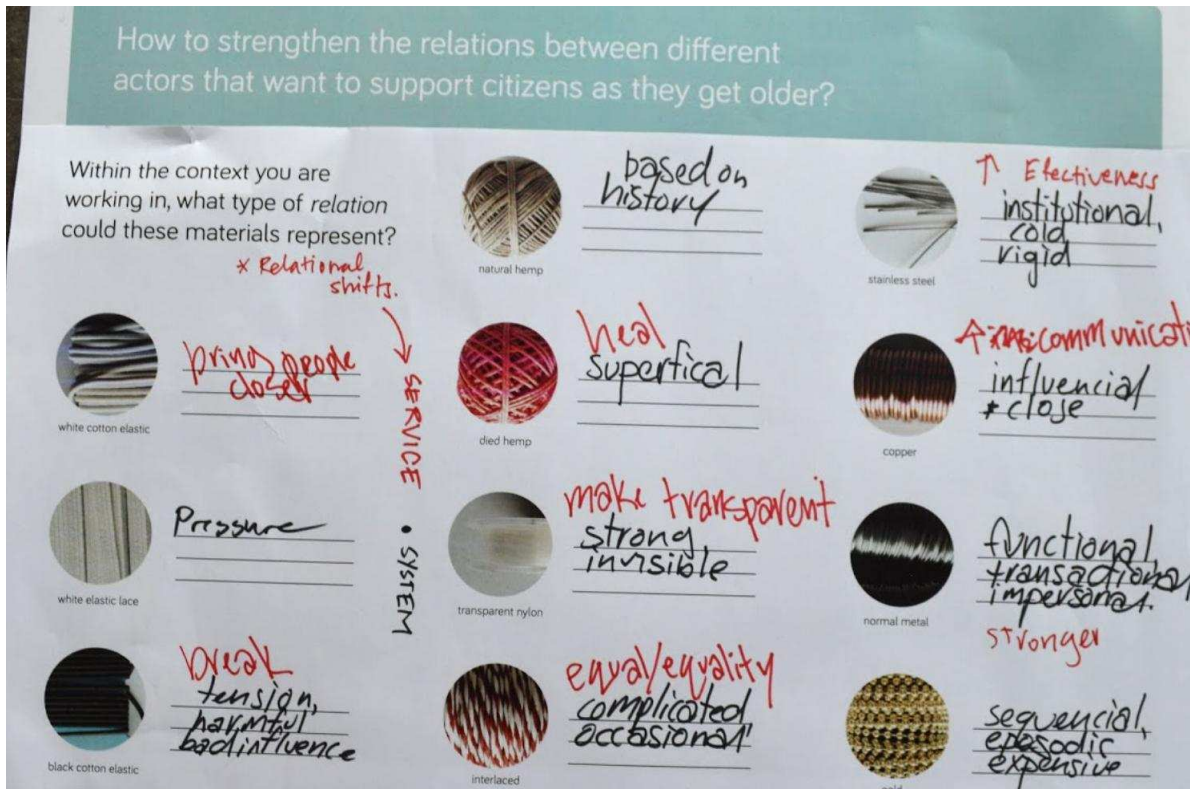
Figure 10 The relational vocabulary each team created before they started using relations as a design material.

The teams designed whole ecosystem of relational properties among service providers, service users, and other relevant stakeholders (Figure 10). The most imporante insights captured were frases, "*we need to bring people closer together, like an elastic*." This just proved how powerful the use of material metaphors became in the context of strenghthening human relationships. Also, participants said that "*its interesting that when we don't have tools like this, our instincts are to create solutions that are not about relationships, but about things. And here, we don't even need a product. It's all about transforming these relationships*." (Authors #1)

Figure 11 *Systemic relations tool* showing only the nodes and surface, which are both made out of transparent acrylic in order to emphasize the relations that will be added later.

BENEFITS OF VISUAL VS. MATERIAL LANGUAGE

The benefits of visual ways of representing complexity creates a shared understanding among participants. You can very quickly establish and observe the whole. Easy to exercise in almost any setting, in almost any format, at a very low cost. The transition from initial sketch into summarized visualisations are fairly easy and logical. A picture or a scan may be documentation enough. Visual narratives are a well known format for transfering complex stories from person to person. Once the visualisation is understood it can (fairly) easily be retold by participants after the work session.

On the other hand, the material language is playful and enables collaboration (Figure 12). It has a low technical threshold, anyone can engage with materials that we interact in our day to day. It allows simultaneous interactions, not sequential like in the visual language (Figure 13). You can create consensus on really abstract elements, like social relations. Its emotional and intuitive, sometimes you don't consciously know why a material property reminds you of a material, you just know it, and its in the process of reflecting back and communicating, why it is that way. We have a rich vocabulary for describing the objects we surround us with in our object oriented lifestyle. Our apprach opened up for the participants to tap into this in the context of describing relations. The kit provided a safe place to experiment with the terminology, that in turn lead to an incresing presision in the discussion through rapid failing and iterations.
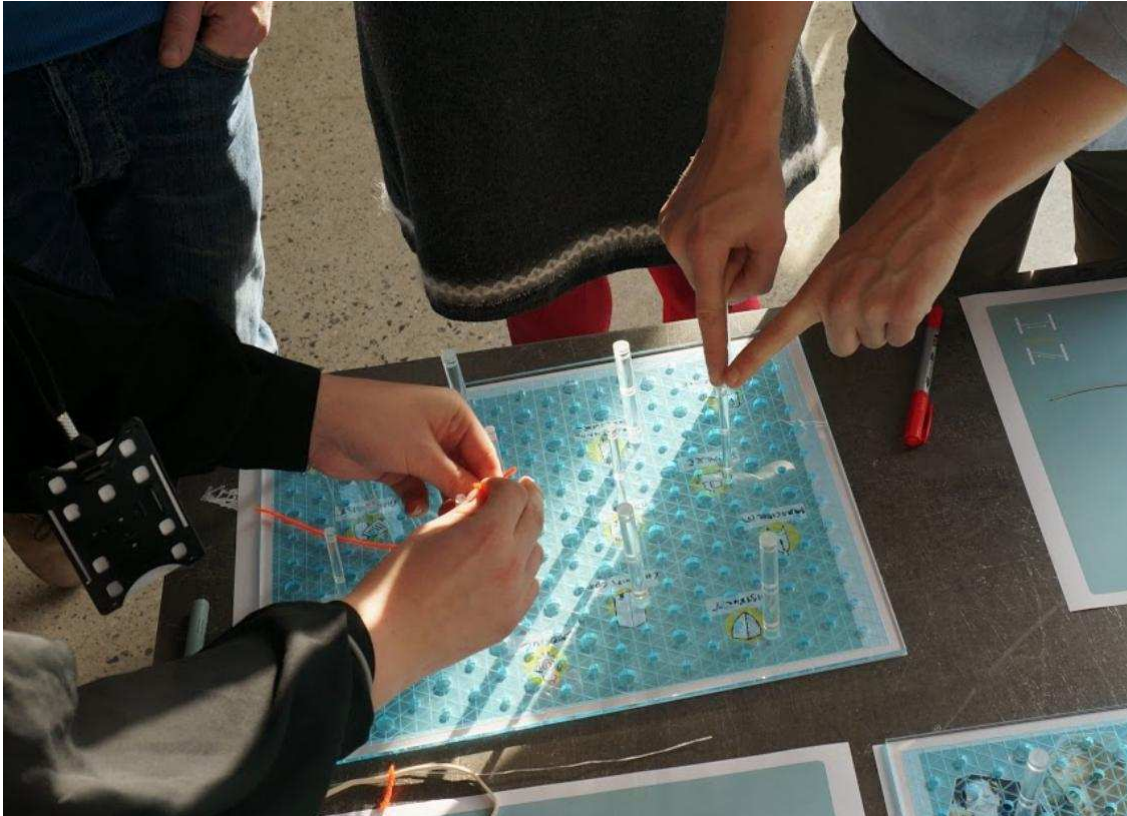
Figure 12 Evidencing that the tool allows for multiple people
to engage on relationship building at the same time.

The biggest challenge of visual mapping are that nodes are emphasised over relations, where relations are represented by lines, arrows, dotted-lines. Paper becomes static and permanent, whatever you write can't be moved, therefor its hard to joggle different possibilities. This often allows (relational) stereotypes to be established early in the conversation and to stay in play long after a stronger shared understanding of the relational complexity has been established. The emerging visual narrative has a downside since they often fails to capture the dynamics (argmuments) of a dialogue, but mainly represents the "winning" storyline. Although it can be breached, there is a skill barrier that often provides the upperhand to the most visually gifted in the group. Even when that person may not have the most knowledge. A visual structures becoming to complex often leaves only the visually comfortable to be able to navigate it. Even if the initial structure is elaborate and abstacht, the visual apprach tends to slowly gravitate to the basic organisational map (box and arrow + hierarchical layers) during synthesis.

Figure 13 *Relationship exercise using visual thinking. It shows how one person is talking while writing; the other has the pen on its hand ready to go next, while the third person is holding back, grabbing the cap of the pen. It shows the sequential nature of this collaborative encounter.*

The biggest barriers with material languages is that they are hard to synthesise, the complexity of the tool doesn't get easily translated back into a verbal o visual format (Figure 14). When having to communicate past the object itself, we default back to our typical mapping visual skills (which lose the material richness of the real-life prototype).
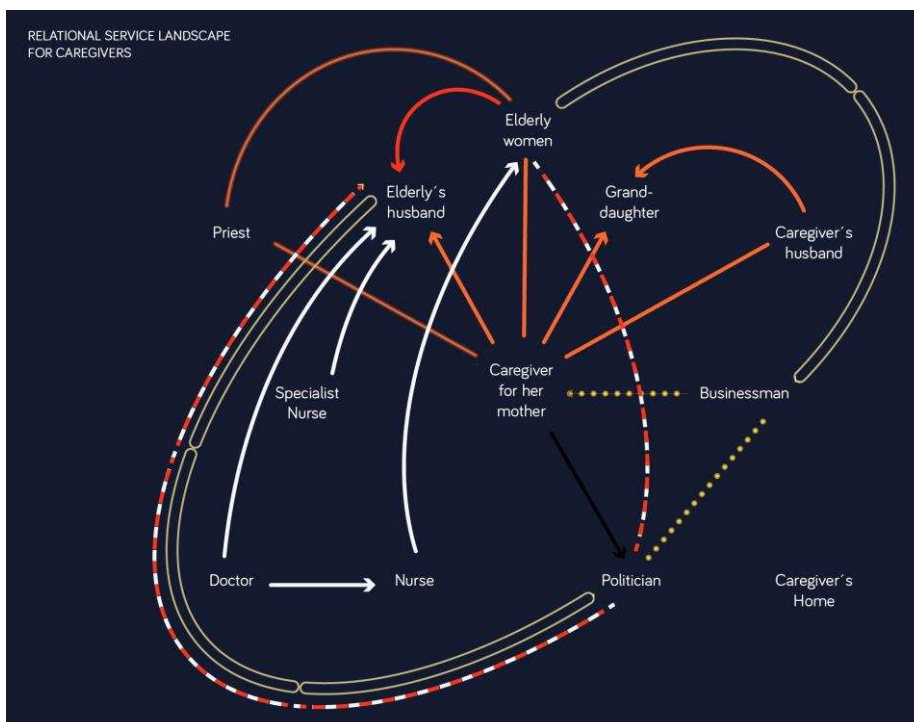
Figure 14 The synthetic process of from one of the material sessions.

This tool does not account for emergent, adaptive or sel-organizing properties, that characterize complex systems.

It´s not easily accessible, you can´t just spontaneously use materials to represent relations (we don't carry out a material library in our pockets or backpacks as we do with pen and paper). The materials demand a different type of documentation and synthesis. The distance from our models and the project work that (theoretically) would follow is a rather substantial leap. The kits does not easily scale to include bigger workgroups and did pose some challenges when the participants where presenting with just the models. Its hard to replicate, each exercise is unique, personal and hardly generizable because it relates to the world views of the individuals who agree upon it. You can´t scale the result, but you can scale the process.

Facilitation and Flow

Facilitating a process builds on the same principles as creating great service experiences, that the end-to-end journey is what delivers the experience. Evaluating the process in this holistic frame there were a collection of factors that we would in hindsight rank as central to the effectiveness of the workshop. These are factors that are difficult to control, but possible to facilitate for. The group included a wide variety of participants ranging from fresh students, practicing designers to senior academics. The common denominator was their shared interest in systemic understanding of services and acquiring new skills. The transitions in the format where set up to provide a steady movement towards an experience of teams, but with no clear competition - but rather encouraging collaboration and sharing of insights. Then there were the moments that facilitation cannot guarantee. People that come early became ambassadors of the work. They assisted in setting up the kit and were given clues to the workshop goals. In addition to open invitation to give feedback and on some level influence our set-up. These ambassadors would pull the late arrivers in and provided support for participants that felt lost.

In this workshop there was no end state. There was no way to measure if we did well. The outcome was very experimental and emergent. We had no idea how that outcome would end up. The outcome was a new skill. It wasn't about solving a case, was about exploring a new skill, which is a new vocabulary of relations.

Conclusion

This paper summarizes the process of designing, executing and reflecting about a workshop that intended to use physical material properties to understand, verbalize and use relations and relationships as means to shape and improve public services. The initial assumption was that we lacked a rich vocabulary to describe the social relations that are fuzzy and messy and hypothesized that by using rich material properties, we could trigger a richer vocabulary. The workshop sequenced four experiments. The first experiment started with an open dialogue for the participants to meet and share experiences of odd relationships that have shaped many of their interactions when working in the public sector. The conversation was rich and intense. Then we explored the properties of different materials – like yarn, stainless steel, and rubber elastics - and created a shared vocabulary of what these materials represent in the context of social relationships. The second experiment consisted of using traditional pen and paper to map out the relations that existed in the room and build teams. The third experiment was the main activity, where each of the three teams explored a complex social public service issue through the relationships between actors. We re-introduced the material library for this exercise where the participants could redefine the meaning of each material for the particular service context they were working within. The final experiment was

the creation of a video that captured a relational scenario that synthesized the role of relationships within that particular public service context.

Things that are invisible are hard to represent because there is no consensus. Taxonomy around those aspects is lacking and people tend to avoid them because they don't agree. We typically draw maps that can be drawn. We typically only describe relations that we can formulate through words. Our initial experiments have confirmed our assumption that there is real value to be found in exploring new approaches vocabulary to be able to describe systems more dynamically.

The challenges of experimenting with new formats are the transition back into a professional context. The shared understanding provided in a facilitated workshop will meet the limitations of everyday work at some points. Taking all the insights created to use does not happen overnight. Where traditions and norms dictate our conversations for good reasons. Although we might all agree that our vocabulary on relationships could benefit from evolving. The current practice is not due to lack of ambition. It is the result of a long evolution and many good intentions. It might be effective and changing it will have trade-offs. This said, that doesn't mean we shouldn't try. Our brain is a muscle and challenging it in new ways is rarely a bad idea.

The participants confirmed that they lack a rich vocabulary to describe social relations. But a recurring factor that was mentioned was social norms and culture. This means that our approach could provide a nudge in a new direction, but not necessarily the push needed to guarantee change. The participants also confirmed that materializing the relations can trigger a richer vocabulary and they indeed all had a more emotionally tuned vocabulary to describe materials. Utilizing this innate capability to describe relations was possible and fruitful. They all completed their team assignment using only means to describe relations. Some also reported a feeling of relief that complex service challenges could indeed be addressed only through altering or changing relations. Challenging their preexisting gut feeling that problem solving was about creating new services or products.

Although it is too soon to conclude we have strong signals that a facilitated transition from spoken words, through visualization and then finally material exploration increase the effectiveness of the material kits. The experience does differentiate from our daily practice and a transition less approach could easily confuse. In the period after the workshop we have presented the kits directly to colleagues and clients without these process steps. This usually leads to a conversation around the challenges of applying them to everyday work. Observations and conclusions that few workshop participants every mentioned.

We did not set up any evaluation formats to measure if we could through providing participants with the kits we would increase their vocabulary. But the response was overwhelmingly positive and some participants have already built their own kits to explore them further. Some also wondered if they could borrow the kits, unfortunately these were lost in the mail. So we cannot report on how that went.

Our feedback from participants was overwhelmingly positive and the deliverables on the brief proved a selection of great insights that could qualify for further exploration. Through introducing tangible materials (something we rarely meet in our daily digital life) created a safe ground where new fruitfull dialogues could be held. Fractions of the positive response from the participants could be credited to the novelty factor and the motivation that is generated simply by being allowed to explore on a new format.

This is not a proposal to discredit the visual approach to work on relations, on the contrary, material and visual properties can engage on a creative dialogue enriching our sensorial and constructivist ways of learning. The openness of the format and lack of rules lead to the teams utelizing the kits in

several different ways. Some groups mounted them on top of eachother to better see the service delivery compared to the system/service perspective. One group merged the two perspectives together in one kit. For now, we can continue to explore the potential of material thinking as "a speculative platform for designers to reorient their way of thinking through adaptive and responsive engagement; to embrace design as an unending, dialogic process." (Freitas, 2008, p. 10)

In conclusion, the experiment was a positive experience that inspires further work. For further work the topic of digitizing it came up and has triggered discussion. We live in a world where digital integration is increasing, but can our vocabulary from our physical surroundings be brought online.

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