The Mediated Action Sheets: A Framework for the Fuzzy Front-End of Interaction and Service Design

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Abstract

The front-end of the design process is where the design work is framed for the first time. It is the early part of the design work where the design team decides what to design rather than how to design something. It is often referred to as fuzzy, since it is very tentative in nature and the design team has yet to develop a sense of direction. In product design, the team, however, already knows that they are to develop some kind of physical product. In graphic design, the team knows that some sort of visual artefact is to be produced. In interaction and service design, the design team has a wider scope, aiming to shape the activities people perform. The problem this paper addresses is what to focus on in the fuzzy front-end of interaction and service design. We propose using the Mediated Action Sheets, which provide a framework based on socio-cultural theories of mediated action to structure the user research and idea generation phases of the design process. The Mediated Action Sheets consist of The Persona Sheet that is a structure for user research and developing personas, and The Concept Design Sheet for thinking concept ideas through in more detail. The paper provides examples of how they can be incorporated into the craftsmanship of interaction and service design.

KEYWORDS: mediated action, activity theory, interaction design, service design, concept design, fuzzy front-end

Introduction

The front-end of innovation and design is where the work is framed for the first time. It is the early part of design where the design team explores what to make, what not to make, whom to make it for, why to make it, and quality criteria by which to judge the design. This phase has been

argued to offer the greatest opportunity for transformational innovation, and a majority of life-cycle costs are determined at this stage, while only a fragment of the development costs are used (Clatworthy, 2011).

The beginning of the process is often referred to as fuzzy since it is characterised by ambiguity and a chaotic and tentative nature and the design team has yet to develop a sense of direction. Questions are at this stage open-ended, like for instance 'how can we improve the quality of life for people living with a chronic illness?' or 'what is the next big thing in family leisure time?' (Sanders and Stappers, 2008). These open-ended questions mean that it is often unknown what the final result of the design process will be (a product, a service, an IT-system, a building etc.). The fuzzy front-end is usually followed by a rather traditional design process with concept development, prototyping and user testing.

One approach to the fuzzy front-end is to conduct contextual research to fit the effort into the everyday life of users. Contextual research methods for this phase include for example ethnography and user workshops. Two distinct types of research approaches have emerged for the early phase: Research that informs the design process, and research that inspires the design process (Sanders, 2005). Methods like scenarios and personas (Pruitt and Adlin, 2005) are sometimes based on informational research and sometimes they are not, at which they instead function as inspiration for team members (Sanders, 2005). An example of a method specifically aimed at inspiring the design process is "probes" that explicitly encourage interpretation, inspiration, and creativity in data gathering and ideation (Mattelmäki, 2005). Another example of a method in service design that aims at assisting with analysis and idea generation, but not informational research is the AT-ONE touchpoint cards (Clatworthy, 2011).

Stappers, Sleeswijk Visser and van der Lugt (2007) have used the term context mapping to describe the activity of informing the design team about the users, their use situation, and their values, needs, wishes, and experiences. They argue that the scope of what should be included will vary from project to project, and that established sources like theories of perception, human factors, and demographics are too abstract and general to provide information and inspiration in the fuzzy front-end of innovation and design. This means that the challenge for the design team is to find a focus, that is, good questions and interesting dimensions, as much as finding answers.

The Problem

In interaction and service design, the design team has a wide scope, aiming to shape the activities people perform, but what does it mean to shape the activities of people? The problem this paper addresses is what the focus in informational research of the fuzzy front-end of interaction and service design could be. While focusing on the information side of the process, we need to balance it with the inspiration side (Sanders, 2005). How do we give structure to the information gathering side of this phase without making it too analysis laden and suppressing the inspirational side of it?

The answer to this question can function as scaffolding to finding good questions and interesting dimensions. In this mostly theoretical paper with we propose using the Mediated Action Sheets (with some empirical support). They provide a framework based on sociocultural theories of mediated action to structure the user research and idea generation phases of the design process. The Mediated Action Sheets consist of The Persona Sheet used for user research and developing personas and The Concept Design Sheet used for thinking concept ideas through in more detail.

Theoretical Foundations

It has been suggested that interaction design can be seen as the shaping of mediated action (e.g. Arvola, 2006; Kaptelinin and Nardi, 2006). Service design can also be seen as the shaping of human activity, mediated by various touch-points and products, and ordered in activity systems (Sangiorgi and Clark, 2004). Lee and Kim (2010) have also suggested a framework for systematic design of product-service systems (PSS) focusing on contextually constituted stakeholder activities.

What is then meant by the notion of mediated action or activity? Wertsch (1998 b) describes the study of mediated action as focusing on how humans use *cultural tools* or *mediational means* (terms used interchangeably). Cultural tools can be simple mnemonic devices, such as marks on a stone, or complex devices as natural language and computers. The focus for interaction and service design as the shaping of mediated action is on the irreducible tension between mediational means and agents' active uses of them.

Wertsch (1998 a) employ Burke's (1945) notion of the pentad of human actions and motives. He argues in the voice of Burke, that it is studied by identifying the act that is performed, inquiring what the scene of the act is (the context or the situation in which it occurs and its history), and finding out what person or role that is performing the action: who the agent is. After that, one is asking how and by what means the action is performed: what its agency is. Finally, one is putting the question of why the action is performed: what its purpose is. It is the standard questions you learn in school for writing a good story: what is done (Act), who did it (Agent), where or when it was done (Scene), how he or she did it and by what means (Agency), and finally why (Purpose). This set of questions is sometimes referred to as the 5WH or just the Five Ws, and has been used in rethorics for centuries.

In Burke's original pentad, the label Agency refers both to "by what means" or steps by which an act is performed (Latin 'quibus auxiliis'), and "the attitude" with which, or the manner in which, an act is performed (Latin 'quo modo') (Burke, 1978). It is important to capture both these aspects in design in order to produce a mediational means with desirable qualities in use.

Making an analysis like this sounds all together very simple, but it is a deceptive simplicity. Stating and naming an agent or a scene does not make them real. We must question how we identify the

act, point out an agent and set a scene. The purposes and meanings of an action is often complex or even contradictory and the interpretation of it is not simple.

Another important aspect of the pentad is the ratios between its constituents. For example, if we know of a person called Dan (agent) who is taking a drink (act), slowly in a glass (agency), in the evening at a bar (scene), together with friends (co-agents), we reach one meaning or purpose of the act. If we however put Dan in another scene where he takes a drink in the morning before going to work, the act takes on a completely different meaning. This means that the pentad should be viewed as a whole, even though different people can put different emphasis on the various constituents.

Reflected in Burke's pentad we can see the hierarchical organisation of mediated activity, where the levels are *activities* oriented towards motives (purpose), *actions* oriented at goals (acts), and *operations* oriented towards conditions (agency). Given the complexity of purposes and intricate details of agency, Kaptelinin and Nardi (2006) as well as Burke (1945), suggest starting with identifying the acts (what, action layer) and then expand the analysis both upwards to the purpose (why, activity level), and downwards to the agency (how, operation level).

The study of mediated action often finds its intellectual roots in Russian psychology and the research of Vygotsky (1978). For Vygotsky, a key issue is that of *development*. When he analysed the interchanges between tutors and tutees he came up with the notion of the zone of proximal development which is the distance between what a tutee can do independently and what the tutee can do together with a tutor. Again, we see the importance of the sociocultural context to mediated action. That mediated action is *socioculturally situated* implies that cultural tools are shaped not by individual designers alone. The institutional, cultural and historic forces that constitute a particular setting, including competing services, also shape them. It is a setting that has specific forms of authority and power, and the individual designer is part of that complex setting and needs to navigate it to create a suitable design. It is no wonder that mediational means are used in ways not intended to. Mediated action take place in a sociocultural setting that is under constant individual, social and historical development. The sociocultural situatedness of mediated activity also implies that it is embedded in participation with others in a community with its rules and division of labour (Engeström, 1987).

Wertsch (1998 a, 1998 b) emphasise that all mediational means always involve *constraints* as well as *affordances*. Norman (1988, p. 9) built his notion of affordances on that of James Gibson when he defined affordances as "perceived and actual properties of the thing, primarily those fundamental properties that determine just how the thing could possibly be used". For mediated action this means that "specific mediational means facilitate certain patterns of action" (Wertsch, 1998 b, p. 522). Cultural tools involve also constraints on performance that often are recognised when comparing design alternatives or making a competitive analysis.

The idea of *internalisation* and *externalisation* in sociocultural studies also has its origins in Vygotsky's research. In Activity Theory it is posed that there are mutual transformations between internal mental processes and external behaviour (Kaptelinin and Nardi, 2006). Internalization is

the process of transforming external activities into internal, as when you in the beginning need to look at the keyboard when typing, and then learns to type without looking at the keyboard. The process redistributes internal and external components of activity. Externalisation transforms internal activities into external ones, as when you get a strange result when making a calculation in the head, and feel that you need to get it down on paper, or when you need to collaborate with others and work on joint material.

Wertsch (1998 a, 1998 b) is however critical of the term internalization since it carries a spatial metaphor that leads to unwanted conceptual baggage. A basic methodological tenet of mediated action is, according to Wertsch, that the boundaries of the unit of analysis (and the unit of design) are flexible and fluid, which means that there is no need to differentiate between internal and external spaces in a rigid way. He therefore distinguishes between *knowing how* and *appropriation* instead of internalization and externalisation.

Wertsch writes (1998 b, p. 524): "Knowing how to use a cultural tool means be able to use it in a socioculturally appropriate manner." This can be contrasted to the 'knowing that' of propositional knowledge. Appropriation is a process that may operate independently of knowing how to use a mediational means. Appropriation is the process of making a cultural tool one's own. It concerns the willingness to use it and a sense of ownership of it. You may be vary capable of using a self-service terminal, but still resist in doing so since it does not fit your identity or how you feel about it.

Mediated action is always directed toward objects of some sort. Kaptelinin and Nardi (2006, p. 66) write: "When people design, learn, or sell, the design, learn, or sell *something.* Their dreams, emotions, and feelings are also directed toward something in the world." Objects can be either physical things or ideal objects, like the wish to become a pilot or a teacher. In interaction and service design, we not only design cultural tools that mediate people's experience and engagement with the world, but also the objects which action is directed at. This includes the prospective outcomes that motivate and direct activities, and the objects in which an activity or a service is crystallised in a final form when the activity or service is completed.

The Activity Checklist builds on Activity Theory and is a tool developed to guide a researcher or practitioner to the critical contextual factors when trying to understand the context within which a mediational means will be or is used (Kaptelinin and Nardi, 2006). It covers all the major aspects outlined in Activity Theory, and this is both its strength and its weakness. For someone who has the know how of sociocultural studies and appropriated the theoretical foundation, it becomes too formal and restricting. For someone who is just entering the field it is a too daunting task to even get started without a capable peer to collaborate with. The checklist is however not intended to be used to investigate all areas it contains, that would be impossible. The designer or researcher should instead start with areas in the checklist that are likely to be troublesome, and then go deeper into specific areas. One problem here is that it still is difficult to know where to start if you are not quite experienced. Another problem is that the results the

checklist yields work very well for the informational aspect of contextual research, but not at all for the inspirational aspect.

What is needed is a tool that is less detailed, less complicated to use, but still provide enough structure for the informational aspect of contextual research and produce more inspirational result in the fuzzy front-end of interaction and service design. This is why we have developed the Mediated Action Sheets.

The Mediated Action Sheets

The Mediated Action Sheets consist of two parts that are described in this section: The Persona Sheet and The Concept Design Sheet. The sheets can be downloaded from Arvola (2012, 08 19).

The Persona Sheet

The first part of the Mediated Action Sheets is the Persona Sheet (Figure 1). It is a support for contextual research and it can function as a basis for constructing interview questions and observation protocols, as well as a basis for constructing personas. The exact contents of an interview and observation protocol may of course vary between projects.

It has two main sections; one concerns the (potential) user and his or her relation to the target domain, and the other concerns the activities users engage in, in relation to the target domain.

The user section has a focus on goals and motivations. But also developmental issues of users' know-how are included, as well as attitudes that may affect appropriation. "An Ordinary Day" is there to make the personas more alive, which can support inspirational aspects and empathy.

The activity page is based on the categories in Burke's pentad for human action: Act, Scene, Agent, Agency, Purpose. A few questions that aim at finding opportunities for design have also been included (things that work well, things that does not work well, design ideas to take note, and questions that remain). Burke's original pentad is used, and this means that the label agency refers both to "by what means" or steps by which the act is performed (quibus auxiliis), and "the attitude" with which, or the manner in which, an act is performed (quo modo).

The Concept Design Sheet

The Concept Design Sheet (Figure 2) was originally a response to our students who always asked what we meant by a design concept. Our notion of what a design concept in interaction and service design is grounded in the sociocultural theories of mediated action. This will lead to a different perspective on what a design concept is compared to graphical design, product design, architecture, or fashion design.
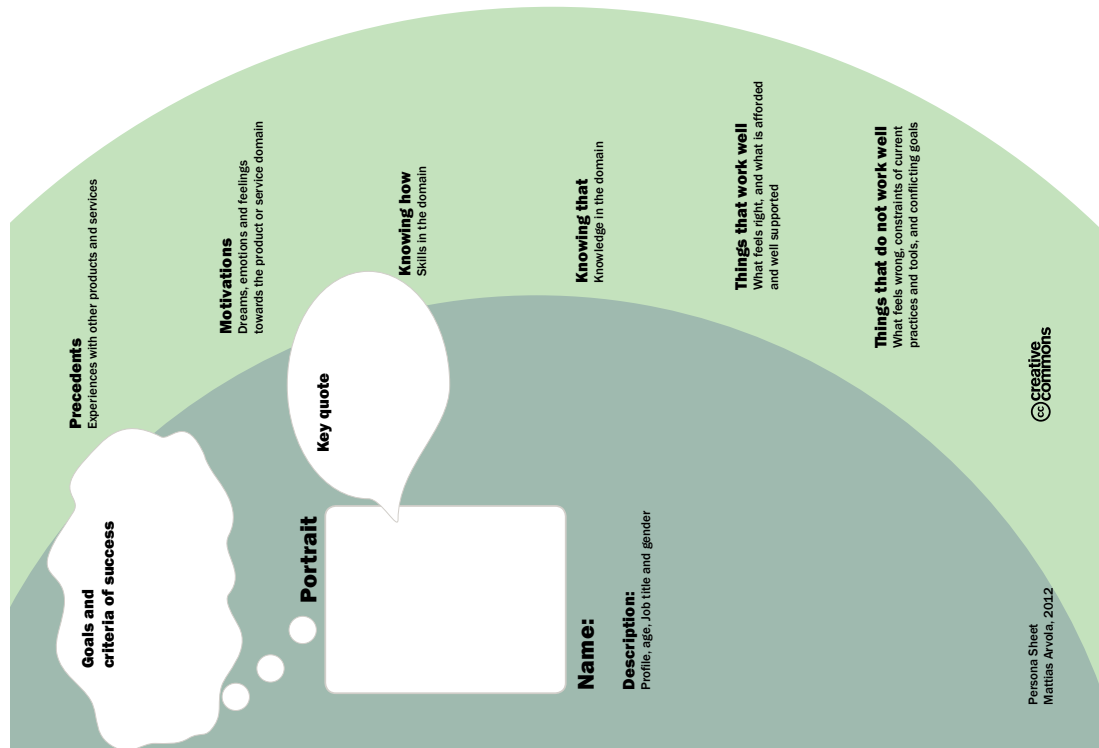
An ordinary day

Activities

Agent: Who did it?
Together with whom, and towards whom?

Scene: When & where did it happen?
Environment, spatial layout and temporal organization, community, rules and norms

Purpose : Why was it done?
Goals, motivations and conditions

Act: What happened?
Actions, and objects actions are directed at. Frequency and amount

Agency: How was it done?
By what means, by what steps, and by what manner?

Questions that remain

Ideas to take note

Project:
Date:
Researcher:

Precedents
Experiences with other products and services

Motivations
Dreams, emotions and feelings towards the product or service domain

Knowing how
Skills in the domain

Knowing that
Knowledge in the domain

Things that work well
What feels right, and what is afforded and well supported

Things that do not work well
What feels wrong, constraints of current practices and tools, and conflicting goals

Goals and criteria of success

Key quote

Portrait

Name:

Description:
Profile, age, job title and gender

Persona Sheet
Mattias Arvola, 2012

creative
commons

Figure 1. The persona sheet.

Name of the product or service:

Sketch how the product or service appear to users

Describe the product or service

Agent: Who is the product or service for? Who is affected by it? Short-term/long-term

Agency: By what means, in what steps and in what manner is the product or service used? How is it experienced?

Scene: When and where is it used?

Act: What do you do with it?

Act-Scene Ratio: How are people, the society, or the environment affected by it?

Purpose: Why is it used?

Project:
Date:
Designer:

Concept Design Sheet, page 1
Mattias Arvola, 2012

creative commons

Concept storyboard:

Show how the product or service is used in a storyboard.

Start the storyboard zoomed out to the scene and include the purpose.

Describes the acts and agency (means, steps, manner of performance) in more detail.

End the storyboard zoomed out again with a focus on scene and purpose.

Project:
Date:
Designer:

Concept Design Sheet, page 2
Mattias Arvola, 2012

creative commons

Figure 2. The concept design sheet.

The Concept Design Sheet is supposed to support a designer to think the design concepts through properly, and it gives direction on what dimensions design concepts can differ from each other. So if there are five design concepts early on in a project, you can describe how they are similar and different based on the various headings in the chart. It also contains a template for a storyboard that a designer can use to figure out what the usage of the design concept would be like, and how people would interact with it. A good idea is to also explore several different alternative storyboards for each design concept. The Concept Design Sheet is, just like the activity page in the Persona Sheet, based on Burke's pentad. There are also specific questions that focus on the ethics in relation to the Agent and the Act-Scene Ratio: Who are affected by the service, both in the short run and the long run, and how are people and the world affected by the design?

Using the Sheets

The Mediated Action Sheets can be used in several activities in the fuzzy front-end of interaction and service design.

Sensitising

Before doing user research it is always a good idea to articulate any preconceived ideas about the potential users and the potential situations of use. The activity part of the persona sheet can then be used to brainstorm potential agents, scenes, acts, agency, and purposes. Doing this will also facilitate the work with reaching consensus on whom to design for and it may be a good idea to do it together with customers.

Data Collection

The persona sheet can furthermore be used as a basis for developing an interview and observation guide. The exact contents of such a guide may vary between different projects, but the sheet can function as a checklist for developing the themes to cover in a contextual inquiry. To for example investigate Motivations and Goals, you may want to ask what is important in a specific situation and what is not important (and why that is important). To investigate Knowing How and Knowing That you may want to ask about what you have to know to do something in the right way.

Data Analysis and Presentation

In data analysis it is generally a good idea to work bottom up with the data to form categories and themes, in order to let the data speak for itself. The first interpretation can then be put into relation to a theoretical framework that facilitates in drawing design-oriented conclusions and

gaining insights. The persona sheet provides such a framework based on theories of mediated action.

Ideation

We have often used a technique we call "functions-driven concept divergence" when generating ideas for what to design in a project and for what purpose. It is related to the function-based design approach widely used in engineering design (e.g. Pahl & Beits, 1988). The idea of this method is to start by brainstorming possible functions of the proposed service. Functions mirror the Act on the concept sheet. The result is a list with all the essential functions and some interesting desirable functions. Concepts are then developed by making experiments of thought on what a service would be like if one of the functions would be the main function that would be allowed to dominate the whole service. The resulting concept is given a name and can then be further detailed using the concept sheet. For example, if we design a media system for use on-board cars, possible functions could be 'watch movies' and 'play games'. If the first were allowed to dominate it would lead to the concept The Movie Theatre, and if the other were the main function we would get a concept called The Arcade.

A similar procedure can be used to diverge around the Agency element of the concept sheet: Designers can brainstorm desirable qualities of user experience, and after that consider what kind of concept it would become if one of the qualities got to dominate.

Detailing of Ideas

When concept ideas have been identified, they need to be thought through in more detail before they can be evaluated. The ideation result in concept names, but what they mean or can mean have not yet been considered. This is the main value of the concept sheet. In order to say if the concept is any good or not it needs some more details.

Interaction and service design is also highly temporal and the concept sheet has therefore also one page for a concept storyboard, where a designer can draw how the service is used. It is then a good idea to start zoomed out to the scene and the purpose, before in a few frames, describing the acts and agency in more detail, and then end the storyboard zoomed out again with a focus on the scene and the purpose. It becomes easier to assess the relative merits of the concept ideas when they have been detailed to some extent.

Initial Experiences with the Framework

An earlier version of The Mediated Action Sheets has been used in several projects but the experiences reported in this paper comes from a project called Webblättläst (approx. 'Easy to Read on the Web' in English) which aimed to develop an online service where web pages are ranked according to how easy they are to read. The experiences come from informal interviews

with the designers involved in the project. These experiences resulted in the revised versions depicted in Figure 1 and 2.

For participating designers it was not always clear what should go under the heading Act and what should go under the heading Agency or Purpose. One designer did not write down things that worked well, things that did not work well, questions that remained, or ideas to take note. She did however, use these parts of the sheet once she understood their purpose.

The same designer thought that it was easiest to write the personas in running text, and then fill in from the different headings in the sheet once she had a picture of the persona. This made the persona description rather long and it did contain some repetitions. She did find the persona sheet helpful when preparing interview questions and also used it as a mnemonic device during interviews and observations. She noted that the activity part of the persona sheet can be filled out together with users if there is time for that.

Another designer thought that it was a benefit that the sheets made it possible for several members of a design team to develop personas and concept sketches and still reach comparable results. She came in later in the process and developed concept ideas for already existing personas. She experienced that the similar structure between the concept sheet and persona sheet made it easier for her to create relevant concepts. On the other hand she also experienced that she should have explore more design concepts than she did.

One critique against the sheets that was raised in the project was that there is a risk of using them as templates treated as the truth, rather than as tools that can support the designers in finding a focus in the fuzzy front-end of the project.

Conclusions

There are two other frameworks that the Mediated Action Sheets can be compared to: The Activity Checklist (Kaptelinin & Nardi, 2006) and the AT-ONE touch-point cards (Clatworthy, 2011).

The Activity Checklist can be too restricting for experienced user researchers, and too detailed for inexperienced user researchers. Sanders (2005) makes a division between methods that inform the design process and methods that inspire it. The Activity Checklist does not provide support for divergent and inspirational design work. The Mediated Action Sheets aims at striking this balance, and the initial experiences from practising designers are promising, but not yet fully validated. In terms of how to use the sheets, there is an interesting possibility to combine them with the Activity Checklist. In user research a design team can start with the Mediated Action Sheets and then go deeper into different aspects using the checklist. This process has, however, not been tried out in practice yet.

The strength of the AT-ONE touch-point cards is that they assist innovation and team cohesiveness. They are tangible, which support design games, and they provide a touch-point

focus in the service design process. They have, however, no explicit theoretical grounding, and are focused on analysis and idea generation. The AT-ONE touch-point cards are made for inspirational research and not informational research. The Mediated Action Sheets have not been tested in any design games, but they do strike a balance between information and inspiration, as well as being firmly grounded in theories of mediated action. The Concept Design Sheet could potentially be developed to be used in design games like the AT-ONE touch-point cards. One idea could be to set up some kind of role-playing game where scenarios are constructed.

There are mainly two risks of using the Mediated Action Sheets. The first is that too much structure to the research phase can limit the researchers ability to be open to the situation of use and the patterns that emerge in it. For inexperienced user researchers this risk must be considered less influential than the risk of not seeing anything at all during the user study.

The other risk is that there are not enough support for affective and experiential aspects in this framework. Burke (1945) himself point to Dewey's notion of experience, which he considers to overlap his notion of the Act. This idea provides an interesting opening for cross-fertilisation between sociocultural theories and pragmatist theories in interaction design. Such cross-fertilisations are already being explored by for example McCarthy and Wright (2004).

The Mediated Action Sheets are like training wheels and they should not be treated as templates, but rather as a structure to get a design team started and find a focus for the fuzzy front-end of interaction and service design. The sheets will eventually become second nature to to the designer and will at that point not be needed anymore. They have then become appropriated and mastered as skilled craftsmanship in interaction and service design.

The sheets are good for making a designer focus on the right things, but they should not be used as presentation material. In order to highlight the experiential aspects of the design, more evocative design representations are needed. The designers' imagination is needed to find ways of presenting the personas and the concepts so that the important things in them are highlighted. Storyboards where personas come to life in stories and comics work, in our experience, well for this purpose.

In future research it will be necessary to make a more in-depth analysis of the actual use of the Mediated Action Sheets. This is largely a theoretical paper of which the outcome needs further validation. Service design projects and interaction design projects could be investigated separately due to their different characteristics.

We have in this paper presented a framework for the fuzzy front-end of interaction and service design based on theories of mediated action. The framework has been put in the form of sheets to use during user research and concept ideation. Our early research suggests that the framework has the merits of focusing and structuring the early fuzzy front-end research on the constituents of Burke's pentad.

Acknowledgements

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