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Mastering Design Case Studies for Grounded Design

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Abstract. Understanding user contexts and practices for the design and development of useful and usable technologies has for long been acknowledged as relevant within the fields of Human-Computer Interaction (HCI) and Computer-Supported Cooperative Work (CSCW). Taking account of the growing interest in human practices for the design and quality assessment of digital technologies, Grounded Design (GD) has been introduced as a paradigm for design research and practice. As a research paradigm, GD focuses on investigating changes in human practices stemming from the use and appropriation of digital technologies. The results of such investigations are used as input for the design and development of new and innovative digital solutions. In this context, Design Case Study (DCS) serves as a framework to orient and document research and practice predicated on GD. The framework, which is organised in three interdependent phases – pre-study, design and appropriation –, provides useful guidance and infrastructure for successful GD initiatives. This masterclass sets out to demonstrate how DCS can be used to accomplish relevant and impacting GD projects. It will introduce the conceptual and theoretical grounds behind the framework, as well as discuss the different methods and methodologies which can be used for it.

Contextualisation

The interest of Human-Computer Interaction (HCI) and Computer-supported Cooperative Work (CSCW) professionals in human practices is not new. Especially within the European tradition of CSCW, practices have been playing a very important role in the way that socio-technical systems are designed and developed since its origins (Richter and Koch 2018). Overall, there is a common understanding that the world is in a state of constant becoming and that human actions are the main element gearing the process and bringing continuous changes upon the environment. These actions are often mediated by artefacts and are guided by purpose and knowledge (Rohde et al. 2016). Eventually, these mediated actions, which encompass both mental and physical forms of activities, turn into routinised patterns, which are in turn used to frame contingent activities normatively. This is what defines practices within Grounded Design (GD), and more generally, within CSCW research (Schmidt 2014; Wulf et al. 2015; Rohde et al. 2016).

Human practices have been often described in the literature as innately social (Wenger 1998; Reckwitz 2009), even when performed individually (Barnes 2005). The arguments towards this interpretation usually defend that practices always refer to something that is either socially acceptable – e.g., taking a shower every day –, socially agreed – e.g., carrying out a surgical procedure in a particular way –, based on some sort of social system, tool, mechanism or resource – e.g., writing something in a particular language – or meant to produce something to be used by other social actors – e.g., writing a book to a particular audience. So, even if practices are enacted in different places, in different points in time and by different body and minds, they would be meaningful to or impact upon different individuals in a society and hence should be considered social (Schatzki 1996; Schatzki et al. 2005; Reckwitz 2009).

Despite the strong arguments towards seeing practices as fundamentally social, some authors would still argue that practices should (or can) not be reduced to a socially-inherent condition (de Carvalho 2013) – unless, of course, the world is seen through an actor-network theory perspective, where everything, as for example artefacts, processes and ideas, is assigned the condition of actants and, therefore, of potential social actors (Latour 1990, 2007), which will interact while the practice unfolds. Lave (1997), for instance, argues that “everyday” cannot be described as a social role, occasion or setting for practice. Everyday practices would thus go beyond patterns of actions that involve different actors, are collectively accomplished or are associated with particular social settings. Yet, Lave, as all the above mentioned authors, describes practices in terms of the cyclical and routinised aspects of the involved patterns that happen ordinarily from time to time, as people go on to solve particular problems in particular contexts.

Therefore, even if practices are not to be seen as inherently social, it can be argued that they are essentially situated and context-specific. In addition to that, it is sensible to argue that they are the most elementary unit of analysis of a social phenomenon (Wulf et al. 2011, 2015; Rohde et al. 2016). After all, practices are what underlies the relationships and interactions between social actors (Wenger 1998; Barnes 2005; Reckwitz 2009), as those involved in cooperative processes, which are central to CSCW research (Wulf et al. 2018).

Practice-based computing pays particular attention to the dialogue between knowledge, artefacts and actions, which goes on as practice unfolds. Within this paradigm, design is conceived as (the results of) a creative activity, in which knowledge, artefacts and actions come together to produce something new (Stevens et al. 2018). Design emerges as a multi-layered intervention into practices, which results in useful and usable tools for achieving particular goals or accomplishing particular tasks (Rohde et al. 2016).

Studying interventions into practices to inform design has proven to be valuable in searching for solutions to wicked problems – or that sort of unique problems which cannot be resolved straightforwardly by scientific approaches and whose solutions may vary according to the context (Gaver 2012).While GD offers a theoretical perspective to study such interventions, Design Case Study (DCS) offers a vessel to this perspective (Wulf et al. 2018).

DCS is a framework built upon three well-defined phases, which can coexist in certain points of the design process. The framework allows researchers and practitioners to reconstruct practices observed in the field, which can be relevant to the design of new and innovative tools or to the understanding of how such tools can be or have been appropriated (de Carvalho et al. 2018; Hoffmann et al. 2019). Trough DCSs, situated findings are documented in such a way that a comparative knowledge base can be constructed to support transferability to new design contexts (Rohde et al. 2016; Betz and Wulf 2018; Stevens et al. 2018). Ogonowski et al. (2018) introduce PraxLabs as an infrastructure for such comparisons and potential transferability of DCS results.

The first phase of the DCS framework, traditionally known as *pre-study,* refers to a contextual study to understand the users, their contexts and the practices that can be supported by new technological artefacts. In general, the pre-study aims at defining the design space – or in a more ludic language, preparing the sandbox – in which all actors involved in the design process – users, designers, developers and other stakeholders – can play. In this phase, well-established research methods are employed following either a qualitative or a mixed methods research design, including ethnography (Randall et al. 2007), action research approaches like living labs (Ogonowski et al. 2013), among others. *In-depth interviews* (Hermanowicz 2002), *observational methods* – both mobile, like *shadowing* (Czarniawska 2007) or more stationary formats involving spending time in a place observing events and interactions (McKechnie 2008) – , and

cultural probes (Gaver et al. 1999) are a few data collection methods commonly used for this phase. The collected data is in turn analysed through techniques like thematic analysis (Braun and Clarke 2012) and qualitative content analysis (Mayring 2014), or through approaches which are characteristic of specific research designs as for example grounded theory (Strauss and Corbin 1998).

It is worth pointing out that, although the pre-study is mainly contextual – and therefore gives preference for qualitative methods –, nothing impedes that some sort of quantitative methods are integrated in a mixed methods approach, especially in cases where a certain level of generalisation is necessary, as common in pragmatic approaches (Rohde et al. 2016). The outcomes of the pre-study is usually a list of functional and non-functional requirements, which are further explored and pursued in the second phase of the framework, namely *design*.

The design phase is predicated upon several design methods and methodologies towards the development of a functional prototype that can be rolled out to natural settings. Here personas (Pruitt and Grudin 2003), scenarios (Carroll 2000), low-fidelity prototypes (e.g., sketches and storyboards) and medium fidelity prototypes (e.g., wireframes) are produced and tested in different iterations, until a stable version of a functional prototype is achieved. The elaboration and refinement of the designed artefacts usually follow a participatory design (PD) approach, involving representative users all along the process, who have the opportunity to actively contribute to shape the designed solutions in an inclusive and democratic way (Björgvinsson et al. 2010; DiSalvo et al. 2013; Wulf et al. 2015). Formative usability inspection and evaluation methods – e.g., Heuristic Evaluation (Molich and Nielsen 1990) or Cooperative Evaluation (Monk et al. 1993) – are used to guarantee that the major usability problems are eliminated before the tool is given to users, so they can integrate and use it as part of their everyday activities. Hence, the outcome of this phase is usually a fully functional prototype, which can be rolled out to the user contexts and effectively used.

The third and last phase of the framework, *appropriation*, focus on investigating how the designed tool will perform in the users' hands in naturalistic settings. The phase starts with the deployment of the technology to the user contexts. The usage of the technology is then closely observed, as are the changes that they will bring upon existing practices or the new practices that they will facilitate or trigger. As for the pre-study, interviews, observations and cultural probes are usually employed to collect the relevant data and particular data analysis methods are used to support the generation of accurate and relevant understandings. Here, the usefulness and usability of the system are further evaluated and it is not uncommon that problems which have not been identified during the evaluation activities of the design phase emerge. These problems can

feed back into the design activities, leading to a new improved version of the prototype. Put different, formative evaluation is still possible in this phase, providing the necessary resources are available. Further contextual studies can also be required and pursued. This means that the pre-study can also last until the very end of the project.

Goals and Activities

The main goal of this masterclass is to provide HCI and CSCW professionals who are interested in exercising practice-based computing with the necessary tools and knowledge to carry out successful design projects under the auspices of the GD research paradigm through the DCS framework. The masterclass will concentrate on the main conceptual and theoretical aspects of the paradigm as well as the relevant methodological aspects of the framework. By the end of the masterclass, participants should be able to plan successful DCSs, using the appropriate research design and methods for the design problem that they would like to address. This should support them to accomplish impacting results with their initiative, both in terms of research results as well as of the quality of the designed artefacts.

The masterclass will be conducted in a hybrid format based on short presentation sessions to introduce the relevant concepts, theories and methods, followed by brainstorming sessions to discuss their understanding, doubts and difficulties with any of the presented constructs. Examples from past DCSs carried out by the organiser will be introduced and alternative strategies will be discussed, so to give participants a better understanding of the options they have to carry out methodological sound GD projects.

Target Group

This masterclass targets young researchers planning to engage in practice-based computing as well as researchers who have already been exercising it, but still have doubts or reservations about any aspects of it.

Format and Duration

This masterclass is originally planned to happen as an in-person activity. Alternatively, an on-line version of it will be carried out, in case the conference turns out to be in a hybrid or complete online format.

Given the breath of the contents to be covered, this masterclass is planned as a full-day event. In the eventual case of a hybrid or online conference, the activities

will be carried out between 15h00 and 20h00 CET, in an attempt to accommodate people from different time zones.

Number of Participants

To assure focused discussions and exchanges, a maximum of 15 participants will be allowed.

Required Resources

In terms of infrastructure, a lecture hall capable of accommodating the maximum number of participants according to the social distancing regulations in place by the time of the conference due to the COVID-19 pandemics, provided with a projector, a proper space for projection, sound system and flipchart will suffice. Participants are not required to bring any particular resources for the activities.

Shall the conference and, consequentially, the masterclass happen online, a laptop or personal computer equipped with a webcam will be enough. In this case, the masterclass will run over Zoom.

Organiser's Short Bio

Fabiano Pinatti, PhD, is an Associate Researcher at the Institute of Information Systems and New Media of the University of Siegen (Germany), the EUSSET Community Building Chair and one of the EUSSET Competence Network Co-Chairs. He holds a BSc and a MSc in Computer Science from the Federal University of São Carlos, São Paulo, Brazil, and a multidisciplinary PhD developed within a joint project between the Interaction Design Centre of the Department of Computer Science and Information Systems, University of Limerick, Ireland, and the Department of Sociology at the same university. His interests span Human-Computer Interaction, Computer Supported Cooperative Work, Practice-based Computing, Interaction Design, Software Accessibility, Cyber-Physical Systems, Mobile and Nomadic Work and Informatics in Education. Since 2016, he has been leading and carrying out assorted Grounded Design projects predicated on the Design Case Study framework. The focus of his research is on technologically-mediated human practices, more specifically on the understanding on how practices can help identifying the design space of new and innovative technologies, and how they can shape and be shaped by their usage. He has published several articles on topics related to these fields of research in prestigious international conferences.

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