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Editorial

This issue of Media in Action highlights two topics, each of them examined from a range of diverse perspectives. The first is a thematic focus is on "Socio-Informatics". Socio-Informatics is an IT design discipline, which combines qualitative, praxeological research with design methods. In this section, four articles elaborate different viewpoints on methodological issues against the backgrounds of their specific research and design contexts. The second section brings together five essays as a book review symposium to Charles Goodwin's latest book publication "Co-operative Action", paying tribute to the lifetime achievements of the recently deceased author.

The editorial team wishes you a pleasant read!

Thematic Focus

Socio-Informatics

Introduction to the Thematic Focus "Socio-Informatics"

Claudia Müller

From ethnography to design and back - Ethnographic studies in industry unveiled that social practices could be in such sharp conflict with technology usage and vice versa that innovation could fail (Trist/ Bamforth 1951). When IT became a focus of researchers and developers, such insights motivated considerations about a possible role of ethnography for IT design. The early and outstanding work of Lucy Suchman (1986) and researchers associated with the Lancaster University (e.g. Hughes et al. 1992) has established a thorough discourse about this issue (Blomberg/ Karasti 2013) with a wide range of different facets, foci and research questions, both in Computer Supported Cooperative Work (CSCW) and Human-Computer-Interaction (HCI). Scope and depth of related methodological reflections differed from simplistic identifications of ethnography with requirements elicitation (see e.g. the related critique of Dourish 2006) to highly general disciplinary debates in sociology, psychology, and computing (Randall 2018, Randall et al. 2018). However, in between these extremes a space has emerged for empirically based reflections about the "socio-technical gap" (Ackerman 2000) and how it is (and could be) tackled.

Wulf et al. (2018) suggest "practice-based computing" as a framework for new design methods that focus on flexibility and the involvement of users. It should be mainly based on research into social and usage practices, into the lifecycle of design projects and products, the complex and long-term nature of technology appropriation and sustainability in (participative) IT design projects (Randall et al. 2018, Meurer et al. 2018).

As a contribution to practice-based computing, Socio-Informatics investigates into current shortcomings of conventional IT design approaches, and proposes alternative venues. While conventional criteria for good design in Computer Science are predominantly based on formal technology-immanent criteria, Socio-Informatics aims at the thorough investigation of the relationship between IT artefacts and the social context in which they are used. At the same time, it is interested in processes, in which IT systems and practices are mutually evolving, the social embedding of computer artefacts (Rohde/ Wulf 2011). It has developed, among others, different action-research approaches such as business ethnography (Stevens/ Nett 2009), integrated organizational and technological development (Rohde/ Wulf 1995) and, lately, design case studies (Wulf et al. 2015) and Grounded Design (Rohde et al. 2017).

Socio-Informatics places the anticipated users at the centre of research, their experiences, desires and needs (Kuuti & Bannon 2014, Wulf et al. 2015). This positioning requires a rethinking of the methodological approach in close analogy to the “practice turn” in various other disciplines (Reckwitz 2002; Kuutti and Bannon 2014; Wulf et al. 2011, 2015, Randall 2018). In this regard, practice-based computing and Socio-Informatics make two major points: a) qualitative/ethnographic methods may contribute to a holistic understanding of the anticipated field of application, and b) the need to understand existing practices and to provide a leverage effect upon their desired further development demands with applied research- and design methods (Rohde et al. 2009).

The described research and development approaches of Socio-Informatics are closely linked to the "practice turn" in social- and media sciences pursued in the collaborative research centre CRC 1187 ("Media of Cooperation") at the University of Siegen.

Possible ways in which research into practices and design work may relate to each other, concern, amongst others, the following questions:

- (Design space): how is this design space understood, defined, (de?-) limited?
- (Research methods): How can specific social settings be investigated? How can design gain access to a field?
- (“Metadesign”): How can communication and transparency be supported in technology projects in an integrative manner that allows cooperative co-creation and individual appropriation even for persons with very different backgrounds and knowledge?
- (Interdisciplinarity): How can IT artefacts help to represent design choices in interdisciplinary consortia for representatives from heterogeneous fields?
- (“Translation"): How can ethnographic evidences help to ground design recommendations?
- (Reflexivity): How can design work itself be sensitized for its embeddedness in specific socio-cultural contexts?

The contributions in this issue

The concept of “design case studies” (Wulf et al. 2015) has been suggested as a framework for design projects: after a qualitative pre-study, (participative) co-design activities take place and are finally analysed. The concept is meant to relate research into social practices within the application domain to investigations of those of the researchers and developers, in a way that allows to make otherwise "invisible work" at the interface between both fields visible. Specific situated conditions which shape the development of design ideas and are influenced (or mutually contoured) by the researchers themselves or within the "user-designer relationship" and the “user-technology nexus” are also in the focus (Oudshoorn & Pinch 2003).

In ideal circumstances design case studies consist of three steps: For the preliminary study, a combination of predominantly qualitative ethnographic and participatory research methods are being suggested

in order to create a comprehensive picture of practices, needs and requirements of the actors. In the IT design phase, co-design and participatory design approaches are in focus and provide opportunities for close user participation, for instance, by means of mock ups, prototypes and demonstrators. The subsequent appropriation study serves to evaluate and further develop the concepts and the IT artefacts using empirical investigations of their effects on the practices initially surveyed. The concept of design case studies may help classifying the four studies in this issue.

Under this perspective the study of *Reuter* and *Leopold* is the closest among the four to a full-blown design case study, as it involves a pre-study, derives considerations about design alternatives and -decision, and finally evaluates the product re-design on the basis of empirical evidences. It also depicts interesting problems and limitations when conducing practice-based computing within a commercial environment.

The works of *Wulf* et al. and *Aal* et al. draw on ethnography and the framework of design case studies. In the latter regard, one may classify these two studies as kind of pre-studies which aim at ethnographically illuminating a certain socio-cultural situation and an understanding of (media-related) cooperation practices from the perspective of the interviewees or through participant observation. The results of the analysis serve as first formulations of possible design ideas, which, in the next step, might inform and inspire the formulation of a cooperative project.

The study by *Nett* and *Bönsch* is based on project ethnography, a further-development of business ethnography. In the given case, project ethnography was applied without reference to design and did not represent a design case study, but showed that poor appropriability of technology represents a general problem for industrial organizations - even before or beyond the establishment of design projects.

In the following we will describe the studies in more detail:

Practice theories and their foci on agency within sociotechnical processes given, the study of *Bernhard Nett* and *Jennifer Bönsch* on technol-

ogy appropriation in small, metalworking enterprises describes these (in contrast to, say, IT- or eBusiness firms) as generally not associated with the `knowledge economy´. Nevertheless, Nett and Bönsch are neither confronted with naïve pre-digitals nor with lazy late-comers on an automation path outlined by today´s discourse on `industry 4.0´. In contrast: the study shows how factual organizations differ fundamentally from such mainstream narratives. The study adopts `project ethnography´, a research design which had – under the name of `business ethnography´ - been developed in the context of Socio Informatics to promote reflexivity in technology design projects.

As `project ethnography´ this conception is now applied outside the field of technology design. Three stages of research are interpreted as a sequence of the `expropriation´, `alienation´ and `re-appropriation´ of intentions of the (industrial) partners. To understand their problems and learning processes is the target of the documentation- and analytical work described in this paper. Even when the classification of the study as Socio-Informatics may be questioned, the detected problems of the industrial actors to operationalize technological innovation are of indubitable importance for Socio-Informatics.

Volker Wulf, *Kaoru Misaki*, *Dave Randall*, and *Markus Rohde* provide an extensive field study on overland transportation in Madagascar, one of the poorest countries in Africa. On the basis of participant observation and informal interviews the essay paints a vivid picture demonstrating the challenges which customers, drivers and operators face when travelling overland with a "taxi brousse". The ethnographic study provides insights into the distribution of labour between the operators of the services and other actors, both in formally assigned roles (bus drivers, dispatchers) but also in informal ones which contribute to overland transportation.

The authors show that current discourses in the CSCW/HCI literature on technological support for public transport may be rather remote from local conditions in Madagascar (this might also be true for

other regions in the global South). While the Western discourse focuses on how to deploy dynamic location-based information to enhance public transport to the convenience of customers; this study shows that socio-political conditions may pose very special challenges here. The two first and second authors, Wulf and Misaki, have experienced such challenges first-hand during their four-week stay on the island and in numerous rides with a "taxi brousse".

Christian Reuter und *Inken Leopold* present a three-phase study of the design and use of a prototypical media artefact to promote grocery shopping. The results of this study include participants' opinions and perspectives of using a location-based shopping app in their everyday shopping, and extensive design recommendations. Location-based applications in retail, especially beacon technologies, have not yet been well researched in Germany. Mainstream research in this areas aims at the experimental capturing of usage data and of reaction times, while customers are rarely asked for their opinion.

Drawing on the design case study conception (Wulf et al. 2015), Reuter and Leopold deploy an evolutionary research and development conception based on three steps. In their attempt to steer between frequently existing temporal limitations and the aim to proceed as practice-oriented as possible, they adopt an interesting mix of empirical methods. After an analysis of potential applications for beacon-based systems in retail, Reuter and Leopold start with an online consumer survey on related customers opinions, discuss the development of design ideas for an app based on the survey data, and finally provide a subsequent qualitative evaluation of the developed app prototype.

Last, but not least, *Konstantin Aal*, *Marén Schorch*, *Esma Ben Hadj Elkilani*, and *Volker Wulf* present a comparative study on discussions and the spreading of political information in social networks such as facebook on the one hand and mass media on the other. What is particularly interesting is that the authors look at the situation after the Tunisian revolution and compare the situation to what colleagues observed dur-

ing the uprising. They focus on insights and reflections given by young people, who were not involved in the uprising, after the end of censorship in mass media.

From the viewpoint of a sample of young Tunisian women and men in urban as well as rural contexts, the authors demonstrate how individual information, communication, and media navigation practices evolve in relation to a changing and pluralising socio-political landscape. The qualitative investigation on the basis of participant observation and interviewing with young Tunisians and partly conducted by a young Tunisian researcher demonstrates the use of facebook and mass media before, during and after the revolution. It explores practices and attitudes of young Tunisian citizens that shape the transition to a "new normality".

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Digitalisation in Small German Metal-Working Companies

Appropriation of Technology in a "Traditional" Industrial Domain

Bernhard Nett, Jennifer Bönsch

Abstract

To explore today´s relationship of digitalisation to work and qualification, small metal-working companies were studied by project ethnography and via a survey. The cases show that digitalisation is expected to promote product quality, flexibility, systematic use of labour, and equipment utilisation. Digitalization in the North Rhine-Westfalian SMEs today hardly follows the full-automation vision of "industry 4.0". In spite of the adaptability of digital technology, it is difficult for SMEs to tailor it according to their particular demands. In terms of qualification, such appropriation of technology obviously strongly depends upon organisational competences of evolutionary learning.

1. Introduction

The (few) computers that had already been developed in World War II filled large halls and consumed as much energy as contemporary middle-sized towns (cf. Stanford Encyclopedia 2006). Some 75 years later, battery-operable "personal computers" with the size of a pack of cigarettes have become mass products, the internet has connected the computers, and new input- and output devices have enabled entirely new forms of usage. No doubt: computer hardware has changed dramatically! At the same time, software applications have been developed for

most areas of daily life and have also become inspired, even further developed and diversified, by users. While computers may support such diverse functions as calculations, information for users, communication, or the control of machinery, "Information Technology" (IT) is generally used as a catch-all concept for all computer technology. The same is true in this text here.

Considering digitalisation, "digital technology" could be defined in an abstract manner (e.g. as algorithmically driven systems operating storage elements of changeable, discrete states), but this definition would also cover the abacus of the Bronze Age. Instead, we are generally speaking of "digital technology" in a much narrower sense: computer technology that uses digital instead of analogue circuits. In this narrow understanding, digitalisation is simply the spread of computer-/information technology. But while the equation of digitalisation with computerisation may be premature for longer-term media studies, the focus of our study is to shine a short-term flashlight on the current situation. Therefore, we have adopted the above-mentioned equation in order to study IT-related change in small enterprises of the metal-working branch.

Schumpeter (1912) was very interested in the role of technology for economic development. To enable the study of processes of change, he differentiated between inventions (new ideas, projects, or conceptions), innovations (new forms of value-creation proved in economic reality), and diffusions (imitations of an innovation which, in the end, turn innovations into a new quasi-standard). While, from this point of view, inventions often were some kind of technology, innovation had to go further and include viable organisational and economic embedding: a challenge for entrepreneurship. Pipek draws consequences for IT-development (2005: 21), pointing out that technology appropriation requires - and enables - opportunities for users to make sense of a technological system, if they are to tailor it.

Generally speaking, IT is about the capturing, storing, processing, and outputting of data. It is a relatively new technology, although earlier forms of above-mentioned elementary processes, of course, had existed long before the computer was invented (from today's point of view, writing, for example, can be seen as a very old form of storing data). To put it this way: The emergence of IT has changed elder forms and contexts of data processing dramatically and inspired a search for opportunities to support human work and life within a *knowledge economy* (Drucker 1993: 20ff.).

However, knowledge is a tricky issue, as it depends on established reference contexts: even when defining things, one needs ordinary language if any meaningful result is expected from the exercise. Knowledge becoming "sticky" or "leaky" only indicates more fundamental problems around the term (Brown/Duguid 2001). Not all existing knowledge is expressed or documented by individuals (Ryle 1949), and not everything that is expressed must be knowledge. Data does not necessarily represent knowledge, and knowledge may not necessarily be data: Fundamental concepts such as data, information, knowledge etc. are tricky and their common (and even scientific) use is anything but consistent. Due to the existence of software, computers, much more so than other technologies, do not only contribute to knowledge creation but are also influenced by knowledge.

To study the role of IT one has to go beyond deductions from abstract demands of data processing and investigate many interrelated factors and areas, e.g. the concrete IT-applications at hand, their technical inter-operability (among each other and with the infrastructure), further IT particularities, established usage practices as well as -skills, the way IT has been implemented and embedded into the organisation, related conflicts and aims, the domains in which IT is used or which are affected. Given this complexity, the first foci of research on digitalisation were striking new forms: of occupations (*programmers*, *data analysts*, ...), work (*home office, ...)* organisations (*virtual enterprises* or

co-working spaces ...) etc. Compared to such eye-catching new phenomena, the enormous changes of work and qualifications in seemingly "traditional" industries could easily be overlooked.

One example for an old industry is the metal-working branch, the interrelation of which with mechanisation (e.g. the steam engine) was among the drivers of the Industrial Revolution (Lilley 1973: 122f.). How to study such a field? While technological determinism assumes that socio-economic changes are pushed by technological advances, social determinism suggests that changes may only be perceived, analysed, and instantiated by humans, whose sense-making is thus considered to be the ultimate instance of change. In spite of this, it appears to be reasonable to take into account that changes may occur as a result of unexpected and even unperceived causes (for instance, globally bad harvests following a big meteor strike). On the other hand, perceptions definitely play a role in social change - and technology determinism is unable to take such factors into consideration.

Therefore, it appears plausible to consider socio-economic change to be caused by an inter-play of factors, in which actors have to interpret both actual challenges and chances. From this point of view, problems and chances of future technologies are "out there", independent of individual interpretations, but what becomes a problem or a chance, is dependent on the socio-historical situation and not independent of the sense-making of actors. This also holds for the differences between social and technological factors. Technology is, therefore, related to expectations, the satisfaction of which may be studied - but there can also be fully unexpected impacts, which can be found by means of empirical scrutiny - but only if one does not blind them out. We have tried to approach both expected and unexpected consequences of digitalisation.

Intended results of digitalisation in Germany are actually discussed as "industry 4.0". Visions such as industry 4.0 are anticipations of the future (the French equivalent to "industry 4.0" is, therefore, called "*industrie du futur*"). One way (1) to address such visions of digitalisation is

to reconstruct the "social construction of technology" (SCOT) by studying the discourses via concepts such as "*interpretative flexibility*" (differences between positions found), "*social groups*" (actors) and "*wider context*" (socio-political situation, see: Pinch/Bijker 2012: 11ff.) Another way (2) is to use established visions and to confront them with empirical studies of work practices. Given the dimension of the discourse, a thorough discourse analysis appears to be an enormous effort, but an attractive one. While our task was empirical research in enterprises, it needed focus. Therefore, the following section provides some explorative discourse analysis, but only insofar as it helps us to grasp the images of digitalisation in today's public discourse and elaborates on the kind of research focus that might push it further.

Chapter 2, therefore, is to constitute the research object drawing on public discourses. It is followed by a description of how we organised the capture of the 'view from within' (... the enterprises). Discussions in enterprises are influenced by public discourses and scientific studies of the former are additional influences. We have tried to contribute to and "ground" the discussions in the companies in a reflected manner, while exploring problems and chances in these otherwise hidden fields. To establish these goals as shared ones by both researchers and practitioners, we adopted, among other approaches, the participatory research design of Project Ethnography, which will be described in chapter 3. The reflections on our proceeding are followed by three case studies, our feedback of results to the companies, and their counter-feedback (chapter 4). A synopsis of the cases will then elaborate the findings (5), which will finally be presented using the research foci elaborated in chapter 2.

2. The Public Discourse on 'IT and Labour' and the Aims of the Study

2.1 Discussions of digitalisation: The Case of "Industry 4.0"

One important topic in the public discourse on the role of digitalisation in the economy is the idea of "industry 4.0". The concept uses the versioning of software products to describe digitalisation as a socio-economic transition: Software producers indicate different releases of a product by means of identifiers, in which minor changes are often counted on the right side, while changes affecting the whole conception are enumerated to the left of the point: each time the left number is counted up, the right number starts again with "0". The term "industry 4.0" borrows this versioning from the software industry to indicate industrial change. It appears as if a versioning is hinted at in which the numbers after the point are to mark minor changes and evolution, while the numbers before the point indicate revolutionary changes.

The vast literature on the Industrial Revolution (cf. Armengaud 1985, Braudel 1986, Hobsbawm 1968, to mention only a few authors) mainly argues for its global and disruptive nature. When Schumpeter (1912) interpreted capitalism as an ongoing industrial revolution, this motivated efforts to classify economic development in the form of periods (cf. Kondratieff 1926). Thomas Kuhn (1962) meta-theoretically reflected on the differentiation between minor, "normal" deviances and structural "revolutions" by pointing at "paradigms": clusters of preconditions that may be extracted in retrospect. While Kuhn spoke of scientific theories rather than of socio-economic change, Dosi (1982) introduced the paradigm concept to technological change. Both were against paradigms to be simply asserted: paradigms had to prove their potential for a better understanding of historical processes. Technological scenarios, in contrast, describe desired future situations. That any such scenario is going to differ from the present state of affairs may be self-evident, but

it is no guarantee for a technological revolution. We shall return to this issue later.

In the discourse, the simplest definition of "industry 4.0" is provided by Möller (2016) as the combination of IT and networks. However, industry 4.0 is many things at the same time. Industry 4.0 is a "future project" of "Forschungsunion Wirtschaft-Wissenschaft" (an industrial and academic advisory board of the German government) and has become a frame for activities dedicated to safeguard Germany's manufacturing base. Industry 4.0 is also a German digital platform with information dedicated to support small and medium sized enterprises (SMEs), founded by three influential associations (BITKOM, VDMA, ZVEI) and which is today operated by a consortium of governmental and non-governmental organisations.

"Industry 4.0" is also used to designate digitalisation in the industry, sometimes independent of its forms. In other texts, industry 4.0 only designates the use of adaptive production technologies (we will subsequently call this the "narrow understanding of industry 4.0"). Adaptivity means the automatic self-adaptation of a system to environmental changes. An example is the windshield wiper which automatically starts when it begins to rain, switches itself off when the rain stops, and which adapts itself automatically to the intensity of the rainfall in-between (which is detected by a rain sensor). Such adaptivity must not be confused with adaptability. A system is adaptable when it may be changed by humans. Adaptivity, in contrast, is linked to Artificial Intelligence and the (far more specific) goal of having machines control other machines – a perspective which has obviously remained fascinating for many authors. Simplifying, one may see adaptability as the rationale of "software", which was to allow different applications to be supported by the same hardware, while adaptivity is a rationale for Artificial Intelligence.

One highly important invention in this regard is the fitting of real-world objects such as materials, goods etc. with barcode labels or

RFID transponders ("tags"). Adaptivity is expected from automatically readable markers on material objects (cf. acatech 2013) which transform the latter into so-called "Cyber-Physical Systems" (CPS). Artificial Intelligence is considered to be most important in this respect, but CPS must in no way necessarily be related to adaptive technologies, automation, or Artificial Intelligence (CPS could, for instance, also be used for something like "craft 2.0").

Once markers can be detected automatically by sensors, physical processes can be controlled by IT, as simulations of real-world processes may become synchronised with the latter. If all relevant information is then correctly represented in the simulation, the synchronisation of the latter with real-world processes allows it to become the reference point of an automated production control. But if fully adaptive/automated systems replace established human cooperation in the future, productivity gains are plausible only if the "adaptivity" of established human cooperation has been modelled and substituted digitally in a clear, simple, complete, and cheap manner, free of damages, contradictions, and additional risks. After the massively negative experiences with comparable expectations in the past (cf. e.g. Brown/Duguid 2001), such preconditions should no more be taken as a matter of course.

The concept of "Industry 4.0" is often mentioned when certain "technology fields" are presented – apart from Artificial Intelligence, as already mentioned above - e.g. "*Embedded Systems*", "*Smart Factories*" or "*Cloud Computing*", not seldomly to allocate related job- or monetary potentials (cf. Bauerhansel et al. 2015; Bauer et al. 2014, 6f; BCG 2015). Other authors cite other fields, such as the "*Industrial Internet of Things*", "*Autonomous Robots*," "*Big Data*," "*Augmented Reality*", "*Additive Manufacturing*", or others (Rüßmann et al. 2015). Pfeiffer (2015) concludes that there is not one "Industry 4.0" (not even a common understanding of what the 'revolutions 1.0-3.0' should have been about). The "technology fields" that are mentioned are typically occupational areas (Abbott 1988) of communities, which run third-party financed R&D projects

around technological scenarios or paradigms. To consider the existence of such a community as a sufficient criterion for revolutionary "technology" - independently from empirical evidences of any practical usage - is to conceive of technological change merely from the viewpoint of its promotion.

In addition to the already mentioned notions of industry 4.0, the term may also be used for kinds of organisational conceptions that aim at the identification and implementation of digitalisation scenarios for companies (Herman et al. 2016). Industry 4.0, in this sense, consists of four elements: network, information transparency, technological assistance and decentralised organisation. The "network" may consist of humans or a technological system. "Information transparency" means that the complete real-life performance of equipment may be digitally mirrored by a synchronous simulation. "Technological assistance" is about technologies which support humans by providing information. "Decentralisation" implies that solving problems should be possible in a local and automated manner, for instance by coupling materials and data by means of CPS. Industry 4.0, in this sense, is a way to approach digitalisation -and a buzzword for studies on this approach.

To conclude, in the confusing diversity of meanings the discourse on industry 4.0 appears to relate to communities consisting of funding institutions, groups of scientists and industrial interest groups, or generally *relevant social groups*. Accordingly, the competition for funds and legitimation seems to be the *wider context*. The *interpretative flexibility* ranges from an understanding of industry 4.0 as any kind of digitalised industry to the narrow understanding of an adaptive, fully automatable economy, and from a mere buzz-word to the epitome of industrial rationality. In spite of the criticism of the *ex-ante* versioning of "industrial revolutions" (Röben 2017: 23f), the term has been widely adopted. The German government (BMAS 2015) uses it and also speaks of "work 4.0". While "industry 4.0" has some features of a project, propagated to mobilise partners to make it come true, we prefer speaking of "digitalisa-

tion" in this study in order not to pre-figurate our findings with a too narrow focus.

2.2 Discussions of Possible Impacts of Digitalisation

A study by the European Commission on "Social Impacts of ICT" (University of Siegen et al. 2010: 135f) criticised both utopian and dystopian visions of future work and labour, for instance, a "capitalism without work", for not taking into account the way in which digitalisation may be regulated and shaped. Three years later, the study by Frey/Osborne (2013) again alarmed public opinion by estimating job losses due to digitalisation for the USA at some 47% by the year 2030. This negative estimation was reproduced for some European countries as well: Brzeski/Burk (2015) even saw 59% of the German workforce endangered by ICT, in addition to clerical assistants (86%) and unskilled workers (85%), in particular drivers and operators (69%).

The alarming studies became criticised for using the role of routine activities in occupations to estimate possible foci of automation and for assuming that, in any case, "what may easily be digitalized, will be digitalized" (Autor 2013). Instead of occupations, individual tasks should be considered as bases of such estimations. Recalculations of the substitutive potential of ICT resulted in drastically lower figures: Bonin et al. (2015) spoke about 9% for the USA, 12% for Germany, while Dengler/Matthes (2018) estimated potential job losses for Germany to be about 15%. Sieglen et al. (2017) saw North Rhine-Westphalia slightly above this national average, at 16%. Furthermore, Blien/Ludewig (2016) and Wolter et al. (2016) suggested that the impact of lower prices on demand creation and of regional clusters on performance had to be considered. Arnold et al. (2016) saw little efforts to automate human labour, at least at the moment.

A first result of the analysis of this discourse is that to estimate future employment by reflecting on substitutional potentials is tricky (Stettes et al. 2017). Recent studies partly adopt assumptions by Frey/

Osborne (2013) who see higher qualified persons (e.g. IT developers) with "abstract" tasks on the winner-, less qualified processing staff conducting manual work and assistants on the loser side (Weber / Zika 2015, Dauth et al. 2017, Arntz et al. 2016). Dengler / Matthes (2018), in contrast, argue that higher qualified activities may become possible targets of automation, too, while repetitive jobs might become enriched by non-routine activities. New jobs might emerge as well (Dengler / Matthes 2015.) Meyer et al. (2016) draw an overall optimistic picture, saying that the labour demand will not decrease in the years to come.

2.3 Research Questions

In our cursory analysis of existing discourses above, we have ignored literature on data security, privacy issues, and health, concentrating on the role of digitalisation for work and qualification. The analysis shows that a major focus of the discourse on digitalisation is about the number of future jobs. There are very different estimations and it appears to be interesting to find out which kind of approach appears plausible. What is going on in small enterprises of the metal-working branch? Is the current corporate policy aiming at full automation? Which are the technologies currently introduced in these companies?

Arntz et al. (2016) argue that 50% of the companies they consulted by phone reported to have 'experiences with industry 4.0', but their estimation of what they considered to be an 'industry 4.0-application' in the company was merely 8% (administration) and 5% (production). Obviously, industry 4.0 is attracting interest even when it is not adopted. This leads to the question if "industry 4.0" is a scenario that attracts small metal-working companies, and if so, in which of its understandings.

Arnold et al. (2016: 3) see a "deficit of studies that put the individual views and perceptions of employees in the foreground". Therefore, one positive outcome of our study would be if it helped to grasp the role of digital media in small metalworking companies. How are changes

of work and qualification perceived at the shop floor? "Industry 4.0" is sometimes described as a further step in economic progress. But what kind of learning processes and qualifications are needed? Are there problems in terms of qualifications? Does the development seem to foster a polarisation between winners and losers or does it result in a more general kind of revaluation?

3. The Research Design

3.1 "Business Ethnography" Has Become *"Project Ethnography"*

When in late 19th century, Europe saw itself as the *avant-garde* of mankind on a universal way from descent *(feudalism)* to democracy (*republic*) (Hillmann 1994), ethnography described its 'exotic' objects as inferior. Later, such *"essentialist"* descriptions were criticised as mere illustrations of ethnocentric classification schemes around "ethnic groups" (see Barth 1969) or "cultures" (cf. Geertz 1972) (not to speak of racial ones). This shows that descriptions of observations can be ideological, even if they have some correspondences in the world "out there": Rules of actions need not be those of the actors but can be simply ascribed by the observer.

Therefore, rules, institutions (stabilised clusters of rules) and organisations (formal arrangements defining 'final vocabularies' (Rorty 1989) to distinguish insiders from outsiders) must not be taken for granted: ethnography has to show how they are enacted, spread, changed, and communicatively symbolised in daily life, and how this could be found out by ethnographers with their own understandings of rules, institutions, and organisations. The classification schemes of the studied actors have to be of major importance, and to identify them needs to be the aim of ongoing self-critical reflections of the ethnographer.

If one considers science as an organisation in above-mentioned sense, one may think about similarities and differences to non-science. In this respect, Abbott (1988) described three particularities of science:

science defends its expertise in the field with a general body of related knowledge, maintained by a "professionalised" community and applied to a delineated occupational area. The monopoly of expertise in the occupational area is defended by mobilising other organisations, such as the state. This relativistic conception helps to empirically describe the competition of experts without privileging one over the other in an *a priori* manner (for instance, the different R&D communities which engage in the industry 4.0 discourse). However, it does not suffice to identify consequences.

Wittgenstein's (1953) conception of "*Lebensformen*" as shared sets of practices that affect the use of words ("*Sprachspiele*"), must not lead into relativism: individuals are confronted with diverse interpretations of the world – but these are no 'absolute beginnings'. The pragmatist assumption is that human action is not an entirely arbitrary construction "from-scratch" of some amorphous, objective "world out there": both language and practices are atomistic and situated in society (cf. Ryle 1949). Acculturation, therefore, is not only about the learning of symbolic forms, such as words or icons, but about the learning of practices as well. Language and practices are both habitual and have to be learned.

Grounded theory (Glazer/Strauss 1967) and relationism (Hübner 1978), therefore, go beyond relativism by pointing at the world as a shared sphere of possible experiences and at the given field as a situated singularity, which needs rational mastering. This approach is promising for studies of digitalisation, as both practices and symbolic representations are chanced and require learning. While the "social construction of technology" ("SCOT", Bijker et al. 1987) focuses on relativism in historical technology discourses, the "actor network theory" ("ANT", Latour 2005) on relativism among social and technological factors, project ethnography (formerly called "business ethnography", see Nett et al. 2009) studies the concurrence of conflict and cooperation in projects anticipating relationalism.

The participatory conception of project ethnography had its origin in Integrated Organisation and Technology Development (OTD, Wulf et al. 1999), which combined different R&D elements that had been developed in Information Systems or Engineering Science (Brandt/Fuchs-Frohnhofen 2001). To determine possible applications for digitalisation in a participatory manner, it consisted of an interview cycle in which the interview participants could express their own experiences in a project and elaborate on related problems and desires. The results were analysed and anonymously fed back to the interviewees in a project workshop which discussed and decided on the further proceeding in the project.

If – and only if – one learned something of relevance in the interviews which had not been clear before (documented in the project documentation and transcripts), some "expropriation" of formerly individual experiences for the project had taken place. If – and only if – rational discussions about the aim of the project started (documented in a protocol or memo), this indicated creative "alienation". And if – and only if – it was possible to jointly define new or more concrete aims (documented in a protocol or memo), "re-appropriation" of the project had taken place (cf. Stevens/Nett 2009). This procedure was initially called "business ethnography" and was integrated into the methodological portfolio of information systems (cf. Nett/Stevens 2009) and later also into media science.

Business ethnography was, in fact, about the understanding of a project. This is one reason why today we prefer speaking of "project ethnography". (The other is that while the concept of business ethnography has become adopted, the participatory reflexive conception described above has not.) While ethnography is typically about observations of the ethnographer, in project ethnography these are typically those of the interviewed practice partners (those of the interviewer play a less important role). Observations in general are only part of what project ethnography is about: As it aims at documenting and commonly

reflecting shared understandings of projects, listening to interviewed partners (and thus integrating their perspectives into the participatory research) is of core importance for project ethnography.

3.2 The QPlus 4.0 Project

From November 2016 until April 2018, the North Rhine-Westphalian Ministry for Innovation, Science, and Research (in the meantime, the name of the ministry has changed) funded ArWiSo e.V., an independent scientific association situated in the Aachen region, to execute a study on perceptions of and experiences with digitalisation in small and medium-sized enterprises (SMEs) of the metal-working industry of North Rhine-Westphalia (three of which will be described here), as well as possible impacts of digitalisation on work and qualification. The industry partners of QPlus 4.0 did not benefit from the project financially or with new products, only by way of the feedback of the results. A strict limitation of time resources for the partners was, therefore, necessary. Typically, we conducted between 5 and 8 interviews of, on average, some 45 min. each. The interviews were recorded, anonymously transcribed, and analysed for the feedback.

To find industry partners the project approached SMEs of this branch by circulating letters which explained our research focus very briefly. Then the phone was used to ask for permission to interview staff members and to launch an inquiry; in return, the opportunity to feed the findings back to interested staff members in "follow-up workshops" was offered.

There was also an inquiry on perceptions of digitalisation among staff in SME, including some unspecified fields, which could help to identify points of interest for the interviews. Apart from this connection, the inquiry was more on general attitudes towards digitalisation, i.e. it was research of its own. The combination of both project ethnography and inquiries was a high hurdle for companies. Some were not able or willing to undergo the whole ensemble of methods. We had

to study much more than the three companies explained in this paper, which are of particular interest, because all of the research design described here could be implemented in them. The focus of this paper is on the interviews and following "future workshops" at our partner enterprises.

The selection of interview partners was based on our own and partner proposals, and on cascading. Typically the initial interview was conducted with the CEO or a shop steward ("*Betriebsrat*"). If it delivered manifest experiences with digitalisation, these were then studied in more detail, for instance, by interviewing persons who had shown to be of significance in the first interview. Initially, there was an interview guide but later, the questions became ever more detailed.

The necessity of anonymisation and the protection of corporate secrets was a very challenging issue in research. A too lucid description of findings could have made individual experiences traceable. Therefore, and in contrast to other projects, we have e.g. not published the names of our partner enterprises and kept the interview transcripts in a discreet manner. In order not to provoke unrealistic expectations, we described QPlus 4.0 as a research project when approaching the partners, not as a transfer project: we explained right from the start that the project was to learn from the practitioners about their situation, not to teach them what digitalisation is about.

For the companies, success stories and best practices are much easier to be communicated than stories of failure. In action research, the situation is the other way around. Failure stories show the aplomb and confidence of our partners. As to understand them requires a certain level of concretisation, we had to manoeuvre between the contradicting demands of scientific analysis and anonymisation.

4. The Cases

4.1 Case 1: Input of Production Data via an MES

The first metal-working company (enterprise 1) shows the potential of project teams for the appropriation of IT in companies. The company has been independent until very recently, when it experienced economic problems and became integrated into what today is Europe's branch leader (a group employing some 1,500 staff members worldwide). This transition resulted in a loss of jobs and products. The interviewees made most of their experiences during the time when the company was still a small enterprise.

The site comprises some 45 staff members in total, among them about 20 shift workers in production. The workers produce standard products of different sizes and finishes, but with limited product variety: the products are containers for fillings of other companies. The market addressed by the company is characterised by mass production and relatively small investments, but by much competition at the same time. This means that the development of comparative advantages without much investment is of key importance for the company. "*Quality is a killer criterion: you are out without it – although price is the first, the second, and the third factor*" (factory manager).

Already at the end of the Nineties, an Enterprise Resource Planning (ERP) system was implemented to integrate data in the administration. At about the same time, customers pushed digital supply chains in order to secure just-in-time supply for their production by synchronizing the production planning of the organizations. "*For small suppliers supply chains may function as a customer tie and provide early information about what is going on the customer's side of things*" (factory manager). The supply chains were established by project teams consisting of representatives of the customer company and the producing company's own staff, among them the IT-department (2 persons with some programming knowledge and a long membership in the company). The project teams

became accustomed to dealing with technological change as well as with organisational demands.

Manufacturing Execution Systems (MES) are able to generate production data automatically and to control production machinery. But while in enterprise 1, quite some workplaces have been connected and equipped with terminals, the manufacturing equipment has programmable logic controllers (PLC) which cannot be connected. The rational of implementing a MES in enterprise 1 was less to control the production machinery automatically, but to integrate today's manually operated *"production planning and quality control into the system. Instead of inputting such data manually on paper, it should be inputted into the system."* Production data (*"how many products?"* and *"which machine is working well?")* were meant to be documented in a second step (factory manager). The manual administration of production data became digitalised and partly expanded.

Quality management had been established in enterprise 1 a long time ago, the operators being part of it: "the *operators conducted quality tests"* (operations manager) and documented shift data (production, quality, etc.) on paper sheets. The operations manager transferred this data into self-generated Excel-sheets in order to determine setup times, running times etc. He passed these Excel-results to the work-preparation manager, who then inputted them manually into the ERP system. When substituting for the work-preparation manager during his holidays, the operations manager detected that work could be organised much more easily: "*if operators are documenting basic data, anyway - why not straight into the ERP system?"* (operations manager).

The idea emerged to expand the ERP system in a way that allowed for a (later) processing of operations data, too. The IT department executed the requirements analysis and was expected to develop the technological solution in house, too. But when it turned out that the project was more voluminous than had been expected before, a decision was taken that the IT department was to develop only a part of the new sys-

tem by itself but participate in the outsourced tailoring of a commercial solution which was to be ordered. Their own requirements analysis could be used for related market analysis. The project started in 2017 to integrate data of the inspection of incoming and outgoing goods. In 2018, a second phase is expected to integrate the quality management and to support the communication between the work preparation and the operators.

Today, fully automated control of the production cannot be managed by the ERP system, although it is enhanced by an MES, as the production equipment still consists of stand-alone machinery with PLC: Production equipment is much too expensive to be changed as long as it runs fast and well. The conversion of the MES into a kind of input mask for production data may appear somehow astonishing but made sense for enterprise 1: not much development was necessary in order to achieve the desired aim of stopping double work.

As the operations manager had been an operator himself, he knew that operators are very sensitive when it comes to work surveillance: he considered the integration of a shop steward a precondition for success. Discussing his idea with the CEO, a team, similar to the project teams with the costumers, was established. The team worked semi-autonomously and used self-management techniques such as priority lists, protocols and so on in order to coordinate their own work with the management. Operators were integrated into the development right from the start, among them a shop steward, who has become a very active co-designer of the new work environment.

After the experienced job losses, remaining staff members were rather reluctant, but not against digitalisation. And as quite a lot of documents had to be collected from different sources, and to be considered before work could be started, one appreciated the opportunity to find information easily online. Right from the start, clear rules were negotiated, established, and followed: e.g. that the changes were not for individual work surveillance. Explicit agreements settled that, e.g., cig-

arette breaks and similar short term interruptions of work were not to be registered in the system. One of the shop stewards put it this way: "*Total surveillance is not allowed. But this has not become an issue here, because innovations were not only about surveillance; they made sense outside of the context of surveillance, too.*"

As the market for production-control systems is still very limited, there was only one optical system available. The system was much beyond the company's financial means, but a customer complaint demonstrated that one could not wait any longer. As a result, staff members developed an optical production control system on their own for only 10% of the price of systems existing on the market. Such projects have become feasible through the institutionalised, semi-autonomous project teams with experts from different departments, which consider and solve technological and organisational problems across and beyond disciplinary boundaries. Representatives of different parts of the enterprise discuss and organise the necessary technological advances in the project team, while the management flanks the re-structuration with necessary decisions.

4.2 Case 2: A Team of Foremen as the Interface Between Production and the ERP System

The second metal-working enterprise also has experienced economic problems recently, after which it returned to a stable path of growth again. The enterprise does not only sell metal products, but also synthetic ones. As both productions are organised rather independently, and due to our overall focus, the study concentrated on the (larger) metal-working section of the enterprise. The company does not produce many of their own products but generally works as a contract manufacturer for others. The 'cash cows' of the second enterprise – like of enterprise 1 - are standard mass products. However, the product variety of enterprise 2 is higher compared to enterprise 1.

This has to do with the special processing of raw materials, a rather unique feature of the company: the market of enterprise 2 cannot be supplied using comparably cheap multi-purpose production equipment. It appears to be stable, if not growing: *"Within the last years, we have integrated some very small companies"* (CEO). As very expensive production equipment already exists, enterprise 2 operates mass production (unlike enterprise 1) on a niche market. It is situated in the countryside, but not far from some urban sub-centres. The company's some 60 jobs (plus about 20 women working from home) are of much regional importance.

To call the administration of enterprise 2 even "very lean" at the time when the economic problems ensued would have been understatement. For instance, sales capacities had been eroded to nearly zero; the workshop tried to secure the production by improvisation and cannibalisation of old equipment. The factory manager delivered a kind of 'one-man-show'. *"When a customer comes with an order, it is generally my job to do a feasibility analysis to determine, from the technical point of view, if we can take over".* This includes research and preparation of drawings and calculations and, if unforeseen things occur or changes on the part of the customer are desired, plans have to be adapted, and new drawings have to be prepared. It also includes the communication with the customer. In addition, the factory manager has to manage the archive and the general schedule. He goes through the factory every day to register the stock of raw materials, to learn about the production process and unexpected events, and to communicate administrative decisions and plans.

However, due to flat hierarchies, much of the work preparation could be handed over to the foremen. (Only in more complex cases, the factory manager also has to do the work preparation by himself). The extraordinary commitment of the factory manager and the strong support from both staff and clients allowed for the continuation of production even during economic problems, providing a chance for a new

beginning and a motivation for the new CEO to take over. He (re-)activated client relations and tried to relieve the factory manager. Another problem was: *"an over-aged workforce"* (CEO). In the meantime, "*the average age has been reduced by 7 years in the last 5 years*". The CEO hired new staff members and cooperated with the regional job centre. The regional job centre is funding (a shortened) apprenticeship ("*13-15 months, 6 of them in the enterprise*", CEO) thus lowering labour costs for enterprise 2, which in turn offers the apprentices secure jobs afterwards.

Enterprise 2 has implemented an ERP system for the administration, too. "*The payroll, data for health insurances, all that is already managed electronically*" (CEO): "*In Germany, it is no longer possible to do this otherwise. The sales tax, which we pay monthly, is a push of a button: an automated process*". However, enterprise 2 neither has a MES nor the aim of an automated integration of operational data. It is the explicit policy of the enterprise to keep the operation equipment as an ensemble of stand-alone machinery. "*The machines will not be networked. We afford the 5 minutes in which the operators copy the meter readings once a day … As no one is coordinating more than 20 persons, technical mediation is not required in that respect*" (CEO).

Even elder staff members are nowadays accustomed to smartphone use. *"In my spare time, I use my smartphone: Facebook!"* (elder operator). "*When a bag falls down: half of the region will know this within half an hour*" (chairing shop steward). This is not too surprising, as the rural environment is characterised by a generally poor infrastructure. In particular, the transportation situation is poor (1 bus per hour during day time – a problem for the apprentices), and there is no food available on site. Mobile technologies are attractive in such environments.

During the former working lives of the operators, they do not seem to have received any formal qualification. The overall tendency that, among participants in qualification measures, the rate of elderly persons, which used to be far below the average, is rising (Bellmann 2017), has not fully reached enterprise 2: shop stewards are encouraged to

take part in trade union-workshops, but operators still do not know about qualification offers. Nevertheless, they have appropriated mobile technologies for daily use by themselves with the help from family and friends. The operators and the shop steward are rather enthusiastic about digitalisation: having seen the results of lacking investment, computers represent more "modernisation and investment" than a "threat of jobs" for them.

The management of enterprise 2 appears to prefer 'analogue' solutions, for instance, company-organised and -sponsored transport-sharing for apprentices. As a result, one may easily underestimate the extent to which enterprise 2 has already been digitalised. Production has not only undergone an integration of the administration by means of the ERP, but: *"In the meantime, the foremen received PCs and internet access. They can now view the electronic drawings, parts' lists and specifications themselves on the intranet – this makes things a great deal easier!"* (factory manager). The production, which the CEO describes as willingly dissociated from digital networks, is thus controlled by meetings of foremen who discuss production orders documented in the ERP system together with the factory manager to organise their production.

4.3 Case 3: Instant Fixes and Beyond

Similar to enterprise 2, enterprise 3 is located a bit removed from an urban centre in the countryside and is also a contract manufacturer. In all three companies, the size of the (metal-working) production is quite similar, but enterprise 3 differs in some other respects: it has no shop steward and does not produce mass-, but mainly individually custom-ordered products. *"Lathe operation with thousands of pieces – well, that's also still there, but where money is earned you can no longer operate without CAD-CAM and 5-axis milling"* (ERP-expert). Remote contract manufacturing requires fast and reliable exchange of construction data: today *"you can always convert data, as there are transmission standards"* (CEO).

Enterprise 3 partly benefits from the outsourcing of workshop facilities of other enterprises. In turn, it has to compete with the state of the art in manufacturing – and is doing so very successfully. "*People are coming up with always crazier things that would not have been possible years ago. There are more degrees of freedom for engineers through CAD development and the new 5-axis technologies*" (CEO). With regard to production equipment, enterprise 3 has to react to customer demands - but to estimate these in advance is highly risky, in particular, when every order is different. On the one hand, one has to care for the key accounts and their technological preferences. On the other hand, equipment is expensive, particularly for a small company, and a high degree of capacity utilisation is necessary for the amortisation of investment. For a small company, it is even more complicated to distinguish between what really pays off and what is only 'nice to have'.

When discussing a specific new digital technology, the CEO stated that with it "*you can do some things that you cannot produce otherwise. I held work pieces in my hand - in fantastic quality. 'Oops: this will be competition!' But you need space, security, maintenance: it's the big guys who are pushing this forward, we are too small*." Clients' expectations of contract manufacturers are very high. They are, for instance, expected to alert clients in cases of constructively better alternatives. The work preparation manager provided the example of clients drawing square corners, while there are no milling tools with a radius of zero. If he saw such a case, the work preparation manager would call the customer by phone and ask if the corner needed to be angular. What 'formally' is simply manufacturing of the client's construction, often requires complex and far-reaching reflections. Enterprise 3 often has to care for new or auxiliary drawings or NC-programmes to be generated: a 'feasibility study' may factually demands co-construction. Clients seem to know and appreciate this: "*That's saving of time for them, saving money*" (work preparation manager).

The co-constructive role of the contract manufacturer implies high demands on work and qualification: *"People are challenged not only to be a good foreman, but also to have computer skills, especially in CAD and CAM. You also need to have knowledge about the equipment"* (CEO). Therefore, "*the qualification of the employees is absolutely crucial. We send them to ... vocational trainings: turning, milling, CAD-CAM, high-performance milling, machine control*" (quality manager). Some staff members, however, complain about too little vocational training. The management mentions the high price of vocational trainings which are offered by the producers of the production equipment.

The educational offers of the producers of production equipment are part of their marketing and, in turn, provide them with insights into new practices of use and emerging user demands: "*there are always new applications, methods, milling or turning strategies that evoke completely new tools. And suddenly you have completely new possibilities*" (CEO). The interaction between equipment producers and -users allows for an evolutionary development of technology that makes the quality of the trainings a central self-interest of the equipment producers. The equipment producers seem to be clever enough not to concentrate merely on advertisement, but to offer solidly generic knowledge, e.g. on CAD and CAM. Their certificates have become quasi-standards in the branch. For small enterprises, it is not the quality but the price of the training which is problematic.

The CEO receives many invitations to promotions. He regularly visits trade fairs and exhibitions of equipment producers to keep track of recent technological developments. When he saw a consignation stock for cutting tools with automatic refilling, he was among the first to order such a consignment stock for his small company and was, therefore, able to benefit from price advantages calculated for large key accounts. However, in the company, attempts to reduce the search for tools by means of identifiers failed: the CEO explained this failure by staff members not sticking to what they were meant to do as users,

whereas a staff member attributed it to inconsistent planning: *"if there was a certain plan, you only had to wait for a weekend to become confronted with just another one"*.

Before the implementation of the EPR system, data had been extracted from a route card organising production and had also been transferred manually into an "Access" data base. Then, there was the desire to switch to the ERP system: *"The man who sold it to us did that very well. He told me: 'I am a toolmaker myself'. 'Ok!' I thought. 'He also comes from the 'mechanical direction' and understands us well'"* (CEO). The ERP was expected to transform calculations into work schedules with timelines, which were displayed to the operators on the workpieces by barcode. When the calculation estimated the production to last for two hours, an end of production after 4 hours was an *"anomaly"* calling for explication. However, the system was not systematically used: *"it's a drama: they just do not stamp!"* The ERP expert interprets this as *"resistance of the employees, an absolutely normal process"* and explains it with a general opposition of the staff against being controlled.

However, another factor may have also played a role: *"There are people who feel controlled because you see who is doing what and when. BUT: there are also people who have to run around: how should they 'stamp'? They make - say - six machines a day. Here 10 min, then help recharge, then on the truck, in the meantime at another place: how should that work?"* (staff member). *"If one man operated three machines, the whole thing did not work ... We have to react DAILY - machine broken, man sick: what are we going to do now? We depend on suppliers! Then there is vacation ..."* (CEO). After three months, the CEO was no longer prepared to endanger the good work climate in the company: *"The software actually was meant to accompany the workpieces - we do not use this part of the software, because if we use it ... we totally lose control" "Putting something on people, because you find it good in the office ... I'm still in the workshop every day. And come from the workshop. Pushing people from above ... that must be very care-*

fully considered". The initial conception for the ERP was given up, and a workaround was established to reinstall the former proceedings.

The decision not to automate production control was appreciated by the staff - the process of decision making less so. This is worth a second look. Considering decision-making, the work preparation manager stated: *"It does not help me if something is fixed much in advance, because we usually need only a very short conversation, a minute or so, to know what's needed"*. His message states that problems could be solved within "a minute or so", if people only cared more. In a very similar way, the CEO described why regular meetings were given up: *"we communicate in passing, or people come to the office. If someone wants you to meet, we do. The alternative is too much talk"*. For both the work preparation manager and the CEO, immediate fixes of problems demonstrate expertise and are reasons for pride. However, skills that help in certain situations may fail in others: The implementation of an ERP system, one's own consignment stock for tools, or multi-user /multi-purpose systems in general, are highly complex projects, beyond the scope of immediate fixes.

Enterprise 3 is very innovation-oriented and full of innovation: staff members keep their eyes open to find opportunities for grassroots innovation. Solutions for specific orders are systematically stored in work preparation documents: in the case of a similar order, one may find the proven ideas there. But identifying problems in the own cooperation infrastructure, e.g. when appropriating digital technologies, is another story. It demands similarly systematic institutions that support evolutionary learning (cf. Möller 2015).

Apart from the production of metal products, enterprise 3 offers clients additional services, such as the acquisition of machine parts and the like from all over the world, and their assembling. The latter could provide new opportunities for persons with little milling or turning skills. The company has no educated assemblers, but staff members who are prepared and experienced in assembling components. The CEO wants them to benefit from the parts lists and 3D-drawings of the CAD

system. However, a mechanic responded to the question why he did not use the CAD system: *"I should have to pass a training course before!"* He knows to help himself, but the example shows that a further extension of assembling would require structural development.

Cooperation with other companies than the clients is generally avoided by enterprise 3. An external catalyst may make a difference in this respect. *"We had apprentices, at some point. But then we had no more time, no longer a vocational training workshop - I cannot afford to contract a certified vocational training supervisor"* ('Meister') *"who only cares about the apprentices."* As a result, enterprise 3 gave up apprenticeship. "*Then this gentleman came, and I thought that I had waited for him*" (CEO). The man proposed a vocational training network, which was indeed established. Today, 8 companies share one apprenticeship workshop and educational facilities. The CEO states: "*I now have 4 apprentices*!"

4.4 Our Feedback to the Companies

After the interviews, we fed our results back into the companies. The related follow-up workshops differed in terms of participants. We shall describe this in the following paragraph. In the workshops, we explained the points mentioned above as well as the conclusions following from these, before asking the participants to comment.

In the preparatory event in enterprise 3, we described the business model of the producers of production equipment in terms of '*Open Innovation*' (Gassmann/Enkel 2006) according to the flow of expertise: the products as a definition and spreading of their knowledge about production practices ("inside out"), the training workshops as means to extract additional knowledge from clients for further development ("outside in"). The producers of production equipment could thus profit from a "coupled" strategy of using both "inside-out" and "outside-in" for evolutionary technology development. In a similar vein, the production of prototypes by a contract manufacturer leaves risks of construction at the client's side, but profits from a kind of "outside-in" process, as the

constructions of the clients provoke learning processes at the manufacturer's side. At the same time, demands of clients for advice for improvement and factual co-construction involve some "inside out" as well. This makes some "coupled" processes attractive for enterprise 3, similar to the evolutionary technology development of the suppliers of production equipment. The CEO found it interesting that one could express the situation of a metal-working company plausibly in terms of the knowledge economy.

We also presented Jan van Dijk's (2012) differentiation of computer skills and his idea that the 'digital divide' is a sequence of deficits: from access, via operational skills ("button knowledge"), to strategic skills. We described the situation today as characterised by a rising multitude of applications with improved usability, used by ever more users, for whom they are more a kind of status symbol than a threat, even for elderly persons. However, two issues remained a problem: usage is often based on so little 'button knowledge' that to solve technological breakdowns is beyond reach. And: the lack of strategic knowledge makes innovation a problem – the latter representing both a problem of organisation as well as one of individual qualification. The highly innovation-oriented CEO took this as a very interesting point.

In all follow-up workshops we reported on the high level of grassroots innovation in the studied companies. We pointed at the role of external actors in disruptive processes of digitalisation, e.g. clients and suppliers of equipment. As examples, we presented the supply chains and the consignment stocks. With regard to multi-user and multi-purpose software, we pointed out that their configuration and implementation represents a big problem for SMEs, as they may affect the organisation intensely. This was commented to be true, but often not clear enough.

Following Argyris et al. (1985) in their differentiation between "first-loop learning" ('have we met our aims?') and "second-loop learning" ('did we follow the right aims?'), we explained that companies with

continuous improvement processes ('double-loop learning') had an institutional frame for an evolutionary way of developing information infrastructures. In turn, this implied that lacking institutions for organisational development endangered the appropriate tailoring of multi-user and multi-purpose platforms – a problem aggravated by the scarcity of ICT-expertise in many SMEs. We proposed semi-autonomous teams with integrated IT experts.

4.5 Counter-Feedback to our Feedback

After our presentations, we asked the workshop participants what they saw as our major message. In the follow-up workshop of enterprise 2, the CEO replied that we had shown him potentials of digital technology. However, we should not overdo it: it would neither be rational nor planned for enterprise 2 to fully integrate the production into digital networks. As he obviously saw us as kind of promoters of digitalisation, the CEO of enterprise 2 stopped further participation.

In company 3, our focus on participation and lacking institutions for evolutionary development was met with kind reception by both the CEO and the participants of the follow-up workshop. Discussions were so lively that the workshop ran out of time before taking decisions. A working group met, which appeared to aim at the preparation of a video for information purposes. This demonstrated the great role of grassroots innovation in the company but was no remedy against the "instant fixes"-habit.

Company 1 had been integrated into a group recently; the factory manager answered our question that reflecting the company's digitalisation measures helped him to understand the related investment process better. Investment into digital technology would "feel" somehow strange, as "real" investment would still be seen as new production equipment: "computers do not produce". Investments are considered to be about equipment and related instruction: that digital products need to be tailored to the situation on-site is still only little reflected in small

companies. When the MES was at stake, one had to estimate gains and losses in terms of the Overall Equipment Efficiency (OEE) in detail, and this was experienced as not that easy.

Calculating additional runtime for existing equipment in case one eliminated double work of the operators, one arrived at some 5% gains: enough to finance the investment. This estimation helps to understand the situation better: in a company of 20 production workers, 5% gains are equivalent to one worker. However, in times of labour shortage and with regard to desired redundancy of labour supply, it would be absurd to put into practice the reduction of one job. Gains are instead used for improvements, for instance, quality control. This is not full automation, as the production remains operated mainly by humans, whose helping activities remain little affected, apart from the fact that their integration into quality management may be conducted at computer terminals now.

5. Results

5.1 A Synopsis of the Cases

It is striking that two of three enterprises have undergone economic problems within the last decade. The CEO of enterprise 3 stated that he had faced longer periods of more than 50% reduction in business volume: this could have caused economic problems here, too. Obviously, small enterprises face an enormous pressure of competition and limitations of resources, in particular, financial ones.

In spite of intense competition, there was little cooperation with other companies - with some exceptions. Customers cooperate in the form of co-constructed products. Such as in the case of supply chains, co-construction with the client is ambivalent: on the one hand, the small enterprises feel pressed, on the other hand, they hope to profit. If the order of a client requires it, companies seem to accept cooperating with complementary enterprises, as long as it does not endanger

the client relation. A last exception is the sharing of vocational training facilities.

SMEs are intensely observing the market, in particular clients and competitors. In this respect, digitalisation has not only shaped the administration in companies, but their interaction as well. Orders are given, accepted, and processed digitally. This impacts production, more or less indirectly. On the one hand, robots, 3D-printers, auto-refilled consignation stocks, bar code readers, data glasses and similar hi-tech equipment are no longer beyond reach in SMEs. On the other hand, small enterprises do not have large financial resources: investments require fast amortisation and thus good capacity utilisation. This aggravates the problems small companies are facing when estimating investment implications.

In this respect, the use and tailoring to their demands of multi-user and multi-purpose systems appears to be a problem for SMEs. In company 2, the factual integration of the team of foremen into EPR use was described as a delinking of the production (this shows that the focus on technological networks may be detrimental for the awareness of networks of humans). Company 3 re-established a kind of *status quo ante* after an attempted expansion of the ERP system into production. Problems of configuring and embedding digital applications do not have to be attributed solely to the SME's lack of competencies, since "*the commercial models and planning processes used in them are almost entirely based on the idea of central planning, capturing and control of all material and immaterial processes*" and are, therefore, too "*deterministic*" (Ganschar et al. 2015: 104).

It was striking that all interviewees were using mobile technology. Distinctions from "digital natives" were no longer that frequent, both among staff and management. In most cases, interviewees tended to play down their problems with computer use. Obviously, generic designs such as windows-based graphical user interfaces have become commonplace. It appears as if staff that experienced economic problems

are seeing investments in digital technologies more as a securing of than as a threat to workplaces.

5.2 Answering the Research Questions

If we look at the results in terms of the research questions of chapter 2.3, the first relates to **industry 4.0 technologies** currently being introduced in small metal-working enterprises. On the one hand, all companies were strongly influenced by digital technology, especially in the administrative area. ERP systems had been introduced in the administration to integrate the data management. On the other hand, an MES system – according to the narrow understanding of "industry 4.0" supposed to control production automatically by using ERP data - was only found in one SME: even there, it was not implemented for automatic, but for manual input of production data. If one sticks to the versioning of industries criticized in the beginning the observed technological change would better be described as "industry 3.x" than as "industry 4.0".

In the small metal-working enterprises, adaptive systems in accordance with the narrow "industry 4.0" – understanding only existed in the form of self-refilling consignment stores of cutting-tool sellers. To connect production the equipment in an industry 4.0 manner would currently not even be possible in the companies we studied, as these have PLC controls which are not suitable to be networked (for this reason, attention is being paid to networkability with corresponding new purchases.)

Hi-tech equipment is not unattainable for SMEs anymore, but the operation of the equipment has to be embedded in the enterprise culture and investments require fast amortisation. In one of the examined SMEs, a robot was bought to feed the production equipment at weekends. The robot was purchased to be able to react to unusual peaks, not to substitute existing staff. We saw several attempts to use cyber-physical systems, in particular bar codes. However, their introduction and use typically proved to be far more complicated than had initially been

expected. All companies worked on improved sensors in one way or another, but in order to improve quality assurance, not for a synchronous simulation of production or full automation.

Our empirical research has shown that a very large number of employees in the studied SMEs would like to have more **qualification**, including older staff members. The importance of qualification has also become recognised by the company managements, but apparently the topic has emerged only recently. Many employees have never participated in any formal qualification. The boundaries between occupational and individual-vocational education appear to be fluid. We found the arrangement of a company paying an (unusually) expensive training for which the employee would have to take holidays. In the metal-working industry, the equipment producers seem to play a very important practical (and expensive) role in providing occupational and individual vocational training. New forms of inter-company co-operation emerge through which vocational training workshops can be shared.

Informal forms of learning such as "over-the-shoulder learning" (mimicry) and trial-and-error play a large role when coping with digitalisation. With the help of colleagues, family, or acquaintances during work and leisure, employees in the SMEs have acquired user skills. However, these do not always include strategic computer knowledge, as basal usage of mass applications prevails. Both skills to cope with usage crises and comprehensive knowledge of social and technological implications should be improved. The **perception of changes in the labour domain** shows a rather optimistic stance, which tends to underrate one's own possible problems with digital technology.

Improved usability of the IT is reducing factual **problems with qualifications**, not only those that may be perceived. Digital technology is often integrated into physical equipment, for instance, in production equipment. When introducing IT, processes of configuration and organising operational contexts play a greater role than for other investments because of the adaptable nature of digital technology, but

the related design tasks could find better solutions in small enterprises, if the related problems were studied systematically. A lack of competencies to reconcile the tailorable digital technology with organisational peculiarities proved to be particularly problematic: this is a deficit in sociotechnical self-organisation beyond the limits of individual qualification. The limited adaptability of some ERP systems appears to aggravate the deficit.

Among the current **drivers of digitalisation** in the studied SMEs, it is not full automation that plays the most important role, but the improvement of existing work arrangements. The situation might change in the long run, but today staff members in the small enterprises that we studied considered digitalisation more as a modernisation of their jobs rather than as their replacement. Operators are typically qualified to work on different equipment. Their jobs have also become linked to quality management, work preparation, or additional services instead of becoming more specialised or replaced by robots. This is in contrast to dystopian prophecies of an end of labour due to digitalisation, and it places doubt on the assumption that manual activities will be among the first to be replaced.

Additionally, there is the question whether management functions at the interface of administration and production (quality management, work preparation, logistics, etc.) will be reduced in the way that Boes et al. (2015) describe as a "digital assembly line" and Hirsch-Kreinsen (2014: 425) as a possible new horror of (middle-) management. In the studied cases of small companies, where such roles are often filled by only one employee (if one does not, in fact, even have multiple roles) larger reductions are rather implausible as one can hardly differentiate between strategic and routine functions here. Nevertheless, with regard to the question of whether digitalisation is more likely to result in **polarisation or revaluation** (cf. Ittermann et al., 2015: 8), there are indications for both. We argue that in view of the complexity of the in-

terdependencies, sound predictions of how change will articulate in the long term are hardly possible.

We have found many changes of work processes: these are predominantly very complex and unpredictable (cf. Hoffmann 2018). However, it can be stated that a high degree of digitalisation does not necessarily entail disruptive changes (Hirsch-Kreinsen et al., 2018: 3). The implementation of technologies that allow for disruptive changes does not determine disruption, but may also support evolutionary processes, while disruptive changes may arise unexpectedly, for instance, as the result of neglecting evolutionary organisational development.

While in other branches, company types, or regions, the situation may be very different, in the enterprises we studied in North-Rhine Westphalia, mostly during 2017, the managements tended to bind experienced staff to the company. This does neither imply that the interests of management and staff were identical, nor that one never tried to gain from the loss of the other. However, one tried to keep within red lines: the situation in the small companies was not characterised by a kind of 'hire-and-fire' mentality, in contrast: interviewed CEOs stated that they experienced the firing of staff members as a personal failure. This may partly have to do with the scarcity of skilled labour in Germany at the moment, but it was obviously more than a short-term strategy of boom times. The actors in the small metal-working enterprises seem to know – and appreciate – this.

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Travelling by Taxi Brousse in Madagascar: An Investigation into Practices of Overland Transportation

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Abstract

Organising public mobility is a global challenge. However, most studies directed at ICT support approach the subject from the perspective of developed countries. In contrast, we conducted a modest and initial attempt to study practices of public transportation in Madagascar – one of the poorest countries in Africa. We found that central assumptions, usually unquestioned in prevailing studies, were challenged in the context of this developing country. We present an empirical study which analyses how collective taxis, locally called Taxi Brousses, are used in overland travel. The study reveals complex socio-political conditions which passengers face in this country. Security as well as corruption issues shape these transportation practices. Based on our findings, we indicate opportunities for supporting intra-organisational cooperation and the customers' interaction with ICT artefacts.

Introduction

How to organise mobility in an economically and ecologically viable manner is a global challenge. It seems obvious that public transportation and the sharing of means of transportation and even rides will play an important role in dealing with these problems. In HCI and CSCW discourses, it is understood that ICT will play an important role in making public transportation more accessible and will

enable new sharing concepts. However, the required pattern and the resulting mobility practices play out quite distinctively in different socio-economic contexts.

The current state of the art in the CHI and CSCW community is quite strongly influenced by North American and European perspectives on the framing of the problem. Transportation infrastructures, available means of transportation, mobility needs, and ICT support vary quite remarkably among industrialised countries. However, there is an even greater level of diversity when taking developing countries into account. For this reason, in this paper we will focus on Madagascar – one of the poorest countries on the African continent.

Many parts of Africa suffer from problematic transportation infrastructures and conditions. The World Bank expresses this fact in the following way: "Perhaps the most compelling problem is that of road infrastructure. There are fewer kilometers of roads in Africa today than there were 30 years ago. Some 70 percent of Africa's rural population lives more than 2 km from an all-season road. And the cost of transporting goods in Africa is the highest in the world" (Teravaninthorn/Raballand 2009: xi).

For a long time, the international development aid community has tried to overcome these deficits by investing in infrastructure, specifically by building new roads. However, such a purely techno-centric approach did not lead to the intended results. The World Bank explains this phenomenon by arguing that policy or institutional failures prevented traffic infrastructures from being productive (Teravaninthorn/Raballand 2009: xii).

Within the CSCW and HCI community it is typically argued that mobile ICT may be able to render traffic infrastructure more effective. However, the specific requirements for supporting public transportation in the developing world are, as yet, neither well understood nor explored in a design-oriented manner. As Miteche et al. (2012) put it for the case of dynamic ride sharing systems (DRS): "The DRS systems that

are available have been designed for use within a developed world context and are therefore not relevant to the majority of the population of developing nations like South Africa" (1).

We therefore argue that design work should start with an ethnographic analysis of a distinct field of social (mobility and transportation) practice in a specific country (Wulf et al. 1999, 2011, 2015, and 2018; Rohde et al. 2017; Friedman/Wulf 2017). This paper is built on a long tradition in CSCW research which grounds ICT design in an empirical analysis of related social practices (Hughes et al. 1992; Crabtree/Rodden 2002; Adeel et al. 2013; Gajera/O'Neill 2014; Liu et al. 2014; Rohde et al. 2016; Shklovsky/Wulf 2018).

In the following we will present an empirical study, which investigates how collective taxis, called taxi brousses, are used in Madagascar for overland travel. Collective taxis in Madagascar offer the lowest transportation fares in urban Africa (GTZ 2008). Accordingly, it seems well worth investigating the corresponding mobility practices, even beyond the capital region.

The argument is structured as follows. In the state-of-the-art section, we link the northern dominated discourse on ICT in support of public transportation to particularities in African public transport. Following this, we introduce Madagascar, its socio-economic and historical background as well as its infrastructural conditions. Following a description of research methods, we present the empirical results. We discuss our findings with regards to the observed transportation practices as well and suggest some implications for design. We conclude by outlining a research agenda dealing with collective taxis and ways to improve their function.

State of the art

Looking at industrialised countries, there is a growing debate on applying (mobile) computing to improve public transportation. Peng (1997), for instance, showed the advantages that accrue when planning a trip

by making use of information and communication technology compared with paper-based solutions. Mobile computing and tracking solutions for individual means of transportation allow live information to be provided during transportation (e.g. Mac Lean and Dailey 2002). Research indicates the benefits of this information with regard to reduced waiting time, reduced uncertainty, increased ease of use, willingness to pay, adjustment of travel behaviour and increased flexibility in general (Dziekan/Kottenhoff 2007; Ferris et al. 2010).

More advanced approaches attempt to predict the information travellers will require in a given situation, based on tracking past behaviour. It is usually argued that it is necessary to include accounts of personal and social behaviour to understand where the users might be heading (Foell et al. 2013; Patterson 2014; Stein et al. 2017). Together with geographic positioning and schedule data, they are able to design "personalised information spaces" based on schedules.

Summing up, research in public transportation has developed from providing static schedules online. Advanced solutions offer live information and access to mobile information in order to increase flexibility and reliability when schedules are not met. The incorporation of personal and social behaviours is deemed interesting for the support of transportation activities in an even more advanced manner.

Interestingly, there is little ethnographic work in the HCI/CSCW community investigating the usage of public transportation in northern countries. Existing, mainly quantitative, empirical work focusses on information related to transportation activities, neglecting contextual factors of mobility practices (e.g. Ferris et al. 2010; Foell et al. 2013) and neglects to question some of the fundamental design assumptions. An exception is a study by Pritchard et al. (2014) that focuses on the question of how location-based services change the work practices of bus drivers in London, UK. The authors developed several design requirements based on the drivers' practices and customers' experiences. Meurer et al. (2014 and 2018) look into the mobility practices of elderly

in a rural environment and develop applications which combine access to public transportation with suggestions for ride sharing based on an analysis of mobility routines (Stein et al. 2017). However, in developing countries, specifically in very poor countries, public transportation may be structured quite differently.

Over the past decades, developing countries have seen a range of different political, economic, and regulatory regimes governing public transportation. Teravaninthorn/Raballand (2009) state that during colonial times in many African, Asian, and Latin American countries, bus services were often owned and managed by monopolies of expatriates as subsidiaries of major suppliers in the colonising country. In the early postcolonial period, they were taken into national ownership but continued to operate as protected monopolies. In socialist economies, such as Madagascar, they were often taken into nationally owned public sector monopolies. These monopolies have now mostly been abandoned. Public road transportation in Africa is nowadays mainly in the hands of privately-owned companies of varying sizes, operating under distinct regulatory regimes. Kumar/Barrett (2008) argue that abandoning state monopolies has also changed the vehicle base of public transportation. It has shifted from large buses towards minibuses, at least in urban public transport.

Overall, the development aid community assumes that public transportation in Africa cannot meet the demands of the population (see Abuhamud et al. 2011, specifically for urban transportation). To better understand the diversity in Africa's public transportation, the German development agency has conducted a price comparison of transportation in African cities. As a result, they indicate that "[p]rivate collective taxi fares differ tenfold (between Madagascar 10 US cent and Senegal US cent 100 [...])" (GTZ 2005: 3). While these figures are more than ten years old by now and biased by exchange rate issues, still Madagascar seems to be an interesting case, as it is operating a low-price public transportation system.

There is a considerable amount of literature in the field of developmental studies which deals with improving transport systems. While for a long time the community of development aid studies mainly focused on the importance of road building, newer studies argue that the way (public) transportation is organised on these roads plays a key role in achieving developmental goals (for the case of rural transport services see Starkey/Njenga (2010)). However, developmental studies are understandably geared to policy making and typically lack a serious empirical investigation into the social practices to be changed.

ICT4D has not yet dealt with ICT support for transportation issues in any depth and the area of public transportation has been specifically ignored. For a notable exception see O`Neill's group's recent empirical work on transportation practices in Bangalore, India (Ahmed et al. 2016) and Windhoek, Namibia (Kasera et al. 2016). Inspired by the success of platforms such as Uber and Lyft, they investigate practices of urban transportation. We believe, however, that mobile computing may offer opportunities for improving the effectiveness of overland transportation even under the very specific conditions of developing countries.

In a related sense, Schaub (2012) explores how mobile phone infrastructure supports Africans to migrate overland to Europe. The use of mobile phones is demonstrated to be central to the migration process: migrants draw on the accessibility of contacts equipped with mobile phones to tie together their expansive help and transportation network. Phones are also used by migrants' "helpers" for the purpose of internal coordination. Miteche et al. (2012) present early design ideas for developing an appropriate dynamic ride sharing system for people on hitch hiking trips in South Africa. Given, however, the fact that empirical investigations into local hitch hiking, ride sharing or public transportation practices remain rare, the claim for design-related particularities in ride sharing support remains vague. One exception is that of Williams et al. (2015), who investigated the semi-formal bus system

of Nairobi, Kenya, focusing on the use of mobile phones to create open source data for better planning of transportation and services. Their study discusses the relevance of data gathering, especially with regard to standardised open-data architectures and the impact on the development of mobile routing apps.

There is an emerging line of research inside the ICT4D community which uses mobility patterns from mobile phone users to collect and extract socio-economic information. Frias-Martinez et al. (2012) present a model that approximates socio-economic levels based on human mobility variables derived from mobile phone call data. Blumenstock (2012) relies on the same type of data to investigate patterns of internal migration in Rwanda. The author argues that he is able to compute patterns of temporary and circular migration, which are difficult to observe using standard techniques. While these techniques to analyse structural mobility are specifically attractive in the context of weak administrative institutions, the data offers considerable potential for state surveillance and other abuse.

The related discourse in the HCI/CSCW community is focused on infrastructural conditions and the transport practices of industrialised countries, specifically the US and Europe. The resulting design assumptions have not yet been questioned by looking at transport systems in developing countries, specifically very poor ones. To our knowledge, there is not yet any ethnographic study in the field of ICT4D which has looked into overland transport practices in the developing world. Moreover, there are also only very few studies which have looked at ICT4D research opportunities in Madagascar. From the perspective of market sociology, Cholez/Trompette (2013, 2014) provide two interesting studies on local fish markets and mobile phones (2013) and note how second-hand car batteries are used to recharge mobile phones, listen to music, or watch TV (2014).

Madagascar: a brief history

Madagascar is an island country in the Indian Ocean, off the coast of Southeast Africa. It has a population of about 23 million. According to economic measures, Madagascar is one of the poorest countries in Africa. Various sources report that between 50 and 70% of the population live below the poverty line (CIA 2015, wikipedia 2015). At only 64.5%, the literacy rate is low (CIA 2015). With regard to the Human Development Index, Madagascar is ranked 155 among 187 listed states (UNDP 2013).

Man has been settled on the island for less than 2,000 years. The initial human settlement of Madagascar occurred around 350 BC by Austronesian peoples who now mainly live in the central highlands. They were joined around AD 1,000 by Bantu migrants from mainland Africa, who now mainly populate the coastal areas. Madagascar was, therefore, ethnically and politically divided into two for a long time. In the 19th century, the island was politically unified by the Merida kingdom, situated in the highlands around what has since become the capital, Antanarivo.

Europeans began to influence Madagascar in the 17th century. At the same time, Arabs were using the island as a base for their slave trade. Madagascar formally became a French colony in 1896, gaining independence only in 1960 following a violent uprising in 1947.

Post-independence, Madagascar has experienced a considerable level of political instability. For one and a half decades after gaining independence, it remained subject to French influence (first republic). Following a military takeover, it became a member of the socialist block under the first presidency of D. Ratsikara (second republic, 1975–1993). After a considerable period of transition, contested presidential elections and a seven-month standoff, Marc Ravalomanana eventually became president in 2002. He moved the country towards market reforms and political alignment with US rather than French interests (third republic). The country benefited considerably from the engagement of international donors, specifically the US. In early 2009 Ravalomanana

was pushed from power in a process internationally condemned as a *coup d'état*. The new strongman, A. Rajoelina, ruled until 2013 while the international community drastically reduced its financial and technical support. Finally, H. Rajaonarimampianina was declared the winner of the 2013 presidential election, which the international community deemed acceptable.

Due to sanctions imposed by the international community, the economic situation has considerably deteriorated since 2009. Moreover, the country faces increasing security problems. Organised bandits, often called 'dahalo' (cattle thieves), often attack not only vehicles on national roads but even entire villages. The political, administrative, and security systems are also characterised by a considerable level of corruption. Madagascar ranks 133 of 175 countries in the Corruption Perceptions Index (Transparency International 2014).

French is still one of the two principle languages and is taught in all schools, together with Malagasy. All higher education is conducted in French. Due to the poor state of the (basic) education system, the capability to engage in meaningful discussions in the French language is not equally distributed but rather limited to the middle class and people working in the tourism and partly in the transport branch.

Transportaton, Electricity, and mobile Phones

Madagascar has a rather limited network of paved roads: 5,613 km (CIA, 2015). The structure of this network is directed towards the capital, Antanarivo. The four main lines of tarred roads, Route Nationales (RN), leave the capital to go north (RN 4 and 6 to Diego Suarez (Antsiranana)), east (RN 2 to Tamatave), west (to Morondave), and southwest (RN 7 to Tuléar).

This limited network of sealed roads is extended and in parts connected via non-sealed roads, which are often only operational during the dry season. For instance, to travel the 400 km from Morondave (west) to Tuléar (southwest) there is an infrequently operating taxi brousse in the dry season which takes two to three days on unsealed

roads. The main city of the country's south, Port Dauphin (Taolagnaro) can only be reached via unsealed roads. To reach Port Dauphin is a 600 km ride via a camion brousse from Tuléar, taking some 30-60 hours, depending on the road conditions.

The network of trains is fragmented as well and basically offers two unconnected lines with a length of 854 km. As for flights, 12 internal destinations are served by Air Madagascar's domestic services. However, these flights are expensive and scarcely affordable for the vast majority of the population.

In Madagascar, many rural areas do not have electricity; according to the ministry of transportation, only 4% of rural Madagascar is covered (Madagascar Laza, 2014). The cities are mostly supplied with electricity. However, they suffer from shut downs for a number of hours every day – except for the living quarters of the upper class. During our stay, we experienced electricity breakdowns quite frequently.

At the time of research, there were four mobile phone providers active in Madagascar (Airtel, Telma, Zain, and Orange). However, none of them covered the whole country. The large, very poor part of the population is not yet well equipped with mobile phones, not even with old ones. This seems to be specifically true in rural areas. Payment is by prepaid vouchers of 1,000 Ar (0,30 €) or more. While different operators were advertising special rates for connections within their networks, the price for internetwork calls was quite high at 300 Ar (0,09 €) per minute.

Internet was typically accessed via mobile operators: connecting a computer to a mobile phone. The connection was not always stable. The price for data services seems to be fairly reasonable. A French hotel owner told us that he can work on his email via a web browser for some 50 minutes using a 1,000 Ar card. There were also flat rates available. So mobile networks allow people to access the internet even in regions where neither electricity nor landline telephones are available – given they find ways to charge the batteries of the mobile phone. Cholez/

Trompette (2014) describe how old car batteries are charged in border areas which still have access to electricity. By transporting them to uncovered areas close by, accessibility of electricity is extended in a manner often sufficient to charge mobiles.

Research methods

The data for this paper was collected during a four week stay in Madagascar in August/September 2014. While travelling the country, the first and second authors used public ground transportation, mainly taxi brousse. However, they also used a train, various (cargo) boats, shared taxis, and hitchhiked via a truck.

In the first phase of the study, the authors travelled via taxi brousse from Antanarivo east to Moromanga (RN2), took a train to Andranokoditra, and a cargo boat on the Pangalan channels to Tamatave. From there they took a taxi brousse via RN5 (first paved, later unsealed) to Cap des Reyes for a boat transfer to Isle St. Marie. On this island they travelled first to the northern end and later to the south. Later on, they returned to the main island and took two taxi brousses back to Antanarivo (on RN5 and 2).

In the second phase of the study, the authors travelled in four different steps south to the southwestern town of Tuléar and back in a single night ride to Antanarivo on RN7. Most of the roads they used were sealed, except for a small part of RN 5 north of Saonierame-Ivongo. Overall, they travelled some 3,000 km, more than half of all paved roads. They spent some 70 hours in taxi brousses, taking 16 rides altogether. The length of the rides varied from 20 km to 950 km, their duration from 1 hour to 19 hours. The waiting time for the taxi brousses was used to investigate the operation of the respective transportation organisation.

While interested in public transportation in general, and ICT-based opportunities for its improvement in particular, the authors wanted to explore how the mobility practices were structured around taxi brousses. Taxi brousses appeared specifically interesting since they

offer a rather affordable means of public transportation in one of the poorest countries in Africa.

Our study is limited mainly to taxi brousses operating on paved roads in Madagascar. These are the infrastructurally more developed parts of the county where we assumed that mobile phones and their networks would be more readily available.

Using taxi brousses extensively, our research methods are based on observations and interviews. Observations were often accompanied by informally imposed questions to better understand the phenomena at hand. We interviewed a variety of different actors. Many of them we met while organising rides, others we met as passengers in the taxi brousses. We observed a large variety of drivers and assistant drivers and interviewed different local managers and matchmakers at taxi brousses stations. During our trips, we talked to other passengers such as a doctor, a retired seaman, and a textile engineer. We also collected information on transport conditions and practices by interviewing employees and owners of local hotels. With regard to the institutional framework, we conducted an interview with an officer of the Madagascan Ministry of Finance.

Overall, 18 interviews were conducted, each of which lasted between 10 minutes and 3.5 hours. While the context for the interviews was chosen deliberately, the interviewees were selected on an opportunistic basis.

The interviews were non-structured and open ended. After some relationship and trust building between the interviewers and the interviewees, the local actors were typically asked to describe their personal background, where they were going, and how they use public transportation. When speaking to the employees and drivers at the taxi brousse stations, we were particularly interested in how they performed their job and which artefacts they used to do so. We also observed and asked about the different actors' use of mobile phones – specifically with respect to their application regarding enabling public transportation.

Fig. 1: Writing of field notes: a bit sick (Anakao, South Western Madagascar)

The interviews were conducted in French and sometimes in English depending on the interviewees' foreign language capabilities. We decided not to include a translator for the different Madagascan dialects in our research endeavour because we were most interested in an immediate and unmediated contact with the different actors. However, we used French-speaking locals to translate for us where necessary.

To avoid disturbing the relationship building during the often-casual encounters, the interviews were not recorded. To document some of our observations, we took photos selectively with an iPhone. Comprehensive summaries of the interviews and observations were written every evening. Overall, we collected some 60 photos and some 30 pages of field notes.

Understanding taxi brousse

The concept of taxi brousse is rather vague in Madagascar and often misunderstood and misrepresented in its diversity. It is typically associated with its operational mode: a taxi brousse will not leave before it is completely filled with passengers, which makes their schedules rather unpredictable. While we found this assumption often met, specifically in rural areas we also found operational modes where the car started its route with empty seats, relying on a rough schedule.

Taxi brousses circulating on longer intercity paved roads are typically 20-30-year-old Toyota mini buses. For some destinations south of the capital and on the long-haul trip from Tulèar back to Antanarivo, newer Mercedes Sprinter mini buses were in use as well. On unpaved roads old trucks circulate, whose loading areas are equipped with wooden benches. Driving a taxi brousse requires a high level of sensitivity and skilfulness in maintaining the operational state of the ageing vehicles, which are in constant requisition.

A business that is run by one owner (typically a natural person, 'le patron') is called a 'cooperative' in Madagascar. These cooperatives can be of very different sizes. The largest cooperatives run more than 100 taxis, the smallest just one. Cooperatives can serve one or more lines, which can be either at national, regional, or urban level.

The cooperative needs to be registered with the government and pays a license fee per vehicle on a specific line (2 Mio Ar, some 650€). Moreover, the cooperative pays a yearly tax per vehicle of about 400,000 Ar (some 130€). Furthermore, the import of vehicles to Madagascar is highly taxed (depending on size; for a mini bus about 6,500€). Gas is taxed as well - diesel costs about 90€ cent per litre, gasoline 1.10€ (fig. 2).

Inside a taxi brousse

A taxi brousse offers a specific physical and social environment. Regional and local services are typically systematically overloaded by 40-90%; e.g. Toyota mini buses can carry 22 adults on 12 regular seats.

Fig. 2: Taxi brousses at a station in the town of Ambositra (Central Madagascar)

Additionally, smaller children typically travel on the laps of their parents and do not pay. These conditions create a physical density of bodies which requires openly articulated or physical negotiation for space. Latecomers are typically disadvantaged and need to gain their appropriate seating space over time. Particularly on night rides, the space issues can become conflictual.

Exiting a taxi brousse can also be a challenge. If somebody from the rear seat wants to leave, most of the other people need to get out as well. Young men sitting at the rear often leave the bus via a small acrobatic exercise through one of the rear windows. Another 'pleasure' of riding in a taxi brousse, we discovered, is children who get travel sick during the drive and vomit in their vicinity. Besides their seat neighbours, it is the mothers who are typically most affected and try to clean themselves and their child up when the taxi brousse comes to a stop.

A taxi brousse trip typically contains breaks for breakfast, lunch, and dinner. In such a case they stop in a town or village in front of a food stall or roadside restaurant for some half an hour. The passengers can decide what to do – stay in the bus, walk around looking for food themselves, or enter the restaurant. The different cooperatives seem to have certain agreements with specific places to stop. By deciding on the parking, they contribute to the allocation of the passengers' buying power. We observed that the drivers often do not pay for their food - getting at least the food as a pay-back for their decision to stop in front of a specific restaurant.

Taxi brousse drivers and their passengers like pop music: local as well as in English and French. Though the taxis are decades old, the drivers typically have their own portable digital storage and play their music via the taxi's radio, which was working in each of the minibuses, no matter how rundown it looked. The passengers often join the performance and a rhythmic atmosphere fills the bus.

A taxi brousse tries to satisfy certain customers' needs very closely. For instance, whenever a customer requires a toilet stop, the driver typ-

ically stops directly on the road and lets the passengers out. On such an occasion, most other passengers will join in and satisfy their physical needs, either directly next to the bus or, in the case of the ladies, first searching for a nearby ditch or bush. Even passengers of the middle and upper middle classes act in this way.

A taxi brousse does not (only) stop at fixed stops. The driver typically allows the passengers to decide where to leave the bus. Thus, when approaching the final destination, a taxi brousse can stop quite often to let individuals out, close to their homes (fig. 3).

Traffic and road conditions

In Madagascar, even the main roads such as RN2 and RN7, are typically rather narrow two-lane streets. They pass through the centres of cities, towns, and villages. Even these roads have in parts huge pot-holes, typ-

Fig. 3: Inside a Toyota taxi brousse

ically they make it necessary to reduce the travelling speed strongly to careful circumvene them. Many of the bridges have only one lane and thus can only be crossed in one direction at a time.

The traffic speed is, therefore, regulated at quite a low level. Heavy trucks are only permitted to drive up to 45 km/h, taxi brousses 75 km/h. During the day, the taxi brousse rarely reaches this speed und typically runs at an average speed of 40 km/h. Hence the average traffic speed is rather low.

Problems resulting from the road conditions are described in the following field note:

> "Later at night, there was a severe accident on the route. A truck was literally broken into two pieces – the connection between the front part and the container carrying part behind was broken ('deattache') because the steel was obviously exhausted. We [our minibus and the whole traffic on the national road] had to wait 5 hours before the rear part [of the truck] could be moved from the very narrow main street [RN2], so that other vehicles could pass the place of the accident. The driver and we tried to sleep during the waiting time (difficult in the narrow confines of the minibus). The village [in which the accident had happened] got sort of rich from the things people [several hundreds of passengers of all the vehicles travelling in both directions] were trying to buy (beer, drinks, food). With regard to this accident one of the other passengers told us: 'I am happy that the traffic is so slow in Madagascar. Otherwise we would have many more victims in this type of accident'. Indeed, the RN2 [which connects the capital with the country's main port] is mainly a winding street of two mostly rather narrow lanes."

Organizational structure and work practices

As already mentioned, the taxi brousse business is run by cooperatives. One cooperative can serve different destinations. We investigated spe-

cifically into the organisation of mid-size cooperatives, which run between 8 to 25 vehicles on national and regional lines. In these mid-size cooperatives, the managerial labour is divided between the patron who mostly works from a central office and local station managers who run small stalls in places where a taxi line starts. The station works with additional local staff who help to attract passengers, mount and fix luggage on the buses' roofs and help organise. Each taxi is operated by a driver who is supported by one assistant driver. In the case of very long-distance rides, the taxis are run by two drivers.

In the following, we describe the work practices of a mid-size cooperative serving a long distance line; in this case the route between Tamatave and Antanarivo.

Placement Agents

The central taxi brousse station in Tamatave (second biggest city with some 200,000 inhabitants) stretches several hundred meters along a rather busy street. Given that 25 cooperatives serve the line to Antanarivo, it is not easy for the passengers to find out which one offers the best value service and leaves soonest. Consequently, Tamatave has a rather large and pushy community of poor freelancers with some language skills whose aim is to convince travellers to move towards the stall of a particular cooperative. The cooperative pays them a fee for securing customers to fill up the taxis (we later learnt that this fee may be up to 10% of the fare).

The placement agents search for potential customers by checking who is approaching the taxi brousse station. They watch out for travellers who are either walking towards the station or arrive by taxi, rickshaw, or another taxi brousse. They typically ask the potential customers where they want to go and use the ensuing conversation as an opportunity to guide the travellers towards a specific cooperative. Placement agents are in competition with each other, at least in larger places, and so they can be quite aggressive when competing for poten-

tial customers and persistent in convincing the travellers to be guided by them. For travellers who are not familiar with the local conditions, it is often very hard to judge whether an agent is trustworthy and which placement strategy he follows. Moreover, it is often not clear whether their provision ends up on the bill, especially where foreign travellers are concerned. Thus, travellers often try to avoid these agents wherever possible, gathering the necessary information by themselves, or at least choosing the agent by themselves.

Arriving in Tamatave in another mini bus, we tried to avoid a group of placement agents who jumped on us even before we had really left the bus. To do so we needed to cross a larger puddle in front of the bus door which physically set us apart from the agents. However, walking along the road and looking for the best way to travel quickly to Antanarivo, we finally felt the need of support and agreed to let two agents help us. They took us to a parking lot away from the main street, covered by puddles.

We came across these agents in almost all the towns we visited. They are of specific importance in towns from which only a small number of services run. These towns rather rely on vehicles passing through for their transportation opportunities. In Moromanga, a city on the way between Antanarivo and Tamatave, we observed one particular local placement agent who was standing at the main junction of the road, matching travellers looking for rides with passing cars, trucks or taxi brousses. We arrived in the afternoon when there was no further direct service starting from the taxi brousse station. The agent told us directly that there was going to be a local mini bus that would still come and indeed, after waiting for 30 minutes, a young guy came along with an empty Toyota. While a crowd of waiting passengers jumped on the vehicle, the agent offered us preferential access. However, the pricing conditions were unclear, and a specific surcharge for foreign travellers was imposed by both driver and agent (which we decided not to accept and, therefore, had to stay overnight in Moromango).

At the Cooperative's Stand

At the places where lines start, cooperatives have small wooden stalls on which their name and the destinations they serve are advertised. Upon arrival in Tamatave, the local agents guided us to a half-full Toyota minibus which was waiting to fill up and leave. Since this was a direct service to the capital, it needed to be filled up to the very last seat (which, in our case, took another 45 minutes).

Before the taxi leaves the station, the local manager is in charge of all activities. He organises the seating of new passengers and collects the money. He is also responsible for the administrative procedures, which are all paper based. The local manager had drawn a rectangle in a notebook, subdivided the bus into 5 x 3 fields representing the driver's seat and 14 seats for passengers arranged in 5 rows of 3 places. In each field, he marked a passenger's name, an abbreviation for the destination the traveller wanted to go to (unless traveling to the final destination), and the fare paid. At the bottom of this page he noted the mobile number of a passenger who had made a seat reservation for this service by phone the day before. Based on this map, he could easily see which places remained to be filled. He sometimes rearranged the seating by crossing out names with a small bottle of tip-ex.

For each passenger or group of passengers, he issued a ticket on a smaller piece of paper on which the 5x3 map of the taxi was printed. By making circles around the space and its number, he documented the seat assigned to the customer. He also put the passenger's name on the ticket and some further information (e.g. date, taxi number). He finally stamped the ticket with the company's stamp.

After having bought the ticket, our luggage was lifted to the roof of the mini bus and fixed there with ropes by the assistant driver and local assistants. Finally, when the bus was filled, the local manager copied the filled rectangle from his notebook into a notebook belonging to the car. Thus, all the passenger information in his books was now additionally in the driver's notebook. This document was signed by both the

driver and the local manager. Finally, he handed over all the fares he had collected from the passengers to the driver (fig. 4a–b).

We found similar practices in other cooperatives operating on longer distance routes. On the long-distance line between Tuléar and Antananarivo, almost all seats were reserved in the days immediately before the departure. In such cases, the local manager works from the beginning with two representations of the taxi's seats: the additional diagram containing the passengers' mobile numbers. In the hour before departure, the local manager and his senior assistant called all the passengers with a previous reservation to ensure they will really take their place (otherwise the seat would be reallocated). This cooperative works with two notebooks to be handed over to the driver: the first containing a list of the individual names and the fares paid plus phone numbers of those passengers who will enter the taxi at a later stage of the jour-

Fig. 4a: Preparing for the departure of a long-distance service

ney. The second notebook just indicates the complete amount of money being handed over to the driver. For shorter routes, we typically found less formal ways of allocating seats to passengers and accounting for the fares. The simplest method is to allocate a seat to the passengers on entering the taxi brousse and to hand over the fare to the driver – often mediated by the assistant driver or a local agent who may take his commission before handing over the fare. In all the settings we investigated, the driver was ultimately responsible for accounting the financial outcome of a specific ride and handing over the money to the patron.

En Route

After having left the station, the driver is in charge of all the important decisions to be made in dealing with the contingencies of the ride. He decides on the stops and breaks – particularly the informal ones; how

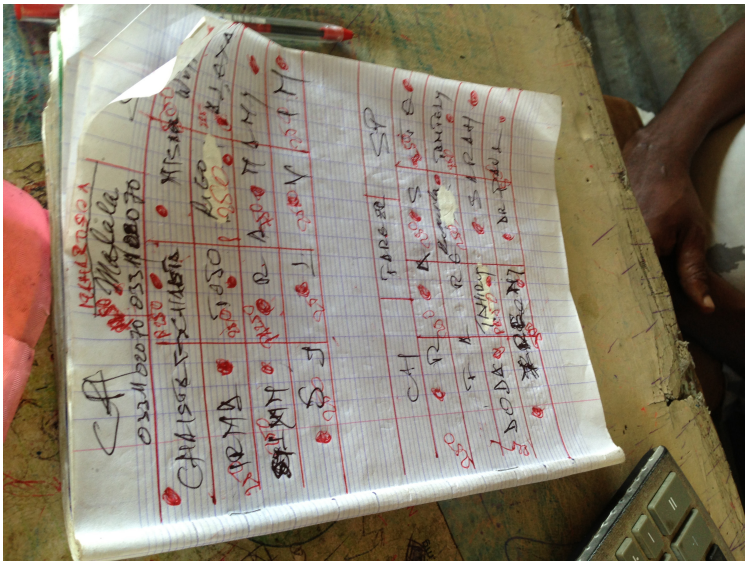

Fig. 4b: Notebook to administrate reservations (Tuléar, South Western Madagascar)

many passengers to add in a specific situation, and whom to allow to take a seat. He also pays for the petrol from the fares he has received.

The driver is also responsible for handling the official documents required. In all cases we observed that the driver was equipped with a folder containing official documents such as his driving license, 'a carte de crise', the taxi's transportation license and a certificate to document that the annual tax had been paid. Since this folder has to be presented rather often to policemen at control posts, it was typically placed over the windshield at the driver's seat. Next to it, the driver would deposit the notebook specific to the intra-organisational purposes of the cooperative.

On the road, it is mainly the driver who does the driving. The assistant driver supports him by letting passengers in and out and loading and unloading their luggage from the roof of the taxi brousse. He also typically collects the fare but hands it directly over to the driver. He does not have a seat in the taxi, so he typically rests half-standing next to the rolling door on the right side of the minibus. In case the bus is completely overcrowded, he has to leave the interior and hangs outside the bus, e.g. on a ladder at the rear.

The assistant driver also helps to fill the taxi brousse. He shouts the taxi's destination when passing potential customers and clarifies the directions and fares with them. He also communicates passengers' needs to the driver; for instance, when they request a toilet stop or want to exit the taxi en route. On the described trip from Tamatave to Antanarivo the assistant driver was less busy with filling the taxi since about two third of the seats had been booked by people traveling the entire length of the route. The taxi driver is typically hired by the cooperative and rather well paid on a monthly salary of 200,000 Ar (65€). The assistant driver is not hired on a fixed basis by the cooperative but is rather badly paid per ride.

The Use of Mobile Phones

Given the unpredictability resulting from the technical state of the vehicles and the road conditions, mobile phones have started to play a major role in organising mobility and linking transportation chains. When travelling to Isle St. Marie, three old 4W jeeps were used as taxi brousses. They transported passengers from the landing of riverboats to a cape from where they could take small motorboats to cross the Indian Ocean to the island. The owner stayed at the cape with his mobile phone and coordinated the jeep drivers who commuted from there to the landing stage of the river boats at a distance of 18 kilometres via a bad dirt road. He also coordinated the circulation of the small boats, commuting between the cape and the island. We observed one of the jeeps breaking down on the dirt road and needing to be repaired by the drivers. However, the entire 18 kilometres of dirt road were not covered by mobile networks. Thus, passing drivers needed to carry the information about the delay resulting from the jeep's breakdown to the owner.

Mobile phones are also used to connect with passengers who want to be taken in picked up along the route. Since the arrival times at certain destinations can vary, the drivers use the mobile phone to inform waiting passengers when they are close by. Mobiles also play a major role when passengers arrive – especially at night – which can be dangerous in some places. When we arrived in Antanarivo in the middle of the night following the major blockage of RN 2, travellers asked to be picked up or ordered taxis using mobile.

Corruption Issues

In all parts of the country, we found taxi brousse drivers bribing policemen. A detailed description of this phenomenon follows (from the field notes):

> "The other striking phenomenon that we could observe…was the way the taxi brousse driver handed over bribes to the police and gen-

darmerie on the way. Leaving Ilakaka [a mining town in the South], there were three control posts, one after the other. On stopping, he [the driver] took a bill of 2,000 Ar [0,65€] in his left hand, closed his fist, and hung his left arm out of his window but below the level of the window, so that neither the passengers nor the second policeman standing at the other side of the car could see what was happening. When the policeman came to the window, he could take the money out of the driver's hand. Of the first three control posts, he only paid at one that way. He put the money back into the middle console of the Toyota. At the next post, two policemen were both standing in the middle of the street. When he saw that, he put the money into the folder containing the official papers. I could see that the policeman only briefly opened the folder, took the money, did not even bother to look at the rest of the papers, and let the taxi brousse pass.

For the rest of the trip, the driver had deposited 2,000 Ar in his folder and he had to refill the folder a couple of times. I think he paid some 10,000 Ar in bribes to the police and gendarmerie (the equivalent of one passenger's fare). ...the manner of paying bribes requires that the handing over of the bribe remains concealed. One of the policemen got a bit nervous when he saw me ('a vazahr' [foreigner]) trying to follow the driver's hand and observing their interaction. Standing at the driver's window, he addressed me, and I decided to quickly look somewhere else so the hand-over could take place.

At another place I observed what would happen when no payment takes place. On approaching the car, the policeman saw a vahzar sitting there [on one of the front seats] trying to observe. Not finding any money in the driver's hand, he [the policeman] grew a bit irritated. He asked for the papers which he was given (containing the bribe). But he could not open it easily, so he went to the rear of the car, starting to complain about something concerning the left rear tire. He then went behind the car [out of sight of his police colleagues, the passengers, and the vazahr] and checked the papers.

When he had found the money, there was no longer any problem and we could continue our journey."

Overall 2,000 Ar (0,65€) looks like a very small bribe, but given the salary of the drivers and policemen it is about 1% for each monthly salary [corresponding to 20€ in German income terms]. Policemen working on the streets are therefore privileged since they have the chance to collect quite a number of bribes in this way.

Interestingly, modern taxi brousses on intercity routes did not seem to pay bribes (or at least not so often). A local manager described this phenomenon as follows: *'You only pay when your things are not in order'*. However, the local and mid-distance taxi brousse system is constructed in such a way that things are not in order. So, policemen will always find reasons to demand a bribe.

Security Issues

Security is a major problem in Madagascar. The problem of groups of organised bandits, dahalos, impacted security in substantial parts of the country and on parts of the national roads – specifically at night. The security situation impacted the way we could travel and explore the field. The following observations shed light on the security conditions in parts of the country.

While staying at the south-western coast of Madagascar, we experienced a dahalo attack on a neighbouring village. The village we stayed was some 15 km south of the city of Tulaér but we had to take a boat from there because there was no viable road connection. The village which was attacked by a gang of dahalos was some 20 kilometres inland. When the news of the attack spread, panic reactions could be observed by the local villagers. The beach suddenly emptied, the local people started to hide in their houses. The expat hotel owners started to get nervous. Their hotel had been robbed on two occasions by dahalos within the last two years. Following the first attack, they had hired three local peo-

ple armed with locally produced guns. However, when a group of bandits approached for a second attack, these guardsmen disappeared. The hotel owners assumed that the guardsmen were cooperating somehow with the dahalos. After the second attack in which the hotel owners were also physically mistreated by the dahalos, they decided to bribe a high gendarmerie officer in Tuléar (some 65€ per month [corresponding to 2.000 € in German income terms]) to have two policemen staying permanently in their hotel - armed with Kalashnikovs, while dahalos are often only armed with self-made guns.

When the dahalo attack happened in the neighbouring village, the security situation in the hotel got out of hand. The two policemen who were based at the hotel got the order to move to the village which had been attacked. So, the hotel was without protection. One of the hotel owners directly called the gendarmerie officer in the city – but in vain. The hotel's two policemen left the village, together with two more policemen who were based in another hotel. Without protection, the hotel owner became very nervous and called his partner who happened to be in Tuléar that day. His partner went to the high police officer and requested three more policemen to protect their hotel. It cost him an additional and rather high bribe, some 195 €, to have them deployed for three days at the hotel. The three policemen took a specially rented boat and arrived in the village in the afternoon, sporting a Kalashnikov each.

The hotel owner was in a difficult situation. He did not want to lose his costumers, us and six others. However, he needed to say something to explain what was going on. So, he first told us a deliberately wrong story that played down the potential risks of the situation. However, during the morning we spoke to one of the other guests to whom the owner had told the actual story. There was no viable land road to leave the village, so we thought about finding a boat (pirogue or a speed boat) to leave. Given the conditions, boats were, however, difficult to find. So, we hesitated and finally decided to stay after the hotel owner had told us about the three additional policemen coming from Tuléar (fig. 5).

Fig. 5: Hotel near Tuléar (South Western Madagascar): Waiting for the Dahalos' attack

Finally, in the evening the two policemen came back from the village which had been attacked. They brought information about what had happened there. According to their account, two soldiers had arrived in the village before them – armed with Kalashnikovs. The had beaten up the badly armed bandits, killing one and injuring 4 out of a group of 10 dahalos. The bandits had robbed all houses, bothered ladies of the village and taken away some 2 Mio Ar, some 700€. In revenge, the villagers had mistreated the body of the dead bandit, cutting his arm and legs with machetes. The policeman showed the photos of the defiled body to the hotel owner who commented on the death toll: *'The army does not take prisoners among the bandits. In this way that is good because they do not have the means to feed them in prison.'*

The security conditions described above affect public transportation specifically at night. In different regions, we were told that it was better to drive at night in a group of cars (convoy) on the RNs. Our experiences during one night-ride exemplify these conditions.

Going back from Tuléar to Antanarivo, we took a night trip in a taxi brousse which left at 3.30 pm, took RN 7, and arrived in the capital at 9am. After dawn, the two Mercedes Sprinter taxis of the same cooperative started to drive close together and were soon joined by a third Sprinter. The size of the convoy grew at a gas station where several taxi brousses were waiting. After some two hours, we came to a barrier of stones on the street; it did, however, contain a gap big enough for us to pass through. The drivers explained that these barriers are made by the dahalos to stop cars, which they do by closing the gap with additional stones. After passing the stone barrier as fast as possible, the driver informed drivers passing in the opposite direction about the upcoming 'dahalo barrage' on their route. Some of them got a nervous facial expression on hearing the news.

On the first half of the night ride (to the city of Fiana), we did not see a single control post organised by the army or any of the police forces. The senior taxi driver explained to me *"No, there is no control post in this region...*

but it is better this way because they [the gendarmerie] cooperate with the dahalos anyway…providing information about the cars". After Fiana, there were very few control posts in place. So, the drivers depend on themselves and each other to cross this part of the country, at least at night.

The situation becomes particularly dangerous when the mini buses have technical problems, or the road conditions force them to slow down or even to stop. We experienced two of these situations. At one point, our driver became aware of a noise from the left front tire. While the other mini buses of the convoy were passing us, the driver stopped, jumped out of the bus, looked at the problem, hectically took out a large screwdriver and tightened the screws. After some 10 minutes, he had reached the convoy which had moved ahead of us.

After another hour, we arrived at a steel bridge on the RN 7. It had a hole through which one could see the river below. Our driver was able to manoeuvre past the hole but the bus following us was not able to avoid the hole and its rear tire, therefore, finally hung in the air over the river. The group of drivers dealt with this dangerous situation very professionally and quickly – but made us somehow feel the pressure and danger of the situation. While the other passengers were asked to stay in their mini busses, the passengers had to leave the taxi which was trapped in the hole. Another mini bus drove onto the bridge, close to the one in trouble. An old rope was used to tie the vehicles together and, after some experimenting, the bus was pulled out. During this manoeuvre, another floor element of the bridge disintegrated, so the drivers needed to fix this problem as well by rearranging the steel elements. Overall, the whole operation only took about 15 minutes (fig. 6).

After all six vehicles of the convoy had crossed the bridge, a Toyota bus left the convoy to speed up his journey. The senior driver commented to me 'They are trying it solo' and shook his head. The rest of the trip went rather smoothly. In the early morning, our mini bus also left the convoy – to pick up some bags of charcoal in the village the driver was from, which were to be sold in the capital.

Later that morning – after the coffee break – the senior driver informed all the passengers that during the previous night a taxi brousse circulating on the same line had been attacked by dahalos. They had thrown a stone from a higher position onto the front window at the driver's side. Fortunately, the driver had been able to escape this attack with only the window broken. The fellow passengers were surprised, a female teacher travelling with her two-year-old sons told me *"Now I am really scared to go back by taxi brousse ... however, a plane ticket is too expensive for us"*. The senior driver told me later on in a private conversation that he had already been attacked by the dahalos. He explained that they robbed him and the passengers of all their money, jewellery, and mobile phones, also some of the luggage was stolen – but nobody was injured at that time.

Discussion

In relation to public transportation in Madagascar, our study offers insights into the mobility practice of a large part of the population and reflects on political and socio-economic conditions. As we described at the

Fig. 6: Taxi brousse being pulled out of a bridge's hole at night (RN 7, Southern Madagascar)

beginning of this paper, Madagascar is characterised by a political and socio-economic situation which is very different from that of northern countries where almost all existing CSCW and HCI studies on public mobility have been conducted so far. First and foremost, national political conditions seem to be responsible for a high level of corruption and recurrent security problems which characterise the Madagascan transportation system. Our empirical data indicates that the low level of institutional reliability in the country plays out in a high degree of insecurity with regard to the organisational context in which public transportation takes place. For instance, businessmen reported that to start a business or lease land, they needed to pay bribes to officials at different levels. If they do not pay, processing may take endless amounts of time. Moreover, we heard rumours that some members of the government of the late president A. Rajoelina cooperated with gangs of cattle thieves (dahalo) and allowed them to export their prey to China via Port Dauphin, at the southern cape.

As reported in our study, both citizens and the operators of taxi brousses respond to this situation with a variety of practices in order to increase security. Since the late government at least seemingly did not want to interfere with criminality, in some places local cattle farmers armed themselves and killed bandits and their leaders. Arbitrary police controls are addressed by systematically paying bribes to the officers in a way so that it is not noticed by the passengers. On many national routes, driving in convoys of at least 10 vehicles is enforced. Driving in a convoy at high speed is the best defence against dahalo attacks. However, even such measures cannot guarantee a sufficient level of security. The many pot-holes in the streets and the very poor state of the bridges add to the fraught situation: They make a convoy very fragile (and individual taxi brousse even more so) because often, these places can only be passed at 5 km/h. During our stay, we read in a local newspaper that a taxi brousse, which had fallen behind its convoy, became the victim of an attack. To stop the vehicle, the driver was shot and all

the passengers were robbed. Furthermore, the security problem does not seem to be limited to night rides. When travelling from Ambolavao to Ihosy during the daytime, a soldier carrying a Kalashnikov sat on the right-hand seat in the first row for the first half of the journey.

Due to the poor road infrastructure, poor capital stock with cars, the low-income level of customers, low labour costs, etc., we find public transportation in Madagascar to be very different from the that in the industrialised world.

In the north, research on mobile ICT support for public transportation focusses on buses and trains which run on static schedules. Tracking devices allow these schedules to be adjusted in the case of situated delays (e.g. Dziekan/Kottenhoff 2007; Ferris et al. 2010). However, taxi brousse – a shared public transportation service – does not operate on fixed schedules.

Moreover, in the north it is assumed that means of (public) transportation typically do not necessarily use all the available seats. ICT support thus offers opportunities for better coordination and spontaneous booking (otherwise just displaying transportation schedules without referring to available seats would not make sense). These assumptions were not confirmed in Madagascar for the most part. Rather, the taxi brousse departure times were organised in an ad-hoc manner on the condition that all seats were taken. In rural areas, where this was not realistic, however, different practices prevail.

Also, specific arrival times cannot be met due to the fact that drivers stop at various places in order to drop passengers off close to their destination. Where available, mobile phones are used to coordinate arriving taxis with the passengers waiting for them. Using a taxi brousse in Madagascar hence requires passengers to accept a different conception of time planning compared to northern standards.

The ICT design for industrialised countries facilitates the situated finding of regularly circulating means of public transportation (Dziekan/Kottenhoff 2007; Ferris et al. 2010), nowadays even adding ride

or car sharing opportunities (Meurer et al. 2014, Stein et al. 2017). ICT support is based on smartphones; however, in Madagascar, one of the poorest countries in Africa, mobile phone penetration is still limited, and parts of the population do not even own low-end mobile phones, let alone smartphones. Access to electricity is still a major issue (Cholez/Trompette 2014).

So, the northern discourse on ICT support builds on a number of unquestioned assumptions about the nature of public transportation and passengers' practices. Our study challenges these assumptions and consequently opens an interesting design space for ICT4D in the south (Morozov 2012).

Inside the cooperatives, we find rather sophisticated paper-based practices for operating the buses at full capacity. The scheme of the bus' seats can be understood as a coordination mechanism for local as well as for distributed purposes (Schmidt/Simone 1996). Copying the scheme from the local manager's notebook to the driver's notebook and having it signed and stamped by both of them provides a certain security concerning fraud. The decisions of drivers and local managers are taken de-centrally. There is an inherent tension between the high level of autonomy the drivers need to have in deciding what to do during a trip and the interest of the cooperative to keep the business running reliably and economically profitably.

Placement agents play a pivotal role for the assignment of seats, particularly for travellers who are not familiar with local methods of organisation. Placement agents are plentifully available and poorly paid. From the perspective of travellers and the cooperative, they act in a way which is not transparent, and which is primarily guided by their income interests. Hence, ICT support might be considered. For the distribution of seats, mobile phones are already used despite the low coverage among the population. More sophisticated ICT services based on live information and location tracking – as advocated, for example, in Mac Lean/Dailey (2002), Dziekan/Kottenhoff (2007), Ferris et al. (2010),

Foell et al. (2013) or Patterson (2014) – might yield a high potential for improving the situation but would require a significant increase in smartphone availability among the passengers. Given the existing practices, one could think of the following opportunities for ICT support regarding public transportation:

- Mobile technologies could help to find taxis more effectively, especially in larger stations such as Tamatave or Fiana where a large number of parallel travelling opportunities exist. Mobile functionalities would not only be of help for foreigners but also for non-locals in finding connections, stop-over-connections, planning longer-distance journeys, or booking seats. Mobile ICT support could provide transparency on trips, e.g. on time schedules or when empty taxis will arrive.
- Mobile banking could help eliminate risks for the driver who currently still carries all the fares with him in cash. This is specifically relevant for long-distance routes in less safe and controlled parts of the country.
- ICT could support the transfer of data between local taxi stalls and stations on the route as well as between the local store and the cooperatives' central office and administration.

Conclusion

Our study represents what is still an initial and modest attempt in that it has approached the problem of public overland transport from a rather specific perspective. Nevertheless, we were able to observe that mobility challenges in Madagascar proved to be remarkably different from the ones in northern countries. Assumptions which are central to the prevailing literature about the organisation of transportation could not be verified there. In this way, Miteche et al. (2012)'s claim, which deems technological concepts from the developed world inappropriate for the contexts of developing countries, were confirmed. Although our

data about the taxi brousse was collected from a foreign traveller's perspective, we were able to uncover interesting local practices.

Furthermore, the distribution of labour within the cooperatives which organise the journeys was investigated. We found that, so far, mobile phones have played a limited role with regard to the practices of these organisations. However, ICT support could significantly contribute to improving security and rendering transportation and travelling smoother and more predictable. Nevertheless, it seems that the first step in improving public transportation would require a change in the socio-political conditions which are at present the main source of the problems with which passengers are faced.

On a methodological level, the study shows the additional value of studying actual practices of transportation compared to merely higher level studies typically provided by development agencies such as the World Bank (Kumar/Barrett 2008). Their policy recommendations nowadays go beyond pure investments into road infrastructure. However, Kumar/Barrett (2008) still propose a large scale, top-down approach to improve public transportation in Africa's urban centres. The authors suggest creating metropolitan transport authorities with jurisdiction over roadways and vehicles, enforcing 'controlled' competition among providers of transport services and reintroducing large buses to improve the public transportation in urban areas. Given the problematic road and security conditions, the introduction of large buses, for instance, may not improve the public transportation in Madagascar. The level of corruption may render centralised metropolitan transport authorities problematic, as well.

Studies like ours may help the development aid community to appreciate the sophistication of given practices and to question their interventions with respect to particular local conditions. Following a practice-based computing research program (Rohde et al. 2017; Wulf et al. 2018), we are in a position to provide empirical insights and early design considerations from a bottom-up perspective. Such an approach to

analyse real world settings in the Global South seems to us highly relevant to policy making – not only in the transportation domain.

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Mobile and Interactive Media in the Store? Design Case Study on Bluetooth Beacon Concepts for Food Retail

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Abstract

The Internet has changed consumer behaviour, having an impact on local retail. At the same time, the number of smartphone users is continuously increasing, making mobile applications more and more important. By using Bluetooth beacons – small radio transmitters that can be placed anywhere and are processed by relevant apps – shopping can be facilitated and made more enjoyable. Even though some supermarkets, especially in the USA, are already using beacons, their use is not common and less researched in Germany. Pilot projects only refer to usage data and reaction times while customers are rarely asked for their opinion. This project analyses potentials of usage and customer acceptance of concepts based on beacons in retail via an online consumer survey, discusses the conception of an app, and provides a subsequent qualitative evaluation. As a starting point for our concept development and app implementation, the initial online survey of 203 participants emphasises the importance of user-friendly settings as well as costumers' interest in informative communication. Throughout all steps of our design case study, concerns for data privacy as well as the interest in transparency were apparent and regarded accordingly. The field experiment stresses users' perceptions of potentially useful functions, and highlights design-related aspects for improvement, offering useful implications for the future design of shopping apps.

1. Introduction and Background

Beacons have been known for a while, but only recently became popular through Apple's iBeacons. According to predictions, around 370 million beacon installations will be available by 2020 (Hilzinger 2016) and there will be 4.5 million active beacon users in the US by the end of 2018 (Iurchenko 2014a). Bluetooth beacons are constantly transmitting a signal which can be clearly allocated to the sender. When this signal is recognised by a receiver's app (e.g., a smartphone), it is transmitted to the web server. The latter determines whether an instruction is sent back and carried out by the app. This technology is enabled by *Bluetooth 4* or *Bluetooth Low Energy,* since pairing between two devices is no longer necessary for data transmission via Bluetooth (BT). The broadcasting feature allows to send signals without an identifiable sender. Along with the increased dissemination of BT speakers, hands-free devices, and wearables, we can observe an increase in BT activity. It is assumed that this trend will be expanding due to increased value associated with BT usage (e.g. via beacons) (Sperling 2014). Possible fields of application for beacons are diverse. The main use cases are analysis and tracking features, marketing, as well as indoor navigation.

Technology has become a part of (social) practices in connection with shopping. Practices are understood as mostly routinised patterns for a context-specific mental and physical activity, often supported by specific tools (Wulf 2009; Wulf et al. 2011). During shopping, customers are already using their smartphones to compare prices, access product information, or read customer reviews. This *showrooming* cannot be prevented and retailers should accept this trend and react appropriately (Scholz 2016). Not only by publishing their opinion to other consumers, but also by sharing the shopping experience and outcome with family and friends, users demonstrate the aspect of cooperation as crucial for shopping. As the study of the evaluation platform *BazaarVoice* by Scholz (2016) shows, there are numerous opportunities for stationary trade that emerge from this change of customers' behaviour. With 8 out

of 10 respondents performing as so-called "webroomers", doing product research while attending the local point of sale (POS) and buying products, as well as Europe's sales volume of offline trade being 92 %, it is suggested that negative consequences for offline trade are not necessarily apparent. It is important to consider that the purpose of *showrooming* is not always to spend as little money as possible. Rather, customers want to find support and reasons for buying the targeted product. In this regard, representations of products via text, images, videos, and customer reviews are relevant factors of individuals' decision-making processes. Yet, offline suppliers should be aware that approximately half of potential customers do not proceed with buying when finding 2.5 % cheaper offers, while a discount of 20 % almost always (90 %) leads to a disruption of the acquisition process. Suppliers may therefore ensure easy access to their respective online stores for their customers, aiming at keeping them away from other influential providers they might come across when actively using a search engine (Scholz 2016).

Analogous to the analyses possible in online retail, beacons are a first step towards keeping up with online shop analysis and conclusions locally as well as improve processes. Pilot projects involving the use of beacons can already be found in local retail, e.g. at *Waitrose* (UK), *Macy's* (USA), *Penny* (Italy) or *Carrefour* (Romania). *Shopkick* has brought beacons to Germany, where only few applications are known so far. Potentials include the accompaniment of the shopping process, for example, via an automatic shopping list sorting, collection campaigns, games, recommendations, or review possibilities. A discussion on whether shopping in general and an increase in consumption should be supported lies beyond the scope of our work. However, a beacon-based shopping app has the potential to assist retailers in analysing and addressing customers' needs more effectively.

The focus of this paper lies on food retail. Based on related work (Section 2), we carried out an online customer survey to point out usage potentials and examine user acceptance. The study includes current

smartphone usage behaviour before and during the shopping, attitudes towards the usage of apps in retail, and opinions on data privacy, localisation, and certain features (Section 3). Based on this, an app concept was developed which is based on the actual app of a discounter grocery store. The app was expanded by features enabled by beacons, such as push notifications, an automatic shopping list sorting, product search, and in-store navigation (Section 4). Finally, the concept was evaluated in a field study (Section 5). We discuss the results in Section 6.

2. Related Work

Up to now, there are only few publicly accessible surveys available on customer acceptance or usage behaviour concerning beacons. Related studies, for example, on *mobile location-based couponing* (MLBC), have been carried out (Banerjee/Dholakia 2008), however, the diverse opportunities provided by beacons apart from coupons, such as tracking or the transmission of further (product) information, have not yet been considered.

Furthermore, similar works on MLBC are either very broad (Dickinger/Kleijnen 2008; Nikander 2011; Shankar et al. 2010), concern other cultures (Catoiu/Gârdan 2010, Jayasingh/Eze 2009), or date back a few years ago and are already outdated due to a fast technological development (Dickinger et al. 2004; Mueller-Lankenau/Wehmeyer 2005). Field experiments, for example, *Gettings* (Städele 2015) are already partly outdated, too. Problems like impairment by thick walls or windows have already been solved by a better beacon modulation. Moreover, user data has been recorded in these experiments, but users have not been interviewed on acceptance, attitudes, or problems.

Meanwhile, apps like *shopkick* or *barcoo* are gaining popularity. Even though user data and shopping behaviour is analysed in the background, customers' opinions and attitudes concerning acceptance and usage in retail receive little attention. As the different (pilot) projects have shown, using a shopping app based on the beacon technology has

a positive effect on companies and customers alike (RCKT 2015; Städele 2015). However, these applications only have a small target group. Considering these aspects, the question arises how apps processing beacon signals can be improved for a more widespread usage. We attempt to answer this question by analysing users' attitudes and requirements towards beacons and apps in retail and their functions, as well as by examining their actual usage.

3. Methodology: Design Case Studies

For an optimal approach to the design of innovative information and communication technology (ICT), it is crucial to understand actual social practice and cooperation in the given context, i.e. an organisation. The method of *design case studies* (Wulf 2009; Wulf et al. 2011) aims to achieve this in three iterative phases. First, given social practices in the field are observed and described in-depth, including tools and methods. In the second phase, based on these findings, an innovative ICT artefact is designed, where the designer should consider assumed changes in the practices. Finally, the artefact is introduced into the organisation and a long-term evaluation takes place of how information systems are appropriated by the users and what effect it has on their social and cooperative practices. According to the results, the artefact may be redesigned and evaluated again in the same application context, thus establishing the cyclic feature of the method (Rohde 2007). In the following, we first present our pre-study based on this concept (Section 4). Based on this, we further designed a prototype (Section 5) and evaluated it via a field experiment (Section 6).

Due to restrictions in time and resources, however, we implemented the design case study approach with strong deviations. Our pre-study was based on an online survey in order to answer predefined questions by including a larger participant sample. In the design phase, we created one version of the system. The third phase can be considered a pilot study of this first design round instead of a long-term evaluation, since

we did not have the possibility to include our app in the existing application and therefore gathered feedback for possible further iterations of the programme.

4. Study on Smartphones and Beacons in Retail

4.1 Methodology

For an analysis of user opinions, requirements and motivations on beacons and their features, we derived the following research questions:

(Q1) What is customers' attitude towards the usage of smartphones, beacons, and apps in retail?
(Q2) When traders offer technology like apps, do customers rate this as beneficial, neutral, or off-putting, especially in terms of data security and privacy?
(Q3) How can customers be motivated to install and use the app?
(Q4) Which features are relevant and likely to be used, and which are not?
(Q5) Do customers prefer one app per store chain or a one-for-all version?

To answer our research questions, we carried out an online survey including open- and closed-ended questions. Participants were recruited online via forum entries and social media and had open access to the survey. From the 228 filled-out questionnaires, some had to be excluded due to incomplete answers, resulting in a number of $n = 203$ participants. Our respondents included 129 (63.5 %) female and 74 (36.5 %) male participants between 19 and 66 years of age, the mean age being 29 years. Over 92 % of respondents had obtained at least a high school degree, with 64 % having completed higher education.

The following areas were covered in the survey: Shopping behaviour, smartphone usage in everyday life and while shopping, familiarity with Bluetooth and beacons, and attitudes towards location-based

advertisement as well as social media (e.g. *Facebook, XING*). IBM SPSS Statistics 24 (IBM 2014) was used for quantitative analysis. Responses of open-ended questions were iteratively sorted, coded, and analysed (Strauss 2007).

A survey was carried out as part of our methodology prior to a qualitative evaluation to include as many participants as possible in a limited time frame and to get a broader idea of our potential users. Quantitative data on the previously defined research questions served to define requirements for the design, which we later evaluated in-depth with representatives of our target group. The main app features were derived from existing retail apps and proposed for evaluation in the sense of a creative requirements engineering approach (Maiden et al. 2004).

4.2 Results and Discussion

(Q1) Customers' use of and attitudes towards smartphones, beacons, and apps in retail: Of 203 valid respondents, 35 (17.2 %) have installed one or several apps by discounters, supermarkets, or department stores. With 53 indications in total (with the option of multiple answers), *Aldi* was the most frequently named app (26 participants). It was followed by *Lidl* and *Rewe,* named by 10 and 8 participants; *real,-* was mentioned three times. Supermarkets like *Kaufland*, *Penny*, *Marktkauf*, *Netto* and *Edeka* were each named by one participant. Apart from these store-specific apps, we examined how often participants install general apps for several stores. Almost 73 % indicated to not have installed any shopping app. These results are similar to previous studies, where awareness of benefits of Bluetooth and mobile retail apps was relatively low (Iurchenko 2014b; Shankar 2010; Thammet al. 2016a). Of the three answer options, *Payback* was most frequently selected (25 answers), followed by *barcoo* (10) and *shopkick* (3). Participants could also state other apps they had installed; among these, *Amazon, Ebay, MyDealz* as well as *iTunes* or *H&M* were frequently named. It should be considered that some participants might not have thought of each single app

they had installed on their smartphones. On average, a higher share of male participants compared to female respondents suggested to have installed shopping apps (men: *M* = 1.59, *SD* = 0.49; women: *M* =1.70, *SD* = 0.46; 1 = app installed, 2 = no app installed). Regarding age, in the group of 30 to 39-year-old participants, more than half had at least one app installed (*M* = 1.43, *SD* = 0.5). The age cohort of 40- to 49-year-olds shows comparable results (*M* = 1.55, *SD* = 0.52).

96 % of all participants always carry their smartphones with them, while 86 % do so always or most times during shopping. Approximately 90 % of survey participants responded that whether a POS had its own app was not a decisive factor regarding their choices of stores. This is supported by only 6 % of respondents using the respective app in case a store represents itself via a smartphone application. Regarding campaigns of collecting points for specials or the possession of loyalty cards, respondents showed neutral attitudes, tending towards refusal on average (joy of collecting points for specials: *M* = 3.56, *SD* = 1.43; possession of loyalty cards: *M* = 3.55, *SD* = 1.34; 1 = strong approval (++), 3 = neutral (0), 5 = strong refusal (--). On average, participants appreciate to have their collected points or membership in paper or plastic form instead of saving respective data in an app, although opinions in this regard varied strongly (*M* = 3.99, *SD* = 1.87; 1 = digital form on smartphone, 6 = hard copies).

During shopping, more than a quarter of respondents are using their smartphones actively, while more than 20 % use it moderately in a more passive way, and more than half of the participants do not use their smartphones while shopping. Active participants use their smartphones mainly to set up shopping lists (37 %) while almost 20 % like to compare prices while visiting stores. 18 % use available WiFi; 17 % like to search for product information during shopping as well as browse through offers and leaflets (14 %). On average, participants viewed their apps as rather good (*M* = 2.41; 1 = very good, 5 = bad), *SD* = 0.73) with medium (2.91) usage regarding frequency (1 = very often, 5 = never,

SD = 0.73). Frequent and consistent smartphone usage, especially during shopping, indicates great potential for beacon-based retail apps. Generally, most users prefer to use such an app during shopping only.

Most important for beacon-based services is whether customers have activated Bluetooth on their smartphones, as well as whether this is intended. When asked for potential recognition of the Bluetooth symbol, only 6,9 % proved unsuccessful; 80 % recognized the symbol correctly, while the remaining answers indicated uncertainty of the symbol's actual meaning. Only 18 % have activated Bluetooth in general, with the larger part of respondents having it turned off or not being aware of it. Bluetooth beacon as a more specific term is known to almost half of the survey participants (46.8 %), while half of this group claims to be able to define it.

(Q2) Evaluation and potential added value: Around 40 % of survey respondents consider the use of apps during shopping at a POS to be redundant, contrasted by 26 % appreciating potentially added value. According to the open responses, apps are merely a nice additional feature in stores, but not decisive for the selection of products. Over a quarter of all respondents are actively using their smartphone when shopping, another 20 % are only sometimes doing so. The smartphone is primarily used for shopping lists, price comparison, WiFi usage, accessing product information, and browsing offers and catalogues. Most participants are shopping at discounters and supermarkets (as compared to department stores and organic grocery stores). Around a quarter of the participants thinks that using an app while shopping in a supermarket could have an added value for them.

Regarding the gathering of personal and location data, the majority expressed concerns (*M* = 2.23, *SD* = 1.39; Skala: 1 = concerned, 6 = not concerned). This corresponds to the question if customers would consent to sharing their data in exchange for an added value discussed in literature (Dudhane/Pitambare 2015a; Mueller-Lankenau 2005; Shankar 2010). In general, 35 participants indicated to have little or no con-

cerns at all. If customers' positions are used for analysis purposes only, around a fifth would agree when asked. However, the level of agreement is much lower if the retailer does not ask for permission (70 % would actively object). If added values like discounts, vouchers, or information are provided, about a third would voluntarily offer their data. Discounts should be as high as possible and usable for products the customer needs. Personal offers and navigation are added values as long as data security is guaranteed, and analysis results are made transparent. Further added values are features increasing shopping comfort, such as product recommendations or reminders. Men expressed less concerns regarding the gathering of personal or location data (Men: $M = 2.15$, $SD = 1.4$; women: $M = 2.36$, $SD = 1.38$), while women rated most listed functions (Q4) as more useful than did men.

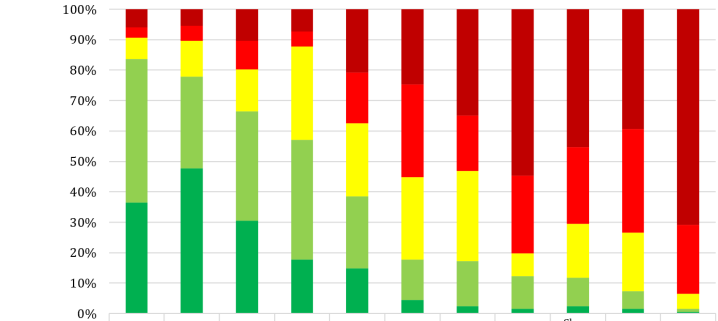
In a general, open-ended question we found that about half of the participants have a negative attitude. Most frequently, they named concerns about possible surveillance or potential spam. A quarter each is either undecided or has a positive attitude. Even those who are concerned see advantages and the practical benefits. Others do not have data privacy concerns, but fear receiving push notifications too often. Customisation options are therefore important. Push notifications and recommendations are regarded as something one must get used to. Those with a positive attitude prefer this method over advertisements via mail or e-mail, as long as the user has given their permission. An added value could be established if advertising is tailored to individual shopping behaviour and personal attitudes.

(Q3) Incentives to install shopping apps: With the prospect of getting a discount in return for installing a store's app, more than half of the participants (52 %) tend to show interest; almost a third indicates the strongest support on the six-levelled scale. Monetary incentives like percentage discounts (5-50 %), two-for-one coupons, loyalty discounts, free items, a one-time free purchase, or exclusive offers, although appreciated by participants (Dickinger 2008; Nikander 2011), were not the

only decisive factor. Non-monetary incentives such as in-store navigation, priority purchase for limited goods, recommender offers or pre mium services (extended warranty, consultation, or prize games) are also named as added values. Most dominant was the desire for personalisation, e.g. via customisation and automatic adaptation to the usage behaviour. Valuable features facilitating and enhancing the shopping experience are therefore the main reason for installing the app.

(Q4) Valuable features: The proposed main features were evaluated by participants on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). Additionally, the respondents were able to indicate in an open question which other app functions they could imagine using. The citations used in the following are taken from the online survey, translated by the authors and marked with the response identifier. Information on offers, mobile coupons, or discount vouchers, reminders of saved offers, as well as further product information were identified as the most important features (see Figure 1). More than half rate information as helpful, while over three quarters would redeem discount coupons. As already described by Weigl (2013), recommendations in general are regarded as helpful and lead to a purchase if they are subtle and non-intrusive, but catch users' attention. Recommendations should be based on previous purchases and not overwhelm users. Further considered helpful are barcode scanners for price comparison ("*scan as you shop*", 164), shopping or wish lists, product search and reviews, store finder, marking favourite or future offers, and managing recommendation notifications. Opinions on in-store navigation, review of the purchase, and prize games are mixed. Only around a third (36 %) agree on the value of purchase reviews. Games, receiving a greeting by the app when entering the store, sharing content with friends, and receiving messages while passing are the least popular features. Only 15 % could imagine entering a store in reaction to a notification. Useful information could "*incorporate indications for allergy sufferers*" (160) or be health-related ("*hidden sugars*" (31) or a "*health traffic light*", 115), produc-

tion, ingredients, nutrition details, "similar products [as a] *decision support*" (106) including "*price comparison*" (65), location-related data like opening times, parking opportunities, current crowd, and waiting time: "*Information on visitor numbers so that I can decide from home if the store is currently too full for me to go shopping*" (40). An overview map, including a search function, display of a catalogue and product categories, or an automatically sorted shopping list are considered equally helpful. This goes with high research interest in indoor navigation, which is increasingly accurate as well as popular with users (Kriz et al.2016; Purohit et al. 2013; Thamm et al. 2016b). Furthermore, a list of favourites with a notification function is required, as well as push notifications on spontaneous advertising events. Many participants hope for an extended recipe function, such as suggestions or ingredient lists which can be added to the shopping list together with the price, ideally even from external



	Info on offers	Mobile coupons/ discounts	Reminders (saved offers)	Product info	In-store navigation	Purchase review	Prize games	Greeting	Share content with friends	Notifications when passing	Games
Strongly disagree	12	11	21	15	42	50	71	111	92	80	144
Disagree	7	10	19	10	34	62	37	52	51	69	46
Maybe	14	24	28	62	49	55	60	15	36	39	10
Agree	96	61	73	80	48	27	30	22	19	12	2
Strongly agree	74	97	62	36	30	9	5	3	5	3	1

Fig. 1: Participants' attitudes towards the different possible features

websites like *Chefkoch: "Open recipes on Chefkoch or similar and add ingredients automatically into the app"* (205). In Table 1, we have summarised all listed features, evaluation results, whether they are included in the existing grocery store app, and implications for our further design.

In general, women appreciate collecting points more than men and show comparatively stronger support for offline loyalty cards (women: $M = 4.57$, $SD = 1.66$; men: $M = 2.99$, $SD = 1.82$).

(Q5) Store-specific vs. general shopping apps: Opinions regarding the scope of an app (one chosen store vs. various stores) differ among participants. Half of the respondents prefer a general app comprising several stores, a fifth voted for a specific app, while the remaining answers are located in-between ($M = 4.07$, $SD = 2.1$; 1 = store-specific, 6 = general shopping app). With respect to age, gender, and education our analysis only yields small variances, exemplified by men, respondents younger than 20 years, as well as 50- to 59-year-olds tending towards general shopping apps. Looking at answers to the question on installed apps by participants (Q1), it is indicated that store-specific apps are less popular among participants as they more often stated names of general shopping apps like *Payback* or *shopkick*. Yet, we have to keep in mind that respondents may not have considered each single app on their smartphone and classified them as a store-specific shopping app.

5 Concept and Prototype Implementation

5.1 Methodology

As the second step of the chosen method of design case studies, it is crucial to develop a related ICT artefact based on prior empirical analysis. Even though the majority prefers a general app, we regarded the integration into an existing supermarket app as suitable for the number of required features. Therefore, the app was specifically designed and equipped with functionalities for discount supermarkets. Furthermore, in this way, customer loyalty and store-specific features and policies

Table 1: Evaluation and implementation of various app features

Feature	Empirical result	Included	Implications for concept
Information on offers	Regarded as useful by 84%	Yes	Add online catalogue, product search and review, and filter
Coupons/ vouchers	Over ¾ would use offered coupon	No	E-coupons, (multiple) purchase points, exclusive and personalised vouchers, loyalty points, free item, loyalty discount
Reminders	Viewed as useful by 2 / 3 participants	Yes	Location-based reminders as push notifications
Product information	Rated as useful by over 50%	Partly	Allergen information, origin, ingredients, health traffic lights, nutrition information, product comparison incl. prices, warning for unhealthy food items
General information	Wanted multiple times	Partly	Product availability, parking situation, crowd situation, waiting times, analysis results, recommendations
Location-related information	Wanted multiple times	No	Opening times when passing, overview map incl. search function and product categories
In-store navigation	Over ¼ would use	No	Guidance towards products, sorting shopping list according to the store layout
Notifications while passing	About 15% would enter the shop	No	Choose carefully due to low popularity
Shopping list	Wanted multiple times	Yes	Automatic sorting, show available offers
Customisation	Wanted multiple times	No	Product reservations / priority purchase, setting interests, favourite list incl. notification
Barcode scanner	Rated as useful multiple times	Yes	Access to further information, home delivery, virtual shopping cart: Spending overview and mobile self-checkout
Push notifications	Mixed reactions (helpful vs. annoying)	No	Informative, send reminders, recommender offers, spontaneous advertisement events, customer recognition
Recipes	Wanted multiple times	Yes	Suggestions, ingredient list, price, automatic import into shopping list (also from external websites like Chefkoch), 'fridge search'
Survey	Prospect of coupons increases participation rate	Yes	Quick survey via push message with direct link to current shopping check

could be considered and maintained. Based on our survey, some of the well-rated features were implemented in a prototype based on an existing discounter grocery store app (see Figure 2). Using creative methods (Maiden 2004), we derived required features which were intended for evaluation in the following stage of the design case study process. Our focus lies on aspects whose functionalities are based on beacon technology. Overall, clear structures were chosen to make the interaction as easy as possible and intuitive before and during the shopping.

We included the features desired by participants (see Table 1) such as information on products based on users' location as push notifications, a shopping list which is automatically sorted according to store layout and user position, as well as product search combined with in-store navigation through the store to a selected product. All functions included in the original app were maintained and supplemented. Also, we considered data privacy concerns and included relevant information on as well as enabled user control over those features which require personal information, such as location and shopping list. Some of the desired features, such as coupons, personalised offers, and home delivery, could not be realised due to store policy and the lack of a complete digital product catalogue as well as online shop, while others were not relevant in terms of beacon usage. The additionally implemented features and corresponding requirements and considerations as well as implications for practices will be described in detail in the following section.

5.2 App Functions and Structure

The user's permission required by the German Data Protection Act is obtained together with an information on the update (see Figure 3). The description of the terms of use and new features play a large role along with transparency of data gathering to decrease user concerns regarding Bluetooth activation and the release of other personal data. Thus, informing users is the most important and a relevant factor with respect

to future use of the supermarket app functions. It is critical to inform users not only about the recording of location and data, but also about advantages for customer experiences, e.g., categorising important and irrelevant information, providing product search, and sorting grocery lists. Critics like Sperling (Sperling 2014) point out the difficulties of convincing users to follow opt-in processes and use Bluetooth. When accepting the terms of use, users are assisted by informing them about the necessity of Bluetooth activation for smooth functioning. In cases of non-acceptance, the app should provide a direct link for changing settings to ensure a user-friendly modification process.

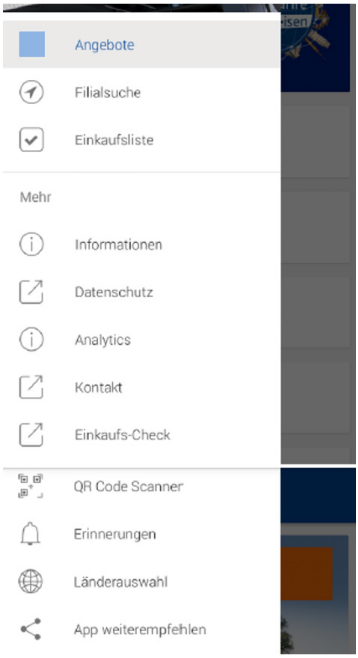


Fig. 2: Excerpt from the current menu of the existing app

Fig. 3: Information on the update

A **shopping list** is integrated into every supermarket app. Customers wish for add-ons, such as the recognition of current offers, sending recommendations, the option to save several lists, or an automatic sorting option. The latter aspect was integrated in the prototype since it is both based on beacons as well as holding a crucial added value.

When the shopping list is first accessed, the user is asked if a sorting should occur automatically to prevent confusion due to a differently resorted list. In an ideal case, the list would be sorted not only at the beginning, but also if the user diverts from the suggested path. Based on beacons, the chosen shopping list will be changed according to the various products' locations in the respective store. Besides this automated sorting, which depends on the store's set up and the costumer's own position, a supermarket app using beacons enables adjustments of products' names (sometimes determined by local stores), thereby helping customers to find products faster. Naturally, such a beacons-based app should ensure the refreshing of the product order within the shopping list in cases of detours or divergent routes.

Although automated sorting of shopping lists is formally accepted by first acknowledging the terms of use and related functions, user-friendly questions signalling the potential sorting of products on the person's shopping list are recommended. Users should be able to decide whether to allow or prohibit (in general or in a singular situation) the sorting of their envisaged products according to location. Furthermore, it may be useful to integrate short-term discounts into the shopping list, as proposed by some participants. Similarly, users have the option **to share the entire or parts of the list**. This way, the app can adapt to cooperative shopping practices with family or friends.

Usage of an **in-store navigation**, which around a quarter of participants would use, is demonstrated in the prototype along with the product search. Not only can one's own location be determined by beacons, but also the way to the desired product can be shown on the overview map (see Figure 4). Furthermore, it is possible to categorise various

shelves according to products and visualise the various groups of goods, e.g. displaying shelves storing groceries in green, drugstore products and cosmetics in red, discounted goods in blue. Entry and exit doors of the respective store should serve as a point of reference as well. Visualising various product categories by different colours and following Gestalt laws by Heinecke (2004) help customers to orientate themselves in the store. An integrated search function should be included analogous to other search functions in the app according to the conformance of expectations (ISO 2018).

Alternatively, a display of **products in the shopping list on a map** was considered, including the most efficient paths, but discarded due to the generally small display size of current mobile phones.

Fig. 4: Product search and in-store navigation

Beacons offer huge advantages like location and time relation when it comes to push notifications (see Figure 5). Highly appreciated by participants and indicated by their usage and answers regarding their interests, push notifications are **informing users about discounts**, e.g. offering them coupons and vouchers. Yet, it is important to consider frequency and perceived (in-)significance of push notifications of marketing products, following the rule of "[t]he right message, to the right user, at the right time, in the right place" (accengage 2017 [translated by authors]).

Opinions towards **push notifications** were very different. Some participants felt disturbed by messages for marketing purposes, perceiving them as interrupting. Others appreciated informative messages, reminders, recommendations, and information about short-term discounts. Participants pointed out to the frequency of such notifications being a decisive factor as well as their habitual use of supermarket apps, where they do not expect regular push notifications. Generally, not only advertisements, but also informative messages should be sent (e.g. changed opening times, product information, reviews). Addi-

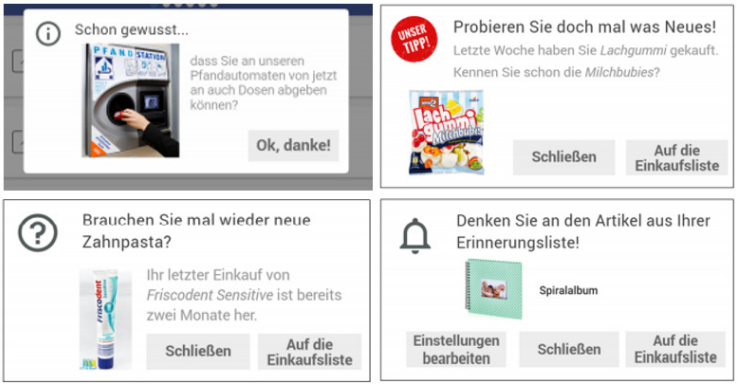


Fig. 5: Product recommendation

tionally, messages may be transported via graphics. In general, allergy-relevant information, product origins, nutritional facts, alternative products (including prices), as well as an evaluation system referring to health aspects is valuable to participants. However, offering these types of information while using beacons may be problematic regarding exact mapping, as products are often positioned right next or above each other.

Furthermore, **recommender** offers can be valuable due to personalisation and location-based services. Participants wish for an adaptation to user behaviour as well as customisation options. Push notifications can be sent in different forms: Apart from information and recommendation (Figure 5), they could indicate set reminders or the option of a purchase review.

To increase customer satisfaction, opportunities to **give feedback** easily may be introduced through push notifications sent to customers after finishing their shopping and receiving a respective beacon signal. Users may evaluate their experience by choosing smileys or a certain number of stars. In case customers do not show any interest in giving feedback, it is crucial to reduce the frequency of push notifications asking for a review.

Apart from the features named above, participants mentioned many functions that are independent from beacons. They would prefer a '**favourite list**' where items can be saved and notifications are sent in case of an offer; up-to-date, shop-specific information like **availability of parking spaces**, **crowds**, **waiting times**, and **product availability**; **location- or shopping-related prize games** (e.g., for bridging waiting times at checkout); **visibility of analysis results**; **product reservations**, and **reviews** after creating a profile; a **virtual shopping cart** and **mobile self-checkout**, as well as an extension of **recipes by suggestions**, **price indications**, and **automatic import of products into the shopping list**.

6 Evaluation

6.1 Methodology

For the evaluation of the concept, a prototype as well as a questionnaire were developed. Testing the subjects' use of the prototypical implementation constitutes the last step of the three-phases-approach of design case studies, namely the evaluation of appropriation of the artefact and its influence on the respective social practices. In the conducted user test, the focus lay on customers' behaviour and attitudes. We evaluated which features were popular, which results from our online survey and related work could be confirmed, which features participants would use in everyday life situations, to which degree the technology is accepted, as well as the concerns, wishes, suggestions, and potentials for improvement expressed by participants. Since the context of software use is crucial to enable a better immersion of subjects in the situation and to safeguard a higher validity of the results, we conducted an explorative field experiment based on a prototypical click dummy with representatives of our target group up to the age of 40. This age group is not only easily accessible, but also includes most smartphone and mobile couponing users (Shankar et al. 2010). In our usability test embedded in a field observation study (Holzinger 2005), the participants were guided through a simulated shopping situation in a grocery store via different tasks (see Figure 6). Our method included an everyday scenario, where participants fulfil predefined tasks reflecting actual interaction with the product from the start until the end of their usage experience in a natural environment. At the same time, participants should express their thoughts and opinions during the usage according to the *thinking aloud* method by Nielsen (1992). By direct observation, we were able to notice the interaction, define attitudes and problems, as well as to react to participants' expressions at the same time. Following the observation, we conducted a conversation based on a semi-structured guideline. For a further analysis of the demographics and shop-

ping as well as smartphone usage habits, we concluded the study with a questionnaire on technology acceptance (Davis 1986) grocery shopping, smartphone usage, assessment of their own affinity towards technology, and personal data, using 5- to 10-point Likert scales.

We carried out the evaluation, which took about 30 minutes, in two identically structured stores which belong to a food retailer. 22 users between 20 and 46 years (M = 28.5, SD = 5.21) in a balanced gender relation took part. Most of our participants indicated a high interest in new technologies and an above-average affinity towards technology. On average, they do grocery shopping two to three times a week (72.7 %), while 95 % manage this on their own or with their partner. All participants indicate to usually buying the same but are willing to try new products. Shopping is often a cooperative activity, as a quarter of participants

Fig. 6: User test situation

share it with a partner, and many are likely to follow a friend's recommendation when looking for new products (40.9 %). The smartphone is used once or several times an hour by more than three quarters of all participants (77.3 %), during the shopping, one third use it *sometimes* (36.4 %), another third indicated to use it *often* or *always* (13.6 % each).

6.2 Results and Discussion

Our evaluation has shown mostly positive reactions to the prototypical implementation of the app. In general, the link between virtual and real world is seen as progressive, especially compared to other countries (e.g. *mobile payment* (Statista 2017)).Currently, apps hardly offer support for grocery shopping and this should change. Around a quarter of the participants indicated to already use apps by supermarkets, while the acceptance rate was greater in our user test and an increase could be achieved by a greater scope of functions. Prior to the evaluation, we asked our subjects about these features. Those who did not previously use a supermarket app wished for a shopping list, display of current offers and discounts, including personalised vouchers, a barcode scanner, store finder with opening times and navigation, stock overview, including prices, and product availability check. Some respondents asked for notifications for various events: When a particular favoured product is in stock or on offer, when a new item comes in or is about to be removed from stock, with the option to vote against it. Cooperative aspects such as creating a common shopping list with others are highly desired for a new version of the app. The checkout can also be made more appealing: For example, by making it mobile or involving scanning, by utilising digital receipts or distributing vouchers for long waiting times. Users also expressed the wish for an online shop and home delivery, as well as the option to create a shopping list via voice recording and recipe suggestions with automatic import of ingredients to the shopping list, based on set preferences or even ingredients the user already has at home. Recipes should not only include ingredients, but also instruc-

tions in text, image, and video. Detailed information on products, their contents, and nutritional and health-related facts is desired alongside reviews, tests, and comparisons. Table 2 gives an overview of all desired features or areas and the according user feedback which cannot currently be imported in our app. The citations used in the following are taken from the interview accompanying the customer journey, translated by the authors and marked with the response identifier.

Approval: Most participants agreed to the opt-in process, meaning the update on the existing app, prompted before the evaluation. Even more could imagine providing the necessary personal and location data for the duration of the shopping as they see the advantages, even though

Table 2: Participants' suggestions for improvement

Feature / area	Requests / implications
Checkout	'Queue function': Offer voucher as reward for long waiting times Scanning articles (see ***IKEA***) Mobile checkout (see ***Amazon Go***) Digital receipt: Save paper and costs, easier return, expenditure overview
Shopping list	Not only sharing, but also creating a common shopping list (see ***Wunderlist*** etc.)
Store finder	Display alternative stores and opening times Navigation to the selected store
Offers	Notification when observed products are in stock When offers are sold out: notify next time Push notification when offers are online
Recipes	Import of recipes into the shopping list Step-by-step instructions, video instructions Active suggestions by the app (e.g., based on set preferences) Suggestions based on products user has got at home
Discounts	Personalised vouchers or discount coupons
Product catalogue	Display whole product range incl. prices and information Receive products recently added to stock via push notification or overview (can be based on previous purchases) Display products soon to be removed from stock, maybe with veto or review function Suggestions based on products user has got at home
Information	Ingredients, nutritional facts, health rating Test reports, reviews, comparisons

one third would hesitate to do so. The accessed data and underlying reasons should be understandable: "*With a calculator, I would say 'no, why does it want to have my location data', but if I have an advantage – like here, when I'm guided through the store or just reminded – then yes*" (2). Using Bluetooth was not a problem to most participants, while a fifth would like to activate it only during app usage and deactivate it afterwards, e.g. via a prompt. We also found out that some were not aware of the existence of such supermarket apps at all. Consequently, awareness should be raised, and interest should be triggered. Therefore, a successful integration in the marketing concept is mandatory. Trust in the providers is an important aspect for the approval. In general, more participants agreed on using the update than expected.

Added values: We found that, in contrast to mostly monetary incentives named in the online survey, added values can also be found in non-monetary aspects, such as sorting the shopping list, product search, navigation, and the resulting faster pace of the shopping. For example, almost all (21) participants agreed to sorting the shopping list, saying it was "*a nice service*" (2) and "*one of [their] main reasons why [they] agreed [to the update]*" (8). In general, the app should "*make the shopping as easy as possible, one should have to walk as little as possible and have as little stress as possible*" (7). In general, shopping practices should be facilitated and made more efficient. However, one participant chose to stick to their practice of working through the shopping list without sorting, willing to risk walking back if they forgot something. If we take a closer look at the added values, data privacy concerns increasingly fade into the background.

In-store navigation: Most subjects were highly interested in the app's navigating function as they appreciated the suggestion of shorter routes to targeted products and called this function "*very cool*" (7) or "*extremely helpful*" (12). In principal, the participants viewed the app design to be intuitive and to offer a comprehensible approach. Ideally, navigation via the shopping app should integrate arrows pointing into the

right direction and a highlighting of the relevant store areas according to their shopping list. While some subjects viewed the map to be sufficient, others demanded one's own position to be included on the map as a point of reference and the direction on the map changing according to the direction of the smartphone. Generally, the field experiment highlighted the need to further optimise the displaying of in-store-navigation, not at least because the map was perceived to be too dominant in relation to other functions. Colouring of various groups of products did not always make sense to the subjects testing the app, where a differentiated annotation would be more understandable, and the integrated search bar was sometimes overlooked. Additionally, the experiment pointed out that users might find it helpful to be able to zoom in or scale up certain parts of the map. An integration of searched products into the shopping list for resorting and optimising the shopping route in total was also suggested.

Push notifications: Users had very mixed reactions to push notifications: On the one hand, they are perceived as unnecessary and annoying when containing irrelevant information or having bad timing, while they can also be helpful on the other hand. Generally, they should adapt to user's preferences, frequency and timing of use, and not create feelings of annoyance and frustration, while an optimal number of push notifications is difficult to determine. Also, the context of usage is relevant: "*It can be really annoying. If one is prepared for it during shopping and is using the app anyway, then I don't mind*" (6). We should also keep in mind that users do not expect a lot of interaction in order not to be distracted from their shopping and possibly miss products.

We tested different types of push messages: Information, reminders of saved products, further purchase recommendations based on previous purchases, product recommendations, and a review request. Reminders and informative messages were the most popular types, while reminders are preferred to be sent at the start of the shopping. Informative push notifications are generally seen as helpful as long as they are

relevant, not redundant, and sent too frequently. Reminders were received positively because they refer to products in which users are already interested, can save walking distances, and the app can remind its user even when it is running in the background and is not actively used. A prioritisation function could help to quickly navigate to desired products but should not disrupt any already running navigation.

Concerning further purchase recommendation based on previous purchases, opinions differed greatly, as participants see benefits for efficiency on the one hand: "*Because often I really need these things or didn't know that I need them. And then I bought them anyway*" (19). Around half had a positive attitude towards such messages, especially if they are linked to their current shopping list. On the other hand, there is the perception of surveillance: Several participants consider such messages as unnecessary and uncanny.

Similarly, users rated product recommendations without a link to their purchases very differently: More than half rated them as helpful and interesting, while others had mixed feelings or did not like them because they feel observed or dislike the advertisement aspect leading to unnecessary purchases. In contrast, participants who approved mentioned that they are encouraged to buy different products than they usually do and appreciate help in choosing from a range of products. In general, recommendations should not be sent too frequently, and it should be explained why a product is suggested: "*So that I know it makes sense why it is displayed to me*" (4). Suggestions of new versions or products recently added to the stock were received better than recommendations based on previous purchases. Unnecessary messages should be avoided, and the system should learn from user input to avoid adverse effects.

Also, more than half of the participants would follow the request to leave a brief review of a purchase, while around half of them would also participate in a more detailed survey, preferably in exchange for discount coupons or other added values: "*I think it is important to have the*

opportunity to leave positive and also negative feedback" (1). Apart from direct benefits, reasons for answering the survey and direct integration in the prompt could, according to the participants, indicate a possible extension of shopping practices into the time after the actual shopping. However, in general, participants would prefer to receive notifications only during shopping and to have the option to deactivate push notifications on surveys and purchase reviews.

Other: Customisation options seem to be very important to users, not only concerning notification frequency and content, but also on the saving and usage of their personal data or location. Concerning the settings, options should be clearly understandable and numerous, but at the same time not too detailed regarding product categories. Participants also expressed the wish for a "new in stock" product list. In contrast to the first survey, a retailer-specific app is well received, because different advantages are offered. Only one person expressed the wish for a general app.

Technology acceptance: In our concluding questionnaire, we asked about perceived usefulness, ease of use, and attitudes towards usage. In total, participants rated the app as useful and the app functions were generally perceived as easy to use. Participants thought using the app could be fun and generally a good idea, while over two thirds (68.18 %) could imagine using the app in future everyday situations and most would recommend it to others. Important aspects for the usage are feeling in control of the app, feeling supported instead of patronised or analysed, and not being distracted by or made dependent on the app. Participants could also imagine combining it with *wearables* or *augmented reality* for optimal support, or attaching the smartphone to the shopping cart as they do not want to carry it in hand all the time during shopping. Reasons for non-usage include privacy concerns and no need for support or shopping in different supermarkets. However, many see a potential in technological support for grocery shopping: *"I think there are too few possibilities, it can and should be more"* (12).

7 Discussion and Outlook

Even though "a certain disillusionment arises" (Becker 2016 [translated by authors]) due to range problems and data security concerns regarding beacons, some of the initial problems have been addressed or solved (e.g. extension of battery time, decrease of impact on battery by BT Low Energy, increase of BT devices and added values). Location-based services are already used in mobile internet, while users are more advanced in this area as compared to companies (Becker 2016). Considering the higher usage of smartphones and online shops, beacons can make shopping more enjoyable and attractive and allow retailers a better presentation and planning. While customer opinions on the specific aspects differ, beacons can be useful and beneficial, although not undifferentiated and in all versions.

After the documentation and analysis of social practices, we followed the productive approach of design case studies to develop a concept and to design a prototypical app. As subjects took part in a field experiment testing the store-specific app, the results did not fully comply with conclusions derived from the first step which emphasised users' relatively strong interest in general shopping apps that include various stores' information. Nevertheless, our work dedicates itself to important questions and offers valuable insight into the attitudes of and usage by customers. In Table 3, we have summarised important results and implications derived from our study.

Even though prior works (Sperling 2014) doubt the success of an opt-in process and data privacy concerns were expressed in the online survey, most of our field study participants were willing to allow the app to use their location and personal data. The importance of trust provided by transparency, comprehensibility, adjustability, and limitation to analysis was stressed (Atkinson 2013). In general, our app was perceived positively and seen to provide an added value, especially when promising an easier and more enjoyable shopping experience to users. In contrast to the study by Iurchenko (2014a), many participants con-

Table 3: Summary of study results and implications

	Pre-study	App evaluation
Acceptance	Less than a quarter are already using shopping apps Smartphone usage is high, among other scenarios, during shopping About a quarter see a potential in shopping apps	Around a quarter are already using shopping apps Smartphone usage is high, among other scenarios, during shopping Most participants would agree to install a shopping app
Added value	Offer information and discounts are one of the biggest motivators for installing shopping apps One general app attracts most participants	Non-monetary values increasing efficiency are popular Most respondents voted for a store-specific app
Desired functions	Discount coupons, offer reminders, detailed product information, and navigation are highly popular Leaving reviews, playing games, or receiving notifications when passing are rated rather negatively or as unnecessary	An automatically sorted and shared shopping list with a recipe function was among the most popular features In-store navigation Checkout should be made digital and queueing rewarded with coupons Detailed product and stock information with reminders and notifications Personalised offers
Concerns	Privacy and security concerns are often expressed Too frequent notifications could be bothersome and should be customisable	Benefits justify the disclosure of personal information to a certain degree Push notifications not carefully based on personal settings can overwhelm the user
Implications	To most users, beacon-based shopping apps are a nice addition, although not a decisive factor, and have potential as many are already using their smartphone when shopping To increase their popularity, shopping apps should be part of marketing and offer selected benefits that make the shopping process easier, faster, and more enjoyable Apart from monetary incentives, features which make the shopping more efficient, like navigation, shopping list sorting, and valuable information on products, reminders, and offers as well as a common shopping list and recipe functions, should be included and emphasised The user should be able to decide in detail and in an understandable way which information to disclose and which notifications to receive and how often.	

sidered the process of shopping to be more efficient using in-store navigation. Also, customisation and adaptation to usage behaviour were crucial aspects. While in the online survey, half of the respondents voted for a general app, almost all participants of the field experiment saw the benefits of a store-specific one. The results could be based on previous experience, where many participants indicated to have only used general shopping apps and emotions as well as experience pose decisive factors for the decision to download a location-based services app (Kang et al. 2015).

However, most of them were not aware of the existence and benefits of similar apps, supporting earlier studies (Iurchenko 2014a; Shankar 2010; Thamm 2016a). Beacon-based shopping apps could therefore be made more popular by facilitating shopping practices: i.e. by offering information on products, prices, availability, and discounts, for example via a catalogue and a scanner, allowing personalisation, navigation, as well as an automatically sorted, collaborative shopping list which users can share with family and friends. Some of these areas have been identified by prior research as well (Kriz 2016; Purohit 2013; Thamm 2016a; Weigl 2013), while coupons and discounts did not play a large role in comparison to the works by Dickinger (2008) and Nikander (2011). High smartphone usage, also during shopping, further demonstrates a potential to benefit from beacons in retail (Thamm 2016a).

In creating a beacon-based shopping app, overwhelming users and sending too many (irrelevant) notifications – which is also a challenge for other apps, such as crises apps (Reuter et al. 2017), e.g. in times of crises (Reuter 2018) or conflicts (Reuter 2019) – and therefore making the experience more difficult, disrupting, and inefficient should be avoided Iurchenko 2014a). The evaluation of the designed app supports moderate implementation of push notifications as participants of the field experiments as well as survey respondents signalled mixed feelings about (too many) potentially unwanted messages. Instead, the app should help users find their desired products faster, offer useful and tailored

reminders and suggestions, provide the opportunity to give feedback and receive rewards, as well as support collaboration with others with whom users share their shopping, all the while allowing them to be in control of all information they are providing. Games, in-app greetings, and notifications while passing were among the least popular functions. Therefore, these features can be left out or limited in a next version of the prototype.

Limitations and outlook: Many questions remain unanswered and beacons, especially in retail, remain an interesting and dynamic area of research. Especially because their use promises benefits for customers and sales increases for retailers (Dudhane/Pitambare 2015b; RCKT 2015; Spender 2015) this technology requires a closer look and an increased customer awareness. It could be examined how customers can be made aware of the app and its advantages (e.g. by comparing marketing methods: digital displays or geo fences). Further research may also focus on general shopping apps. In pilot projects lasting over several months, customer behaviour, loyalty, satisfaction, and changes in revenue could be analysed to find out whether the creation and implementation of such apps and technologies are worth the (financial) effort for a company. Not only the benefits for retailers, but also the advantages for customers should become a focus of studies. How beacons are appropriated by customers and how all the new app functions influence shopping and corresponding social practices requires closer attention. Even though sharing content with friends was not highly valued, the desire for a shared shopping list indicated that cooperation within the family or shared flat, which is an integral part of shopping, should be addressed in retail apps and can be supported and strengthened in the evaluations of longer usage processes. Meanwhile, the requirements towards the app could change and functions previously regarded as useful could be perceived as unnecessary or annoying, while wishes for additional features could emerge. These questions can only be answered by a long-term study accompanying the implementation

and usage development. It is also crucial to analyse the transformation of social practices in-depth, as is the requirement of design case studies, and to fulfil the final step of iteration. Context factors like the individual shopping situation, social environment, or culture should therefore be taken into account. The study should be conducted with more representative groups with a more demographic diversity, especially concerning age and affinity towards technology. One could also consider a shopping support for people with (visual) impairments, as suggested by López-de-Ipiña et al. (2011). Apart from usability tests and an evaluation for increasing user experience, beacons should also be evaluated in other stores and sectors. Furthermore, alternatives should be considered, such as *Google's Eddystones* or advertisement in messengers like *WhatsApp* or *Facebook*.

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Facebook and the Mass Media in Tunisia

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Abstract

Facebook played a considerable role during the political uprisings of the so called 'Arab Spring' in 2011. Together with Al-Jazeera, it was one of the few reliable sources of information for protesters at that time. In this paper, we explore the media landscape in Tunisia two years after the uprising. We conducted a qualitative investigation (participant observation and interviewing) with young Tunisians. The paper describes how they use Facebook (FB), newspapers, and TV for gaining information and for exchange. By that time, FB was their primary medium for access to political information. They prefer the variety and diversity of user-generated content, they select information, discuss issues among their friends inside FB and with that, co-create meaning and trust. It seems that both traditional censorship in the national mass media and the revolutionary experience have created a unique media landscape among young Tunisians. Facebook still plays a leading role for many in that landscape, but there remains a 'digital divide'.

1. Introduction

The media landscape has changed radically during the last two decades. An important aspect of this change is the digitalisation of mass media content and its distribution via www-sites and computer networks. At the same time, we see a serious change in user behaviour: they move from being more or less passive consumers of mass media content to becoming active participants in creating ratings, recommendations, and self-generated content via a large variety of different functional-

ities such as comments, annotations, wikis, blogs, micro blogs, or social media platforms (Thurman 2008). This has serious consequences for professionally produced mass media content and for the culture of engagement. As Jenkins has suggested, there are consequences with respect to media convergence, participatory culture, and collective intelligence (Jenkins 2006). He argues that "if old consumers were predictable and stayed where you told them to stay, then new consumers are migratory, showing a declining loyalty to networks or media. [...] If the work of media consumers was once silent and invisible, the new consumers are now noisy and public" (Jenkins 2016: 15). In political terms, as he suggests, there is as yet no agreement about the 'terms of their participation' but, even so, the skills learned through the use of new media "may have implications for how we learn, work, participate in the political process, and connect with other people around the world" (Jenkins 2016: 23). Obviously, such changes in the media landscape have the potential to wield influence on public policy and democratic decision making, as has been indicated by a number of writers (see e.g. Axford/Huggins 2001; Howard 2006 and Thurman 2008). An attempt to make sense of global variation in the reporting of events, and specifically the role of new media, is the edited collection, *Citizen Journalism* (Allan/Throsen 2009). In contrast to Jenkins' views concerning the 'noisy and public' consumer, however, the latter authors are more likely to reflect Raymond Williams' original contention that the effects of the media would be the outcome of a relationship between various forces, including the technological, the social-cultural, the political, as well as the legal and economic (Williams 1974). If so, there remains a need to contextualise online activity through careful examination of the interplay between the changing media landscape and the political and economic realities.

In this paper, we point at a specific case and reflect on the political usage of Facebook (FB) by young Tunisians, members of the generation who started the 'Arab Spring' uprising, but who were not actively involved in

the uprising. The national media landscape in pre-revolutionary Tunisia entailed a strict regime of political censorship – with the exception of satellite TV and social media platforms. Consequently, social media like FB, Twitter and satellite television like Al-Jazeera played an important role both in the 'Arab Spring' (Kavanaugh et al. 2011; Kavanaugh et al. 2012; and Lotan et al. 2011) and specifically in the Tunisian revolution (Warnick/Heineman 2012; Kavanaugh et al. 2016). In earlier works, we provided first materials from our long-term research in Tunisia (Wulf et al. 2013). Additionally, there are some studies on social media use during the uprising in Tunisia (see e.g. Kavanaugh et al. 2016), but these studies were mainly surveys, quantitative research and lack in-depth insights that only qualitative research provides. However, we know little about the long-term effects of social media use in the Tunisian media landscape. After the old regime fell, most political censorship disappeared from the national mass media and thus, in principle, activity became 'open' again. Below, we examine the degree to which that is true, and the role new media play in contemporary Tunisian politics.

Our research mainly focusses on the 'revolutionary' generation – young Tunisians in their 20s and 30s – who were the drivers of the revolution. We are interested in their use of social media *inside the country*, specifically FB, as well as traditional mass media (TV, newspapers, radio) for political purposes. In this respect, we investigated both the way and the extent to which these social media are used. We focus on FB in particular because available data suggests that it had a key significance, especially during the uprising in various countries since 2011 (Crivellaro et al. 2014; Wulf et al. 2013). Lynch, Glasser, and Hounshell have stated that "Mubarak provided the grievances, Tunisia gave the inspiration, Facebook set the date, and the Egyptian people did the rest" (Lynch/Glasser/Hounshell 2011: 72). The role of the media in these countries can primarily be defined as providing a tool, not the cause for the political movement. Twitter, though used, seems to have been less important. Thus, as Kavanaugh et al. state,

> The most frequent tweeters (Twitter users posting messages or 'tweets') are not necessarily in the country. There is a large majority (almost 63%) of our collected tweets that are retweets (original tweets that are copied by other tweeters and sent out under their Twitter account as 'retweets'). This pattern is a likely indication of users outside Tunisia forwarding on messages from users inside the country. (Kavanaugh et al. 2012: 5).

Based on recent qualitative research in the country, the paper describes how members of this generation rely vastly on FB for political information and opinion building that replaces traditional mass media.

2. Related Research

A number of studies have examined the relationship between new media and it is often stated that Twitter, Facebook, and other social media platforms have a great influence on the disruptive and non-disruptive political participation (e.g. Cha et al. 2010; Jungherr/Jurgens/Schoen 2011; Lynch 2011; Shirky 2011). More specifically, a series of studies on social media use in a political or activist context have been published in the CSCW community (Lotan et al. 2011; Al-Ani et al. 2012; Kavanaugh et al. 2012; Wulf et al. 2013; for an overview of earlier work see Mark/Semaan 2009). These studies describe aspects of the use of blogging and micro-blogging sites such as Twitter, mainly during the uprisings in Egypt and Tunisia in 2010 and 2011. They have made a hugely valuable contribution to our understanding of political change and the role of new media. For good reason (Wulf et al. 2013), most of these studies have concentrated on people actively posting and are thus limited to the analysis of digital traces downloaded from the (micro-) blogging sites. Howard/Hussain (2013) compared the role of conventional mass media such as radio, television, and newspaper to the role of social media.

While the conventional mass media played a major role in other stages of the ongoing democratisation process, social media was used

for mobilisation during the early days of the uprisings. Hence, they tell us less about the relation between the use of social media and users' everyday political activities 'on the ground'. One of the few studies which used the 'on the ground' approach was conducted by Rohde et al. (2016). The study is based on 17 interviews with Syrian FSA fighters, activists, and refugees and describes the current fragmented telecom infrastructure in Syria and the critical role of mobile video for documenting, mobilisation, and propaganda.

To our knowledge, there are few qualitative studies that look into the political dimension of social media usage from the point of view of the activities of ordinary citizens. M'barek/Jeddi/Achouri (2015) investigated the impact of social networks on the voting behaviour of Tunisian voters during the 2014 elections. In their study, they collected direct self-declarations (in face-to-face surveys) about the voting behaviour of 564 Tunisian citizens, its determinants, and the main factors that influence it. For the investigation of the influence of social media and the importance of it when choosing political parties, the authors used the variance ANOVA for their qualitative analysis. In comparison, Woolley/Limperos/Oliver (2010) present a quantitative content analysis of more than 1,000 FB group pages dealing with the 2008 US presidential campaigns of Barack Obama and John McCain. Like the Twitter studies mentioned above, this study is limited to digital traces and does not provide an understanding of FB's relevance in the practical political decision-making process. More recently, other studies have begun to emerge. They include, for instance, analyses of social media use in Egypt based on survey data (Tufekci/Wilson 2012) or online data and reporting (Lim 2012). A number of empirical studies of non-activists in the context of political crisis exist. They include Semaan/Mark (2011), who conducted (mainly telephone) interviews with a set of ordinary Iraqi citizens to examine Internet use, trust building, and the shaping of (public) identity in disrupted environments during the second Gulf war and the civil war that followed. In addition, Shklovski/Wulf (2018)

observed how soldiers use ICT and also social networking sites during war time. This qualitative study highlighted the importance and dangers of using mobile phones as well as smartphones while being in war zones.

Another area of research covered the usage of social media by terrorist groups such as ISIS, where social media were not always used with the goal of pursuing democracy. On the contrary, social media has given terrorists the ability to directly come into contact with their target audience and either spread terror or recruit (Alfifi et al. 2018). In fact, ISIS has been repeatedly described as the most adept terrorist group at using Internet and social media propaganda to recruit new members (Farwell 2014).

The purpose of our research was to track the use of social media for political purposes, focusing mainly on FB, inside Tunisia and, moreover, to see how the interweaving of FB use and political activity might have altered since our first study. Overall, we still know relatively little about the extent to which the use of social media is related to the socio-economic and political landscape, which impacts the political activities and the interest in these evolving situations. We investigate these issues via the case of Tunisia, and concentrate on the current situation, two years after the successful uprising. This study forms part of an ongoing project that has been taking place in Tunisia for two years. That is, the study has a longitudinal element. Here, we specifically focus on changes that have taken place as something that could be considered a transition into a new "normality" in Tunisia.

3. Tunisia's Media Landscape: Mass and Social Media

Tunisia was ruled for some 24 years by Zine el-Abidine Ben Ali (1987-2011). The Ben Ali regime was basically a dictatorship. Political participation of the people in the sense of Western democracy was not encouraged. National radio and TV stations as well as newspapers were censored and under strict state control. However, Arab satellite TV

channels, such as Al Jazeera, with its headquarters in Qatar, had started to fundamentally change the media landscape. Since most Tunisian households were able to receive satellite TV, Al Jazeera played a major role in the Tunisian revolution (see e.g. Wulf et al. 2013). After the subsequent uprising, the Ben Ali regime was replaced by a transitory government. After a first democratic election in October 2011, a coalition government under the leadership of the moderately Islamist Ennahda party took over. In 2014, a new constitution was established, and the country voted for a parliament again and later on also for a new president. Censorship within the mass media system has been largely abandoned, so newspapers, terrestrial TV stations, and satellite TV today offer a rather wide range of perspectives on national politics. At the same time, statistical data demonstrate the increase in the number of Internet users in Tunisia from 27.5 of 100 people in 2008 to 39.1 of a 100 people in 2011 (World Bank 2013). At the end of 2010, Tunisia had one of the highest rates of FB usage among the Arab states (17.6%), a trend which continued in the following year (22.5% in April 2011). Young people made up 75% of FB users (Kavanaugh et al. 2012).

4. Research Design and Empirical Methods

Before presenting our findings, we would like to reflect on our field work and describe its setting and the people involved (e. g. the interviewees), our methodological approach and methods of data collection and analysis.

4.1 Qualitative Research "on the Ground" in Tunisia

We characterise the work we describe below as broadly ethnographic (though largely interview-based). Here, we follow the likes of Clifford Geertz and George Marcus as well as work in the specific context of CSCW (Randall/Harper/Rouncefield 2007) in arguing that ethnography implies no particular stance on method, but an analytic position reflecting, in a necessarily incomplete and partial way, the point of view

of participants. Much of our data comes from a series of open and later semi-structured interviews. The interviews are additional instruments to gain insider perspectives about media use and patterns of interpretation by native Tunisians. The interviews are predicated, as stated, on a longer-term involvement with Tunisian life. Our empirical work started in December 2011 and is still ongoing. Based on the first field trips, a research paper was published. The focus of this previous work was on the role of social media during the uprising (Wulf et al. 2013). The findings indicate that social media "performed an amplifying role for people who might otherwise have been content with a lower level of participation" (Wulf et al. 2013: 1417).

The data for this paper was collected during two visits in Tunis, the capital of Tunisia, and Kélibia, a provincial town on Cap Bon peninsula some 40 km south of Tunis. The last author visited Tunis in February 2013 to establish research cooperation with the Higher School of Science and Technology (ESSETT) of the University of Tunis. He taught a project-based course and stayed for ten days. During his stay, the opposition politician Chokri Belaid was murdered and Tunisia experienced a political crisis including country-wide demonstrations and strikes. Due to the insecure political conditions, the author stayed mainly in Tunis. During this time, he worked with students, engaged in discussions with academic colleagues, and had conversations with a wide range of people in and outside the scientific community in Tunis. These contacts helped furnish access to the field and to find some of the later interview partners.

One of the surprising first field observations was the fact that FB seemed to play an important role as a primary source for political information and exchange. Subsequently, we followed this observation and explored this theme in fifteen qualitative interviews. We firstly conducted six informal, exploratory interviews for gaining initial information about media usage in general in Tunisia today and for broadening our contact base. These interviewees are all connected with the

university and have a high level of education (except one): They are faculty members of the Computer Science department, PhD- or Master's students, and one is a driver working for the university. The age of the interviewees varied from 22 to 50 years. Back in Germany, we additionally interviewed a female Tunisian Master's student in Media Science currently studying in Germany.

These interviews and their first analysis brought forth more aspects of the related topics and research questions, but also revealed a number of open issues. These findings induced a second phase of data collection and interviewing in April 2013. The third author, a Tunisian native, conducted seven additional interviews in her home town of Kélibia on Cap Bon (interviews 9 to 11) and via Skype (interviews 12 to 15). These interviews were semi-structured and focused on broad areas based on our initial findings. All the interviewees were first asked to describe their personal background. Central topics of the following guideline of the semi-structured interviews were: media use in general, Internet usage, social media usage, FB usage and preferred sources for gathering political information.

The choice of the interview partners relied on efforts to find as much variation in our sample as we reasonably could, given access and time restrictions. In contrast with our initial interviewees, who were well educated and centrally located (Tunis), our follow-up sample lived mainly in smaller towns. Three of them have a low educational qualification (elementary school), the others hold a degree in Engineering or the Humanities. All interviewees of this second data collection phase were aged between 19 and 30 years. Overall, we conducted 15 interviews; the length of which varied between 25 and 150 min.

The first, open interviews were conducted in French or English depending on the interviewees' foreign language capabilities and were not recorded due to the sensitive context but documented in intense field notes directly after the interviews took place. In comparison, the semi-structured interviews by the third author were conducted in Ar-

abic, the mother tongue of the interviewees and were audio-recorded and partly transcribed thereafter. The interviewing by a native Tunisian of the same age group provided some guarantee that an 'outsider' effect could be avoided.

The analysis of the field notes and of the interview transcripts were realised by a qualitative content analysis, which entails controlled analysis of texts within their context of communication. It combines inductive category development, focussing only on the data material, and deductive category application, also integrating the findings of the first data collection phase, in order to identify central aspects of our research question that will be further developed in follow-up research (see Mayring 2000). After the different phases of data collection, the data was analysed cooperatively by the team of authors who, in this paper, present selected findings of their analysis and research.

4.2 The Interviewees

The interviewees represented a fairly broad spectrum of Tunisian society, although most of the interviewees have an academic background and were under thirty years of age. The discontent of this age group was the main driver for the demonstration movement leading to the fall of the Ben Ali regime. One-third of the interviewees were female. Five of the interviewees had a background in Computer Science, two in Engineering, and three in the Humanities and Social Sciences. With regard to political activities, our sample represented a rather diverse spectrum. During the time of the Ben Ali regime, it was not opportune for ordinary people to engage with politics, specifically not for those who could be understood as opposing the regime.

However, the countrywide demonstration movement in 2010/11 had contributed to a considerable political activation of the Tunisian population, specifically among the younger generation. Two years after the revolution, some of our interviewees expressed disappointment about the disharmonious character of the democratic discourse and the slow

pace of improvement in the material dimension of their living conditions. For instance, Arij[1], a 23-old-house wife from Cap Bon, explained that she had been interested in politics during and after the revolution, but now she is disappointed about her decreasing standard of living. She also finds it difficult to understand the current political situation. Still, she watches occasional broadcasts of the constitution-shaping assembly on state- owned TV. However, she considers the political fights and the personal attacks as often ridiculous, while somehow amusing as well (see int. 11). [table 1]

Except for Karim, all interviewees expressed some interest in the political developments of the past two years, though to different degrees. Three of our interviewees indicated support for Ennahda, the ruling moderately Islamist party. Others expressively favoured the laicist opposition. None of them positioned themselves as a political activist.

All interviewees use the media and show some similarities in their preferences, despite the differences that will be discussed later on: FB clearly is the most frequented media in our group of interviewees, followed by TV and newspapers. Three interviewees mentioned radio: Amin, a 30-year-old day-labourer, Mahdi, a 25-year-old hydraulic engineer with a long history of unemployment, and Hanan, a 27-year-old female English teacher.

In contrast to other countries, additional social media platforms, such as Twitter, are not really common for our interview partners: *In Tunisia, we do not use Twitter.* (int. 4, Ali, a student). One exception is Mahdi who used Twitter as part of his job for a political party and puts high confidence in the quality of information received via Twitter.

5. Findings from the Ground

In the following, we are going to address the major findings of our data analysis in depth. We decided to structure the findings based on the central categories that emerged during the data analysis: We start with feedback concerning the general access to and usage of Facebook by our

Table 1: Interviewees' Background Information (as of 2013)

No.	Pseudonym	Age	Gender	Residence	Education	Professional Engagement
1	Khaled	25	M	Tunis	MA Computer Science	PhD student in Computer Science
2	Sami and Mohamed	Mid-twenties	M	Tunis	MA Computer Science	PhD students in Computer Science
3	Adel	Mid-thirties	M	Tunis	Basic education	driver
4	Ali	22	M	Tunis (originally from Cap Bon)	Unknown	Master student in Computer Science
5	Laila	30	F	Tunis	PhD in Engineering	Junior Faculty at a university in Tunis, Computer Science department
6	Samir	50	M	Tunis	PhD in Computer Science	Faculty (Professorship) at a university in Tunis, Computer Science department
7	Moncef Ben Salem (needs no pseudonym)	60	M	Tunis	PhD in Math and Physics	Minister for Higher Education (2011-2015), died in 2015
8	Samira	27	F	Cap Bon (50 miles from Tunis)	Master in Language and Communication	Student of Media Science
9	Karim	19	M	Cap Bon	Elementary school	Barber
10	Amin	30	M	Cap Bon	Elementary school	Day-labourer
11	Arij	23	F	Nakhla	Elementary school (just three years)	Housewife
12	Marwan	26	M	Kelebia	Degree in engineering	unemployed for more than 9 months now
13	Mariam	29	F	Tunis	Degree in History (to become a teacher)	unemployed for quite some time now
14	Mahdi	25	M	Nabeul	Degree in Hydraulic engineering	Engineer, before: long-term unemployment
15	Hanan	27	F	Jendouba	Degree in English (Teacher)	English teacher (part time)

interview partners, then we enlarge upon this topic by focussing especially on the use of political Facebook pages as well as their use during the uprising. In this context, the categories of *trust* and *distrust* in social and mass media turned out to be a crucial factor for the interview partners. Hence, we report on the findings in that respect in more detail in subchapter 5.5, pointing first at mass media, specifically television, as a questionable source for information, followed by the perception of newspapers and finally, reflect upon the question of trust/distrust in Facebook).

5.1 Getting Connected: Accessing Facebook

While conducting the first interviews in the larger capital area, our data indicated that Tunisian society is deeply divided in its access to the Internet in general and to FB in particular. None of the interviewees from Cap Bon have access to the Internet at home. Arij, the above-mentioned housewife and mother of two children only went to school for three years and is scarcely literate. She just owns an old mobile phone to organise her bread baking and selling activities. She explains *"it's expensive to have Internet access in the village. It requires one to have a telephone landline and to pay an additional registration fee of 120 Dinar"* (some 73 US-Dollars) (int. 11). Due to the limited financial resources available, her home does not yet have a landline. As a consequence, she does not use FB and has only a very vague understanding of what it is about: *"Facebook is like a newspaper in which people inform themselves with regard to the political situation. Moreover, you can watch videos like in the TV."* (ibid.).

In contrast, Karim, the barber, who also lives in a rural area, is a quite avid FB user, having started in 2010. He uses the local Internet café that had been opened after the revolution. However, in relation to the income levels in that region, access is rather expensive (one Euro per hour).

As opposed to this, all students, university graduates, and academics had access to the Internet at the university, at home, or in the student

dormitories. They were all avid FB users, even before the revolution. Many of them also had access to the platform via their smartphones. According to Sami and Mohamed, Tunisian telecommunication operators offer *"free access to Facebook. So even people who have only a pre-payed phone card can access Facebook for free, upload data and view it. Moreover, the telecom operator offers free sms to inform the users about updates on Facebook."* (Int. 2). Our interview partners interpreted this as a marketing strategy by the providers of these services. These examples clearly underline the differences in generally getting access to the Internet with respect to one's place of residence (in towns and all the more in the capital Tunis, it is more common to have access for everybody than in rural areas) and with respect to economic resources, especially within the rural or poor areas.

5.2 Patterns of Facebook Usage

Those of our interviewees who have Internet access in their homes have used FB since well before the Tunisian revolution. One of the Computer Science students, Ali, explained that after coming home from the university to his dormitory, he directly opens FB and leaves it open the whole evening. He uses FB for a variety of different activities, such as socialising, job search, and political information (int. 4).

Samira, a 27-year-old communication science student, reports an even more intense usage of FB (having been a member since 2008): She opens FB first thing in the morning after waking up. She keeps it open and checks it regularly during the day via her mobile and reads longer articles and watches videos in the evening. She explained that FB is her *"most important media to inform about politics"* (int. 8).

Karim, who can only use FB from the Internet café, has also appropriated it in quite interesting ways: He shares music and funny videos via FB. He told us that he works with two accounts: *"a 'serious' one registered with my real identity, mainly for chatting with friends and a 'non-serious' one which I use to chat with girls."* (int. 9).

The PhD students from the capital Tunis (Khaled, Sami, and Mohamed, all in their mid-twenties) informed us that most of the events in Tunisia are nowadays organised via FB. Mohamed, for instance, announced a scientific workshop via the network to make people aware of the event and to make them look at the workshop's WWW-site. In this way, initial traffic was created. Sami explained that he even invited friends and family to his marriage party via FB and that all of his friends have FB, using it on the PC as well as on the mobile (see Int. 2). He also told us that he has stored all of his photos on FB and many of his friends do the same. He uses FB's privacy settings to control access to his photos.

Sami, as well as other interviewees, mentioned *"some people even apply through FB for jobs. Companies announce jobs on FB and young people apply there."* (int. 2). But he modifies this statement by explaining that this might not necessarily be the best way to do things because it bypasses the WWW portal of the state-owned employment bureau. To fight the high unemployment rate among Tunisian youth, the bureau considerably subsidises early stages of employment and first job contracts by means of a government programme. Bypassing the bureau via FB means abstaining from this source of financial support (see int. 2).

Since FB plays such an important role in the life of most of our interviewees, it also influenced their practices of gaining information and discussing matters. One of the engineering students, Marwan, explained that he does *"not need to search for actual political information on FB as I have some 400 Facebook friends, most of them from Tunisia. (...) When opening Facebook, one directly finds lots of this information created or recommended by them."* (int. 12).

Ali, Computer Science student in Tunis, stated that FB is his main means of obtaining political information. He likes to follow political pages – but he prefers those that are politically moderate. He is not affiliated with either left- or right-wing radical FB groups. He finds new FB pages via content sharing from his friends. If he finds their content

interesting, he marks them via the 'I like' button. If he later finds out that a page does not offer good quality information, he 'unlikes' it (see field notes int. 4) in much the way users would do elsewhere. This way he keeps updating his sources of political information.

Ali also discusses things with his friends on FB. Among his classmates, there are three supporters of the current government and one of the opposition. He recalls that, the night before the interview, they had been arguing about who had burned the cars in the parking lot in front of their faculty building. The faculty building is located just opposite the cemetery where Chokri Belaid was buried. The burned cars belonged to supporters of the opposition who had participated in the funeral. The student in favour of the opposition argued that actors close to

Fig. 1: Cars burned during the funeral of Chokri Belaid in the parking lot in front of the faculty building (picture: last author, February 2013)

the Ennahda party must have burned the cars. The students supporting the government argued that this was not true. They assumed that the perpetrators were rather kids who did not have any political agenda. This discussion took place on the FB wall of one of his classmates (see field notes int. 4).

One of the female interviewees, Samira, reported recent negative experiences when actively contributing to a political discussion on FB. While quite actively posting during the time of the revolution, she now states that *"the discussants are not anymore of one opinion and one often experiences quite negative topic-unrelated reactions."* (int. 8). Therefore, she does not contribute actively to political discussions on FB anymore. However, FB is her most important medium for informing herself about politics in general.

Samira also explains this statement in more detail, pointing out the functions of FB as primary information source, useful for the dissemination of incoming information from multiple sources via its users: She regularly receives links to TV programmes and newspaper articles via FB. When reading these links, she finds it easy to identify and name the original sources (www sites of the newspapers) of the posting. Sometimes she then moves to that website (see field notes of int. 8). Like other interviewees, she is also a member of Tunisiana, a private TV station's FB group. There she can download videos of programmes of this TV channel.

5.3 Political Facebook Pages and Groups

Beyond representations of TV programmes and newspaper content or recommendations to them, FB users in Tunisia have created a wide range of pages and groups which cover more or less exclusively political content. There is a FB page called 'Tunisia' through which many political videos are shared. These videos originate from TV channels such as Al Jazeera, Al Arabia, or CNN. However, this FB page also provides the platform to exchange amateur videos with political content. At the time of investigation, more than one million users were following this page.

Even Tunisian TV stations seem to take amateur videos from this site and broadcast them.

There are also FB pages and groups which articulate a clear political stance, sometimes framed ironically. Like most Tunisian politicians, the head of the Ennahda movement, Rached Ghannouchi, has an official FB page that is liked by some 250,000 people. However, our interviewees also mentioned pages that have a clearly Ennahda-critical tone in their title. One of these pages is called 'Get Ghannouchi back to London' which has more than 200,000 followers and comments ironically on the Ennahda rule. The page's name refers to the London exile, where Ghannouchi had lived for 20 years before returning to Tunisia after the revolution. Hanan, the English teacher, mentioned that she shares slogans against the ruling party via a FB group called *"I am Muslim but Ennahda does not represent me"* (int. 15).

In addition to their major representatives, all political parties in Tunisia are represented on FB. They even seem to use FB to comment on each other's news releases. The Tunisian government has widely embraced FB as well. All ministries in Tunisia were represented on FB at the time of research.

5.4 "Thank you Facebook!" – Facebook Usage During the Uprising

The importance of FB today cannot be discussed without looking back at its role during the Tunisian revolution in 2010/2011 (Wulf et al. 2013). This is demonstrated by the fact that some of our interviewees referred to their experiences of the revolution during our interviews. To many of them, FB, together with Al-Jazeera, was the only source of reliable information during the uprising:

Ali, for instance, mentioned that he had probably heard about the self-immolation of the street vendor in Sidi Bouzid for the first time on the very day it happened. He was not very sure whether he had received the news via FB or via Al Jazeera (int. 4). However, he did not pay much

attention to the event because these things happened often in Tunisia in those days. He got more concerned when the demonstrations started to grow. Looking at FB and Al Jazeera, he was able to get an appropriate understanding of the evolving political uprising (see ibid.).

FB use was very widespread during the revolution and played a *"major role"* (int. 12). Political discussions as during that time are partly still ongoing (see int. 8 with Samira), but often they do not appear on the pin board, *"but via messaging"* (Mariam, int. 13). From the point of view of Marwan, *"there are not many political discussions any more as people are disappointed, frustrated with the long transition period and the actual political situation"* (int. 12). Nevertheless, he is still sharing articles, videos that reflect the recent political situation, and background information via his pin board. Along with Samira, other interviewees stated that FB usage was surveyed by the Ben Ali regime.

5.5 Trust in Social and Mass Media

Trust and distrust in the diverse forms of media became one of the key issues in our interviews. Although this topic is more than present nowadays (fake news etc.), looking back at the perception of our interview partners during that very specific and politically charged time is worth making the effort in order to gain more insights into that context.

5.5.1 Television in Tunisia: A Reliable Source for Information?

Television remains an important medium, in Tunisia as elsewhere. Even so, our interviews clearly show that TV usage has to be distinguished *"before, during & after the revolution"*: Before, all TV programmes were censored and were not entirely trusted. After the revolution, the channels are perceived as much better and more differentiated. During the uprising, the Arab channel Al-Jazeera had a unique position in gaining reliable information that was not otherwise reported. Besides FB, it was the central source of information for a lot of people but lost *"all the trust*

they had built during the revolution" (int. 8 with Samira) due to its growing proximity to Ennahda: *"they are clearly one-sided"* (ibid.).

Marwan – as a very active user of FB and the most reflective interviewee when it comes to trust and validity of information – shows complete distrust in Al-Jazeera today and blames them for a *plot against Tunisia* (even before the revolution, int. 12). Laila, a 30-year-old junior faculty member at the Computer Science Department at the University of Tunis ascribed misinformation to them: *"They have distributed wrong information – even already during the revolution."* (int. 5). For Mariam, another problem is that the channel is not focused on Tunisia anymore and that the reporting is *"too sensational and bloody"* (int. 13).

TV usage after the revolution also has to be distinguished with regard to different channels: 'Al-Tunisia' was often mentioned in the interviews as the political and 'social' programme viewed by many people. Three of our interviewees, Marwan, Mariam, and Hanan (one engineer and two teachers) give this television station 100% credit with respect to reliability because their journalists are supposed to be under surveillance by the public.

Another well-liked and often mentioned channel is 'Al-Watanija'. Mahdi, a hydraulic engineer, perceives it as *"the best one, very objective"* (int. 14). With regard to the time before and during the revolution, when there was no trust in Tunisian TV at all, that change is remarkable (see int. 11 with Arij).

Despite this development, TV in general is still perceived as being too selective, not always sufficiently neutral in its reporting, and failing to offer detailed analysis in the way that FB does, for instance about the killing of Belaid in February 2013. This might be a central reason for the practice of comparing news from one channel with another channel or with reports about the same incident in different media.

5.5.2 Perception of Newspapers

Most of the newspapers are perceived as being anti-government and *"very biased in their perspective"* (int. 1 with Khaled, a PhD student), and consulted mostly by people from *the older generation* (int. 2 with Samir and Mohamed). The papers more likely to be trusted are perceived to be politically *"more neutral, and not supported by or supporting any political party"* (see int. 12 with Marwan).

Media use in this field has sometimes shifted from the classical papers to their online versions. Adel, for instance (driver for the university), prefers to read the newspapers online (see int. 3) via his mobile, although Marwan prefers the printed versions, reading mainly local or international press about political news and sports (int. 12, Marwan).

5.5.3 Trust in Facebook?

Generally, the quantity of information available on FB is perceived as a better basis for gaining information and for filtering out the most untrustworthy sources than other media: *"In FB, I can better make up my mind (...) there are much more unfiltered sources which one can better rely on"* (int. 4 with Ali, a Master student).

During the revolution, FB was used and described as the most reliable medium, but that image has also changed slightly with time. Karim, the barber from Cap Bon, is less trustful of information on FB and accuses some sources of making up stories and spreading lies (see int. 9). But despite the distrust in the reporting of political issues, he uses the network for private communication quite intensively.

Mahdi puts confidence in just 20% of the postings on FB, based on his short-time experiences as political activist in a political party (CPR – Congress of the Republic, a liberal, secular party in Tunisia). He describes videos and pics as *"often edited"*, cut, etc. and that is the main reason why he validates postings by checking the links (int. 14). Hanan, the female English teacher, believes in some sort of control (censoring) as she observed that some videos disappeared from FB – that is why she

distrusts FB and validates information via TV (see int. 15). In reference to FB's role in the political landscape in Tunisia today, Sami and Mohamed said that FB plays the main role in the political landscape, *"a 90% role in sports and in politics"* (int. 2).

Marwan, being a vivid FB user, confirms the importance of FB as first source for information: *"You can find every news there and don't have to look somewhere else."* (int. 12). He likes the variety of information but stays sceptical with regard to the reliability of information on FB at the same time. That is why he reads all the information that he is interested in and then separates the wheat from the chaff, picking out the information that seems trustworthy to him and discussing it with friends .

Concerning postings from FB-groups, Marwan comments *"one should be sceptical about postings from groups that have a more or less clear political position, left or right. (...) One should take that critically."* (int. 12). He relies on information pathways that have additional comments about reliable sources or include hints about the uncertainty regarding the reliability of that source. By actively checking and verifying the sources with others, spreading information or links via his pin board, or in starting discussions about postings with his friends via messaging, he co-creates meaning and trust (ibid.).

6. Discussion

During our field studies in Tunis, we observed and spoke with both a well-educated, urban group (mainly students in Computer Science and similar disciplines) and with a less favoured group outside of the capital city area (with respect to education and socio-economic position). The latter group provided a useful reminder that social media use is not universal. A 'digital divide' clearly remains both because access is expensive and because Internet infrastructure is of relatively poor quality outside the capital. Nevertheless, as we have already indicated, we were specifically interested in how the socio-economic and political land-

scape was mutually elaborated with FB use, especially during a process of 'normalisation'.

The reported media usage of the Tunisians interviewed is rather particular and has evolved within the specific historical and political setting in which national mass media could not be relied upon due to heavy political censorship. Since the fall of the Ben Ali regime at the beginning of 2011, a central, non-governmental source for political information during the Revolution – Al-Jazeera – has lost credibility, at least in the eyes of those actors critical of Ennahda politics. But the second central resource for information in the revolutionary uprising – Facebook – has not lost its importance. On the contrary! The social network offers a media space in which many users generate content, often almost at the heart of the action or immediately after a political event. Therefore, it still is clearly faster and more diverse in its content production than traditional mass media and allows an 'on-site' perspective on events. The comment by Ali, one of the Master's students interviewed, puts this into a nutshell with reference to traditional media: *"There are much more unfiltered sources which one can better rely on"* (int. 12). Rohde et al. (2016) describe a similar phaenomenon with regard to content production by means of mobile media in the Syrian civil war.

Nevertheless, we see certain shifts since our first visit: The first and most obvious is that Tunisia has, at least to some degree, become a more pluralist and open society. The paradox – if that is what it is – here is that this is associated with a more sceptical, critical approach to content by FB users. There was without question a considerable scepticism about the mass media at the time of the uprising, where political censorship was pervasive (Wulf et al. 2013, for the case of Syria see Rohde et al. (2016)), but we now see a much more prevalent intertwining of the mass media and FB content. Journalists routinely use materials published on FB to include in their own reporting and vice versa: Users of FB post video snippets or reports from different mass media on their pin boards to spread information, but also to start critical discussions

of it. Citizen journalism (Allan and Throsen 2009), that is, is alive and well. The 'mood', so to speak, has shifted from FB being a locus for and a call to political activity, to it being a locus for pluralistic, critical discussion. Unsurprisingly, at the same time, content taken as a whole becomes less overtly political and FB is put increasingly to uses that any Western user would recognise. In this period of transition, however, the politics has not disappeared.

Given the experience of long periods of censorship and a mass media landscape which is still in the process of its transformation, materials imported into FB, recommendations and links from FB-friends help users to find their orientation and to reduce complexity. The new pluralism is, for some, bewildering, and FB – supported by its structure of social networks, implemented via friendship relations, 'likes' and FB groups – provides a means to navigate this complexity. The network is not to be seen as a black box, but as a dynamic network that supports the needs for media usage of many of our interview partners, but also calls for a very critical reflection and selection of the material presented there. This can be seen in the conflict in the Ukraine as well, where mass media is not trusted and soldiers rely on social networking sites to gain information of the conflict to understand what is happening (Shklovski/Wulf 2018).

So, in Tunisia, FB has become an important platform for user-generated content production and recommendation in the political domain. This role is facilitated by the fact that FB has become a key infrastructure in many aspects of young Tunisians' life – it merges the public and the private sphere in new ways (Wulf et al. 2013) as summarised in the quote that became eponymous. A vast range of persons, (political) institutions such as government ministries, and businesses have FB pages. The process of normalisation includes a developing breadth of usage. In a similar way to that reported by Wyche/Forte/Schoenebeck (2013a and 2013b) in their studies of urban poverty in Nairobi, Kenya, who observed that FB plays an important role for people's job search living in

that very poor setting, the same is happening in our context. A number of our interviewees use FB for job-hunting (for example Sami, Mohamed, and Marwan). One could argue that FB provides a widely applied IT infrastructure for societies that are poor in other IT resources, one that is available to a relatively large sector of the population.

However, our later interviews in rural Cap Bon indicated that FB and the Internet are *not* ubiquitously accessible all over Tunisia. There is a considerable issue of digital and economic exclusion related to FB usage (as we exemplified with the cases of a housewife, Arij, and Amin, a day-labourer, who did not have the financial resources for the Internet).

While FB usage affords active involvement in allowing users to contribute content and recommendations, there is a severe problem with the platform it provides. The public space that FB provides to Tunisians is offered by a private US company – a fact that becomes even more critical, given recent NSA disclosures. This company has its own rules with regard to censorship of content and it owns all rights to the data produced by users of the platform. FB has used its ownership rights to impose certain rules on which content could be published. These selection criteria can be quite political in nature, e.g. in their interpretation of incitement of violence or their definition of pornographic content. If users display their political activities on a social media platform, their political believes, networks, alliances, and tactics can be tracked. FB owns a database on political activities, which many secret services may envy. Recently, it was leaked how Cambridge Analytica could access the data of FB's users, which could be used later on to target all of these users with personalised political ads (Solon 2018). Cambridge Analytica stated that "its tens of thousands of propaganda items were viewed billions of times" (Adams 2018), nonetheless, it is still unclear how and in which ways these posts may have influenced the presidential elections in the USA. But FB blurred the boundaries between different contributions (e.g. editorial and promotional articles), which are then delivered

(shared) via FB with the reliability of being "shared" by a trusted person (Adams 2018).

It is interesting to note that the empirical data suggests that FB has taken over the role as first information source from other (mass) media, and even newspapers are perceived as less reliable (int. 1) and not suitable for the new generation of young Tunisians (int. 2). Videos tend to be posted on FB first; interviewees describe how these videos could be seen on TV later (see int. 13 with Mariam, a teacher). Two of the PhD students as well as a Master's student go even so far as to say that *"Facebook replaces TV"* from their point of view (see int. 2 and int. 4). Furthermore, people actively contribute to this change: They post news and articles from newspaper websites on FB and share them with their friends and relatives.

Pluralism in Tunisian society is mutually constituted with pluralism in FB usage. There are multiple ways for the complex use of FB for the young people. Mariam for instance, a 29-year-old female teacher who has also been unemployed for quite some time now, reports that she entered FB late (in July 2012) and that she *"uses it now for gaining international and local news from TV, newspapers, and FB on FB and for communicating with friends"* (int. 13). Other interview partners describe that they generally use it for gathering information about recent political events, to advertise events (even weddings, see int. 2).

FB started its career as an Internet infrastructure in the social and then in the political domain. It gained credibility during the Tunisian revolution and has retained it, although it is now being viewed through a more critical lens. Arguably, the very fact that continued interest in political activity and information is woven in with a more pluralistic set of possibilities in relation to ordinary social life is what cements its role. In FB, there is no particular need to differentiate between the personal and the political. A similar phenomenon we observed in Palestine when investigating the appropriation of FB by political activists who were fighting against the wall (Wulf et al. 2013b).

FB offers universal access to political information, integrating access to different mass media, merging the public and the private sphere, merging reading, advising, and coproducing content. Closely connected with that, political discourse is changing from top-down to more bottom-up which means on the one hand that it is less easy to influence, but on the other hand also becomes more variegated. Above all, the influence of FB means that a private company in Silicon Valley (with its own content-oriented censorship) becomes the platform provider for a country' political discourse. And, as shown with Cambridge Analytica, this influence can be used to change political opinions.

7. Conclusion

The majority of current literature on media usage focuses on certain themes and is often based on the analysis of Western democracies above all other political contexts (with a few exceptions, see Dawson 2003). Here, the tension between the development of new media (such as FB and also Twitter) and the political process is a recurring theme. One consequence of this research focus is that we have very little empirical data which examines the situation in a rapidly evolving, non-Western, political context. The situation in Tunisia, while no longer one of 'crisis' or 'revolution', is nevertheless unstable. The nature of Tunisian democracy is dynamic and rapidly evolving. A feature of this, and unlike most Western democracies, is that interest in the political process remains high and is often focussed on the new media and specifically on FB. Jenkins and Thorburn (2003) report that, according to Pew research, only 18% of Americans had used the Internet to learn about the candidates in the Bush-Gore presidential election. Later on (2012), it is reported that 21% of the 60% of Americans who are social network users belong to a group that pursues political or social issues, while 20% of them follow elected officials. Strikingly, however, social media users in the USA are more likely to express interest in the political process than non-users. Also, as seen by the leak about Cambridge Analytica (2018),

these users are targeted by political online-campaigns to change their opinions about political candidates. Even with the limited sample in the context of Tunisia, we could show that most of the statements made for the Western society appear to be true for Tunisians as well.

If we are to understand the interplay between new media and other political, economic, and social factors, however, then some kind of ethnography recommends itself, particularly one that focusses on precisely those issues. Moreover, to our knowledge, no longitudinal study has hitherto been attempted in order to ascertain how things change as we move from a 'crisis' situation towards one which is relatively normalised. Political behaviour in stable democracies (we use the term advisedly) cannot automatically be generalised to emerging democracies. Our study attempts – in an admittedly small way – to rectify these omissions.

The study, we suggest, makes three main contributions:

1) It provides an initial basis for understanding the way in which social media use is embedded in a dynamic, rapidly changing, socio-economic context.
2) It introduces the prospect of longitudinal studies of social media use in developing situations, providing a comparative possibility as a society moves from a 'crisis' situation towards some form of 'normality'.
3) It provides a dynamic account of the interplay between the 'old' and the 'new' (social) media.

Our findings show that the relationship between 'old' and 'new' media has shifted over a period of two years. Where Al-Jazeera had a dominant role during the uprising, it is –somewhat paradoxically – less well-regarded now as competing narratives have become available. Perhaps more importantly, we see no overall decline in the use of FB as a politi-

cal medium, despite the availability of these new narratives on television and in the press.

We would argue that what we are seeing is an emergent, uncertain, and somewhat tense development of a pluralistic democracy tied in with the affordances that the new media provide for 'citizen journalism'. However, and this bears emphasising, such practices do not emerge automatically in virtue of the mere existence of new media. They are embedded in socio-material life. Equally, they have to be learned. Saeed/Rohde/Wulf (2011) list some of the skills that are required for a 'participatory culture' to emerge: They include collective intelligence, transmedia navigation, appropriation (sampling and remixing media content), judgment (about reliability), networking, and negotiation. Our findings reinforce the notion that these skills are a function of a developing pluralism as well as of new media's affordances.

Following our empirical work in Tunisia, we have created a larger body of empirical studies which analyse the use of social media on the ground by particular actors over a longer period of time. We looked at political activists in other Arab countries such as Palestine (Wulf et al. 2013b) and Syria (Rohde et al. 2016). Currently, we study Berber villages in the High Atlas Mountains in Morocco which only recently got access to the Internet in general and to social media in particular. We also investigated social media use in countries which are in a transitory phase from a communist past, such as China (Liu et al. 2014), Bosnia (Tadic et al. 2016) and Ukraine (Shklovski/Wulf 2018). Such a body of empirical studies allow us to compare their findings and contrast them with social media use in the Western Hemisphere. It also allows to ground the design of new social media functionality in an understanding of its appropriation in practice (Wulf et al. 1999 2015, and 2018).

Notes

1 All the names are pseudonyms with the same cultural background as the original.

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Book Review Symposium Charles Goodwin

Charles Goodwin's Co-Operative Action: The Idea and the Argument

Erhard Schüttpelz, Christian Meyer

L'idée, le principe, l'éclair,
le premier moment du premier état,
le saut, le bond hors de la suite…
À d'autres, préparations et exécutions.
Jette là le filet. Voici le lieu de la mer
où vous trouverez. Adieu.
(Paul Valéry)[1]

Because of Charles Goodwin's death—foretold and still so untimely—, his latest book was meant to become his legacy. It became the personal *summa* of his research activities of 40 and more years, and this might be the reason why it is so difficult to come to an assessment, even after months of intensive and sporadic reading and familiarity with many of the examples included in the book from talks and workshops. When after long years one is used to expect from Chuck Goodwin the ever "next article" and the ever "next unearthed empirical gem" accompanied by an ingenious analysis, one is inclined to pursue this routine even against the facts rather than pretending the death of the author could interrupt this inspiration, and as if we were able to come to a final conclusion, or a preliminary judgment.

Can the book tell us something that his "next article" or "next talk" could not have? Or should we read the book with the confidence that we will find more articles and talks that Chuck Goodwin would have written, or given, and that we are to write, or give, in the future? Maybe we

could find these articles and talks or do some mock-ups of them. But alas, all this will not help: We have to take the book as his book and savour its gifts as well as ponder its difficulties. The latter are mainly two: the book's systematic structure and the central claim brought forward through its title.

1.

The biggest stumbling block of the book may be its title, in which Chuck Goodwin has invested his entire ambition. The concept of "co-operative action" is meant to embody no less than what makes a human being a "human being", a real "homo sapiens sapiens", or, to be more precise, what makes a human being a socialised and socialising being, a "zoon politicon", but equally a "homo faber" and even a "homo ludens". Given the grandness of this project it makes little sense to announce one's scepticism. One can only inspect it as to whether it succeeds, and this takes time since the presentation of the empirical as well as of the theoretical results is intricate. One reason for this is that no less than twenty articles were assembled after years of preparatory work that combined theoretical claims with extensive empirical demonstrations. A second reason is Chuck Goodwin's decision to launch a new concept that is also meant to function as a play on words: "co-operative" is meant to be something different than "cooperative", or better, to represent three different things at once.

1) In "co-operative action", *operations work on other operations* on which they build and whose material they use;
2) This is why these *operations produce cumulative effects* that can be further transformed in the course of the ongoing situation in ways that are understandable for their members;
3) And the effects of these operations may become effective as processes of learning or as stabilised artefact *beyond the present situation*.

However, "co-operation" also encompasses its "normal" meaning, or the normal analysis of a cooperative process: that we help each other in the course of an interaction and act in reciprocal benefit by mutually doing our groundwork and assisting each other in co-operative processes. Therefore, Chuck Goodwin's "co-operative" is "cooperative" as well, in each of the latter's established and traditional senses. The word thus tries to engrave in a hyphen what is distinctive for the *specific* human skill of mutual assistance, in particular, distinctive in contrast to other animals, without neglecting the term's generally established meaning.

Such a conception, if it succeeds, requires at least one generation of footnoting. Derrida's "différance" comes to one's mind: Was it really worth introducing a difference that differs from itself, a "differing" that constantly shifts and postpones itself and that stays inaudible and obtrusively legible at the same time? One may want to conquer conceptual history in this manner, or supplement it, or maybe merely confuse it. What about Chuck Goodwin's hyphenated difference? Would it not have been sufficient for the definition of "co-operative action" to register that the cooperative faculties of *homo sapiens* are "co-operative" in the three senses distinguished above, instead of emphasising that "co-operative action is not the same as what evolutionary biologists, anthropologists, and psychologists investigate as cooperation" (Goodwin 2017: 432)?

Is game theory's understanding of "cooperation" in effect so dominant that it can be premised as general tenor of the research literature? Does the definition of cooperation as "costly behavior performed by one individual that increases the payoff of others" coined by Boyd and Richerson (2009) and quoted by Chuck Goodwin right on page 5 truly represent the standard meaning? Maybe the state of theory was as one-sided when Chuck Goodwin started his theoretical and empirical Argonaut journey in the 1970s and 80s (Goodwin 1979, 1980, 1981), but times are changing. Game theory's coinage of the concept of "cooperation" has for years been exposed to an increasing critique, and Chuck Goodwin's question of how "cooperation" is related to culture, as something that is

teachable and learnable, nowadays not only defines research activities but also the concept itself. By now, a great number of evolutionary biologists, anthropologists, sociologists, and psychologists have addressed "co-operative action" as characterised by Chuck Goodwin, not least after having consulted his papers and the literature referenced therein.

Still one might emphasise that Chuck Goodwin's insistence on "co-operative" linguistic events differs from other approaches in that it is unique in dissociating the concept from former individualistic (if altruistic) orientations, including recent work into altruism by Michael Tomasello (2009, 2014) and his research group. This is particularly well visible in Chuck Goodwin's methodology. He succeeds in representing, understanding, and analysing social events as dynamic, emergent, intertwined totalities, not as aggregations of individual acts that are sequentially performed, as not only variants of speech act theory but even of conversation analysis have it, at the very least in its linguistic offshoot known as "interactional linguistics". The same holds for several kinds of Goffmanian sociology that are oftentimes much less concerned with "moments and their men" than with "men and their moments" by relating communicative interchanges to inner desires and wants and even strategies of the participating actors (e.g., "cooperation in facework", Goffman 1967: 27). In contrast, Chuck Goodwin's pioneering methodological work as of now has established a wholly new strand of CA—"embodied" or "multimodal interaction research"—that takes this holistic stance towards interactional situations as its starting point. It is for this reason that today it is standard to encounter comic-like drawings of social events, verbal actions, and gestural practices in the most professional scientific journals that give an impression of the holistic gestalts of interactional situations in which members are embedded and operations, practices, and actions mutually elaborate one another. Along with few other scholars, all this is the result of Chuck Goodwin's ceaselessly innovative thinking and pioneering work.

Theoretically, the idea that "co-operation" must be decoupled from ideas of individuals acting for their mutual benefit is certainly not new. Not only has Georg Simmel counted concurrence as one of his typical "forms" of socialisation. Phenomenological sociologists as well as social anthropologists who resisted to become distracted by contemporary claims of game theory have long established traditions that insist that "cooperation" is equally present under conditions of rivalry, and that a Janus-faced constellation of cooperation and rivalry may establish particularly stable social arrangements that form the basis of entire societies. And still, Chuck Goodwin's book presents better than most the altruistic constitution of human interaction, even in the sense of the definition as "costly behaviour" quoted by him: We assist and help one another, mutually correct and repair ourselves to assist one another, and perform actions and accomplish practices that mutually elaborate one another in order to be in the world together and to get things done. Without our permanent mutual assistance, we would not be able to speak and act at all. The most exciting collection of examples of "altruistic behaviour" at the moment may well be Chuck Goodwin's book.

Having said all this, what remains is merely the "accumulative" dimension of human "co-operation" that theoretically distinguishes his concept from the "normal" concept of cooperation. Here, Chuck Goodwin's theoretical proposition is as radical as it is simple: Human cooperation is "co-operative" in that it uses the processes and components of preceding operations (by *ego* and *alter*) as its building material. No other animal is as capable of "bootstrapping" all the time from mutually provided situational resources as the human being. Human "co-operation" defines the characteristics of human "cooperation".

Other definitions of human cooperation, equally covering the dimensions that are at the centre of Chuck Goodwin's, have been suggested. Take, for example, our own definition of cooperation as "the mutual accomplishment of common goals, means, and processes" (Schüttpelz/Meyer 2017: 158). Goals, means, and processes are accom-

plished mutually, i.e. they are co-operative in that they are continually accomplished on the basis of, and by means of, former operations of others, to use Goodwin's words. In the course of these operations, common goals, means, and processes are created, which are partly restricted to the time of the joint activity and partly extend beyond it. Each of Chuck Goodwin's examples of multimodal sequences shows in detail "a mutual accomplishment of common goals, means, and processes", even those examples where the co-operative action leads to conflict or dispute, or where the means become misused to the disadvantage of the counterpart. For even in these cases, the co-participants are situated in the midst of a common, jointly staged event, they use and re-use common, "public" means that are partly created ad hoc, and they agree on a common goal, be it the agreement to publicly disagree by arguing or even fighting.

The great merit of Chuck Goodwin's book is to enrich these dry-boned definitions and distinctions with an opulent, fascinating, and awe-inspiring feast of examples and with intricate details of the specifically human faculty to indexically and incrementally accomplish all multimodal parameters within a semiotically rich and stimulating environment. He does so in such way that after reading his book one is convinced that in our everyday social life, we do *nothing else* but that. And Chuck Goodwin is right: All human and all multimodal cooperation is "co-operative". Human co-operation is the specific form of cooperation that maybe only *homo sapiens* is capable of. The title of the book could thus also have been "*Human* Cooperative Action". Skip the hyphen or leave it in place.

2.

Thus, Chuck Goodwin has succeeded, in a far more convincing manner than any interaction theorist before him, in defining what makes a human being a human being. What are the systematic consequences of his approach? (Admittedly, this may be a typically German question to ask.)

In an article from 2013 he already exposed the "co-operative" structure of human actions, partly anticipating the structure of his book. The sequence ran like this:

1) "Structure-preserving transformations on a public substrate";
2) "The laminated organization of human action";
3) "The accumulative power of the laminated structure of human action";
4) "Co-operative transformation zones";
5) "Human tools";
6) "Building epistemically competent actors through co-operative action" (including "professional vision").

Compared with the article, the book is much more exhaustive (20 vs. 500 pages), but it starts with the same examples and concepts, particularly by comparing the *ongoing linguistic junction of permanently heterogeneous components* characteristic for interaction—its "lamination"—with *material tools* in the Stone Age that are equally, and often literally, "laminated"—i.e. stuck and glued together. This principle of construction—the "accumulative moment" of the two components of an assembled artefact—stands at the beginning of both the article and the book, and both end with the formation of specialised actors. However, in the book the "co-operative transformation zones" play a much lesser role than in the article. They are mentioned only twice and have become conceptually expendable, even though ironically, they were integrated in the title of a recent festschrift for Chuck Goodwin. Still, the article contains the book *in nuce*.

Goodwin explains the systematics of the book twice, once in a summary (2017: 9-12) and then chapter by chapter (2017: 12-17). In the first part, he refers to three phenomenal dimensions that are affected by the concept of co-operation: language, sociality, and the creation of techni-

cally adept actors (in other words, skill). The extensive explication of the chapters then especially emphasises the following keywords:

- Language and socialisation;
- The linguistic and multimodal reference to the environment and the mutual anticipation of events;
- The reference to past and absent persons and things, and pedagogy as universal attribute of the human species that anticipates, and prepares, future;
- And finally: The formation of specific actors who possess specific stocks of knowledge.

When reading the book, one becomes aware that the systematics cannot be entirely met by the author, simply because he, time and again, uses the same examples, so that often "later" categories are mentioned or become theoretically relevant earlier than they are explained. One of Chuck Goodwin's favoured examples for "professional vision" is the pedagogical behaviour of archaeologist during excavations, and they are introduced in the first third of the book, while pedagogy becomes theoretically relevant only at the end. The same holds true for other categories and their respective examples. But the book was certainly not intended to expose and gradually explain a theoretical argument. Its strength is that it makes the abundance of human interaction and co-operation evident, visible, and palpable. And this is where Chuck Goodwin has done so much pioneering work: In finding and developing methods that make the richness of the details of co-operation scientifically describable and evident and thereby render justice to the artfulness of human co-operation, methods that teach a professional vision to less experienced interaction researchers and thereby create technically adept actors in this area. In other words: The book itself is a pedagogical device that incorporates Chuck Goodwin's year-long experience of presenting, and rendering experienceable the multimodal details of in-

teraction to an audience that, in their professional vision, is less skilled than himself.

We should therefore ask less whether Chuck Goodwin has succeeded in keeping up his theoretical systematics throughout his book than what systematics he actually envisioned. For example, in philosophical questions, is the systematics presented so far appropriate for a constitutional analysis or suited for the preparation of such? How plausible are the passages from one point to the next? Are there argumentative gaps or discontinuities?

Let us once again paraphrase the core theses of the book in a "co-operative" manner in Goodwin's sense, i.e. in a mixture of his and our words. To do so, we again use his explications of the chapters in the introduction, since in the chapters themselves the arguments become intertwined and the systematics he envisioned become invisible.

Let us recapitulate his theoretical argument, starting from "language" and moving, via "human sociality", to "creating skilled, competent members" (2017: 9-12, 12-17):

- Verbal interaction and linguistically shaped interaction, or language and interaction, are not only cooperative, but first of all co-operative. This means that verbal interaction constantly furnishes its co-participants with "public" resources that they can re-compose in the course of the interaction and that through this activity gradually "accumulate".
- The compositions and re-compositions that are undertaken in verbal interactions are based on a compositionality of resources, which is characterised by mutual assistance and by permanent de-compositions and re-compositions triggered by small troubles occurring all the time. The compositionality of language itself is permanently co-operatively produced and re-produced, confirmed and re-confirmed, through its very quality of ongoing assistability and reparability. Only those materials that are repaired and discovered and

treated as repairable and discoverable by the co-participants are to be treated as linguistic (lexical, syntactic, prosodic, morphological, pragmatic) "units" at all.

- In this way, we not only inhabit the language of others but also a part of their thoughts, specifically the kind of "thoughts" that we can anticipate in the course of an ongoing interaction. In the process of their ongoing accomplishment we are able to repair only those verbal actions (or operations), intentions, and meanings that we are also able to anticipate; and all that we are able to anticipate we are also able to think, feel, and project together with *alter*. Conversely, our thoughts, feelings, and projects are bodily, mentally, and linguistically accompanied, sometimes even co-experienced, by *alter*'s anticipations. Thus, these verbal occurrences at the same time constitute the elementary sociality of an interaction as well as a "distributed cognition" in the sense of Edwin Hutchins, one important source of inspiration for Chuck Goodwin's research.
- Through our common and mutually shaped language we do not only inhabit a mutually accomplished sociality and its "distributed cognitions" but also its non-linguistic environment, including things that we talk about, use, and modify. Even these things are part of language, as they are included via language and via talking-about-language. Language and sociality do not end at the margins of things since we also "inhabit" things through language (an outcome of our early childhood tactile, gustatory, and olfactory experiences with them). We can point at things and direct our joint attention to them, and while we talk about them, they become just as verbal as our words. We can elaborate on our words, meanings, and intentions by pointing at things. Then, these things are part of talking-about-language.
- We live in language not only together with our co-participants present but also, in particular through things we use, with absent persons—those who were here just now, those who were here before,

those who were here a long time ago, or those who were somewhere else, and who all have helped furnish this place—thus with predecessors and things past. Mutuality is partly suspended here, but still our predecessors have anticipated us as later inhabitants of this place, who will be active here during their absence and after their presence. In the same way, we anticipate our successors as broadly as possible and continually brace ourselves, and our place, for them. We are also able to prepare our stocks of knowledge for the future.

– This is possible because of their teachability and learnability. We ourselves were (and still are) taught in many of our skills thanks to the teachability and learnability of knowledge, i.e. through "pedagogy". Such a pedagogy simultaneously creates modified persons, a modified knowledge and a respective skill. Is there a general knowledge and skill that encompasses everybody and another specific knowledge and skill that only creates specific persons? In cultural comparison or between two languages there is no such difference, but within one and the same culture, a large number of specialisations and professionalisations emerge that are characterised by particular forms of knowledge and skill.
– This specialised, professional knowledge and skill is invisible and inaudible for non-specialised, non-professional others when they watch or listen, even though it is just as "public" as what we all jointly perceive and process. Even for those similarly specialised and professional, those who are skilled, it is visible and audible only for the time of the respective co-operation and its mutual monitoring and joint attention. However, the specific knowledge is potentially just as stable as more generalised stocks of knowledge or skill. The specialised, professional knowledge and skill thus exhibit the same qualities as any other form of knowledge and skill. Eventually, adequate cooperative behaviour and precise knowledge merge to form a specific personality.

In the course of the development of his argument, Goodwin has wandered through a great portion of linguistic, social, and cognitive theory:

- Grammar, prosody, gesture, lexemes, speech acts (if one wants to call them such), and, in total, the compositionality and de-compositionality, reparability, and projectability of language;
- Interaction, including interaction with co-participants present and absent, cognitive behaviour, specialization, institutions (at least in the form of "predecessors"), materiality of social relations;
- Anticipation, inhabiting the minds of others, joint anticipation, repair as well as jointly and individually distributed cognitive activities (recognising, memorising, feeling, etc.).

In Chuck Goodwin's model, these three dimensions are not separated as isolated processes, but they coalesce. But can Goodwin's pedagogical order be viewed as an phenomenological constitutional analysis of the subject-matter at hand? At least it can be read as such:

- It starts from the co-operative compositionality and reparability and goes on to referencing and anticipation;
- Referencing and anticipation form the basis for the inclusion of past and future through anonymous, or anonymisable, generalisations of what accumulates and can be created in a specific situation;
- Situations, therefore, encompass potentials of specialisation and, thus, the possible exclusion of the unknowing and un-belonging. Thus, co-operation sometimes creates non-cooperation as well as occasionally even non-co-operation; and at least in the making of professional actors, it certainly provides practical resources for excluding non-professionals from professional core activities.

Thus far, we have dealt with Goodwin's concept of "co-operation". But what about the second element of the title, "action"?

For reasons of space, we are unable to fully cover the sprawling discussion about action theory in philosophy and sociology when contextualising Goodwin's conception of action. Let us merely say that his concept of action is intended to be just as laminated as his conceptualisation of co-operation (cf. 2017: 14). First of all, he says that actions are built by "practices that human beings use [...] in concert with each other" (2017: 1). "Practice" appears to be interchangeable with "operation", as actions, for Chuck Goodwin, are also built "by performing systematic operations" (2017: 11, 30). Operations, or practices, "occur simultaneously in the midst of single actions, rather than sequentially" (2017: 13) as any theory that reduces interaction to the chained (strategic) moves of individuals would have it. They thus form jointly created "action packages" that "combine opportunistically quite different kinds of semiotic materials" that "mutually elaborate each other" (ibid.). For Goodwin, this "combinatorial power of human action" (ibid.) is an important aspect of the uniqueness of the human species. On the other hand, it is "by competently building an appropriate next action" that co-interactionists demonstrate to one another their understanding of prior actions, as he says in reference to Wittgenstein and Sacks (2017: 40). This forms the basis for the "orderly unfolding of sequences of actions" (ibid.) and for the social order in general. Thus, sometimes, apparently minor (individual) actions are contributed to major (co-operative) action packages in order to sustain intersubjectivity. To be clear, (individual) actions contribute to the unfolding, or building, of (co-operative) action, even though the latter, once realised, is irreducible to the former.

Thirdly, social organisation as a whole is an outcome of co-operative action starting with

> the collaborative actions of speakers and hearers within utterances, through the co-operative construction of social action by those who are copresent to each other, to encompass social ties that extend be-

> yond kin to link into courses of common action groups widely dispersed in both space and time. (2017: 1-2)

Here we can see Goodwin's intuition about the lamination of action: from actions contributed by individuals to actions built co-operatively by co-participants in a situation to common actions of groups. As he says, this "laminated organization of action enables actors living four hundred years apart to construct a single action" (2017: 14). The reflexivity of action consists precisely in, and is a direct outcome of, its layering as action *within* action *within* action.

But what is the threshold beyond which operations, or practices, are actions? Actions are constituted by practices. But how is this done? Goodwin's approach differs from established phenomenological or (other) sociological attempts in describing the foundational dimension of action, as, for example, "pre-reflexivity of practices", "habitualisation" or "habitus", or "routine". Instead, he introduces the notion of "operations" that "accumulate" and "mutually elaborate each other" in order to highlight the material and procedural, and not yet fully social, bases of action. For him, operations constantly transform, or specify, or modify the ongoing action which is only action insofar as the co-participants possess a vague idea (and not a definite "working consensus") about what they are doing *together* (playing, chatting, talking about snow, investigating the ground, etc.) that makes action a potential object that can be talked about. Alfred Schutz (1967) has made a similar distinction between *action*—as ex post facto attribution of a socially known concept to an event that has ended and can be observed and talked about as a finite entity—and *acting*—as ongoing, emergent process of doing that can be changed in character at any moment, so that it is still unclear where it goes and how it will be possible to talk about it.

This is where we have accomplished our journey through the concept of "co-operative action". Our co-operative journey started with a real phenomenological constitution theoretical insight: that all verbal

utterances are outcomes of co-operative actions, or of practices; and that mutual reparability is at the centre of their compositionality. And it ended with the equally important consequence that cooperation and non-cooperation, inclusion and exclusion coincide in professional (and other) ways of acting and perceiving, before and beneath becoming an action by actors.

At the very least, we are able to say that these (necessarily rough-grained) keywords indicate that Chuck Goodwin has worked intensively on the question which of his parameters presuppose others for their explanation or should be preceded by others for pedagogical reasons. The structure of the book follows a gradual passage from resources of interaction formed and continually furnished in the "here and now"—i.e., compositional, laminated, and material resources—goes on to the integration of the future and the present-absent past to end with professional specialisation. It must be added here that every co-operative interaction continually creates its own indexical past and its own indexical future—including personal memories and anticipations, so that in a common situation we, in the words of Alfred Schutz, "are growing older together" (1967: 166). It is this "growing older together" that we can take with us into our future as premise for the idea that a concluded interactional episode pertains to the past.

Anyone familiar with Schutz' and Luckmann's "structures of the life-world" (1973) or Berger's and Luckmann's "social construction of reality" (1966) will feel reminded of their theoretical endeavours, especially of the idea of "stratifications of the life-world" that likewise start from foundational dimensions in the here and now and go on to past and future worlds, anonymous typifications, stabilised stocks of knowledge and skill, institutions, and more personal and specific dimensions that are the basis of social differentiation. Indeed, the similarities are striking. There is a salient difference, however, which relates to the methodological starting point: While Chuck Goodwin starts with the situation that creates its participants and their intentions and actions, Berger,

Luckmann, and Schutz, at least in the texts mentioned, start from the individual actor. This is why Goodwin's innovations in methodology are so important: they succeed in representing and making analysable the intertwining and mutuality of co-operative actions and practices. In doing so, they render justice to the assumption brought forward by ethnomethodology and other practice theories—and implicit in Chuck Goodwin's book—that individuals, or social persons, are a consequence of interaction rather than a prerequisite. Co-operation is pre-personal as well as trans-individual, even pre-intentional. Just as we have noted on the formative environements of co-operative action, individuals are not the originators of such activities, rather they can become entitites that can be talked about, once the involvement in the situation of co-operation has ended and a new reflexive situation has opened. Part of this *ex post facto* talk-aboutability is the attribution of motives (or intentions) through vocabularies, grammars, and rhetorics of motive to oneself and others.

Max Scheler has expressed this in an unparalleled way: In interaction occurs

> an immediate flow of experiences undifferentiated as between mine and thine, which actually contains both our own and others' experiences intermingled and without distinction from one another. Within this flow there is a gradual formation of ever more stable vortices, which slowly attract further elements of the stream into their orbits and thereby become successively and very gradually identified with distinct individuals. (1954: 246)

It is thus in the methodology and rigid implementation of this basic idea that Chuck Goodwin has realised, where the great strength of his book develops. We can watch the flow and the vortices, the orbits and their gradual identifications in action.

Notes

1 "The idea, the principle, the flash, the first moment of the first condition, the leap, the jump out of series… To others, the preparation and execution. Cast your net here. This is the place in the sea where you will make your catch. Farewell." (Valery 1948: 44) ("Extracts from Monsieur Teste's Logbook")

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Multi-Modal Interaction and Tool-Making: Goodwin's Intuition

Christian Meyer, Erhard Schüttpelz

1.

We will comment on two important themes of the book in order to demonstrate that we can read and use Chuck Goodwin's radical book in an equally radical way. We will be concerned with the issue of the cooperative nature of the title and of *homo sapiens*. The title of the book could also have been "Human Co-operative Action"; another possible title would have been "Co-operative *Language*". For it is indeed one of the greatest books in linguistic theory after Karl Bühler (1934/1990), and we only wished this fact had become more apparent in its title or subtitle, for example as: *Human Cooperative Action: How Language Lets Us Inhabit Each Other's Bodies and Minds*.

In the book, we learn that and how, through language, we mutually "inhabit" our bodies and minds. Goodwin has shown in abounding detail how we do so by way of the "accumulative" property of verbal interaction. However, it is regrettable for linguistic theory that Goodwin emphasised the "accumulative" property of verbal interaction and language use in an intention to downplay the altruistic character of precisely this very property. As we view it, and we think that Goodwin's analyses make this overwhelmingly evident, both inseparably belong together, and one explains the other. Goodwin's examples excellently demonstrate that each "co-operative" action is dependent upon a mutual possibility of assistance, upon a mutual and, therefore, "publicly"—visibly and audibly—available assistability. Thus, we could go so far as

to say that "language" is nothing else than human "altruism", or vice versa, that the altruism of human beings is primarily and finally embodied in their being creatures of language. Goodwin demonstrates that the *zoon politikon* is essentially a *zoon logon echon* and, conversely, the *zoon logon echon* is necessarily a *zoon politikon*.

In our view, and we have already extensively described this in another text (Meyer/Schüttpelz in press) on which we heavily draw in the next paragraphs, the familiar linguistic possibilities of "turn-taking" and "repair" are phenomena from a much more embracing dimension of cooperation: the dimension of mutually embodied and linguistic assistance, of "assistability". This assistability is often rendered possible by the mutual anticipation of next turns, or generally "nexts", that are fed by sequentiality, as Goodwin has shown in much detail. In particularly "hard cases", the basic principles of assistability can even be expedited, as evident, for example, in the general matrix of a cooperative occurrence: "From each according to their abilities, to each according to their needs."[1] However, this matrix does not become effective as a "categorical imperative", but in the context of practical circumstances (urgency, state of information, interactional memory, course of events so far). Reparability is always directed, as Goodwin emphasises rightly, towards the (incremental) "compositionality" of an occurrence. Only the reparable can be compositional and vice versa, as we have stressed above.

Even in situations in which one of the co-interactionalists is aphasic, this assistability can ensure that the aphasic person can participate successfully in an interaction. Chuck Goodwin has shown this in a number of his texts, most notably in his paragon of "co-operative action" that opens his text of 2013 just as well as his book, and that is discussed in the book at least five times and all in all in over more than 30 pages.

Chil, who after a stroke is only able to say "Yes", "No", and "Di", directs through his gesture Candy, who lends him her voice for his con-

tributions. Subsequently to Candy's own utterance that in Chil's neighborhood it had not snowed much this year (line 1) in contrast to last year (line 10), Chil corrects her by saying "°yeah- No No. No:.", which he specifies with a gesture of his left hand. In this gesture, Chil performs a semicircle that depicts a step-like movement from one place to another.

Transcript 1: The cooperative accomplishment of a turn

In spite of his heavily impaired faculty of language, Chil is able to produce a turn in the conversation that is both complex and accurate: In contrast to what Candy had originally suggested in line 10, it was not "last year" but in "the year before last" in which there was a lot of snow in Chil's neighborhood. Chil's "yes" and "now's" have such a strong indexical component that they allow him to use them as resource for the detailed structuring of Candy's utterance in line 14 and to integrate in it his own explicit gestural corrections. In the audio-visual recording, it is audible how precisely he puts his contradiction to Chuck's utterance of line 12 with his contribution of line 13 and how he positions his agreement to what Candy says in line 14 with his utterance of line 15.

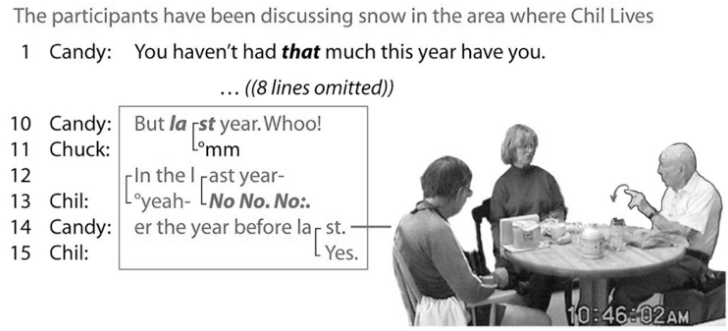

Fig. 1: The cooperative accomplishment of a turn" (Goodwin 2018:69, Fig. 5.1, edited).

It will be enlightening to quote Chuck Goodwin's analysis at length, to then paraphrase him in order to decompose his constructions and recompose them again. His best terminological ideas are often themselves composed like the stone-tools that he has presented in the introduction: They are laminated of several components and assembled to produce a specific repercussiveness. For the example above, his terminological suggestion is "indexical incorporation" (2017: 73). He explains the concept as follows:

> By interrupting Candy's 'In the last year' before it has even reached completion, Chil vividly marks precisely that talk as what his "**No No. No:.**" Is emphatically objecting to. By using proximity in this way, he refers to Candy's talk indexically.
> Indexical incorporation is among Chil's most powerful meaning-making resources. His operations on Candy's talk … create a path … through which what Candy said, including her use of rich language to state a specific proposition, can flow into Chil's utterance. Through indexical incorporation Chil's tiny lexicon can be used to create utterances with rich semantics, and to state varied, complex propositions. It is the key to his ability to reuse accumulatively for his own purposes complex resources created by others.
> The practices being examined here are clearly relevant to Volosinov's arguments about how in reporting another's speech we simultaneously provide a new commentary on it, to Goffman's deconstruction of the speaker in 'Footing,' and to the Bakhtinian argument that the dialogic organization of language and culture is made possible by our capacity to rent and reanimate the voices of those who preceded us. There are, however, some crucial differences. The practices being examined here are not restricted to reported speech, or intertextual use of another's language, but emerge as a pervasive feature of the generic indexical organization of language and action. (2017: 73f)

How can we relate Chuck Goodwin's concept of "indexical incorporation" to the summary of the book given above? "Indexical incorporation" is an ad hoc concept for the ability to include what has been said just now, or even what is said simultaneously by *alter*, into *ego*'s ongoing utterance. Conversely, it describes *ego*'s possibility to chime into *alter*'s ongoing utterance in such a way that it is commented upon and modified at the same time and that it is completed together with the joint knowledge of all participants. The "deixis" or "indexicality" that is necessary to do so is transversal to the variants identified by Bühler (deixis in absent space, pronominal deixis for linguistic reference, deixis ad phantasm). The reason for this is that the deixis of indexical incorporation *simultaneously* refers to absent or imagined content, to preceding linguistic units, and to the present space, which is used metaphorically to improvise a gesture of "leaping over something" by Chil. The leap (or step) was intended to signify a leap (step) over "last year" to "the year before last". But even the three types of signs of Charles Sanders Peirce (1935, 1958) that Goodwin presents at the end of the book are activated in Chil's gesture *simultaneously*: While "no" is a regular English word, the gesture is iconic, indexical, and symbolic at the same time. Any analysis of spoken language leads to this kind of analytic complexity, since everything that happens in verbal—multimodal—interaction fractalises and subverts the far too rough-grained semiotic or grammatical categories, which weren not, after all, developed in detailed sequential analyses of audio-visual footage, but in a world of written and invented examples. Chuck Goodwin was maybe the most productive scholar to remedy this situation, and we are grateful for the dozens of fine-grained concepts that he has developed to complement the vocabulary of language and interaction theory through detailed analyses of multimodal data.

We do not know whether the concept of "indexical incorporation" will defy the terminological ravages of time. We will try, however, to paraphrase the terminology in full sentences:

Verbal interaction reveals itself to be here, just like anywhere else, an ever-unfolding process of mutual accomplishment. This accomplishment not only premises what has happened so far but provides it with a new usage, a new meaning, in a so far unforeseen way that was not yet designated in the repertoire. As soon as several persons start to attend to a linguistic or verbally previewed task, as, for example, to reconstruct a story or (as in our case) episode, several resources come to be deployed whose mutual assistance leads to surprising "coinciding elucidations" (our ad hoc paraphrase for Goodwin's terminological invention of "indexical incorporation"). The co-operative accomplishment of components and compositions that continuously accumulate and vanish again (since they are tied to the moment) is itself a form of mutual assistance that becomes visible particularly well where the resources are distributed unequally but can be bridged and balanced through creative acts of assistance (as in the example of Chil and Candy). But this assistance is never one-sided, it is just "from each according to their abilities, to each according to their needs". And the "needs" and "abilities" of interaction are switching all the time, thus Chil's improvised gesture becomes the heroic feat of the moment (and of Goodwin's book).

This insight into the mutual constitution of co-operative and cooperative action entails consequences for linguistic theory that can be formulated in a weak and in a strong version. The weak version implies that natural linguistic "grammaticality" and compositionality is tied to demonstrable reparabilities, and that without mutual reparability, no "rules" can exist. The strong version goes a step further and implies that natural linguistic "grammaticality" is nothing else but a (talk-aboutable) manifestation of the mutual reparability and correctability of linguistic practices, and of the mutual assistability of practices in general. A theory of grammar that follows this intuition might develop some time by returning to the original program of EMCA that Garfinkel and Sacks (1970: 341) once defined as the study of "the rational properties" of "indexical expressions". We know that philosophy, logic, and linguistics

for centuries (and in the case of philosophy and logic even millennia) have understood this question to be solved by asking 'how any property of indexicality can become a reasonable part of rationality'. And we can learn from Goodwin's book, time and again, that the practical questions of learning skills and of coping with a task or a situation are just the opposite: 'how any rational (or linguistic) property can become an indexical part of being reasonable'. This practical question, to cut a long story short, should be the guiding theoretical question of grammar.

Furthermore, the example above demonstrates that verbal interaction, verbally guided interaction as well as interaction-in-its-being-talked-about can only be distinguished theoretically. All in all, language and interaction can only be distinguished theoretically. Of course, we may interact silently, as if there were no words. And we can talk in the dark or on the phone, as if there was no interaction. No, we cannot. We act as if there was interaction, and we act as if there were words. And there is, and there are. Because in reporting on the action involved in both cases, or in arguing about either, neither words nor interaction are missing: to talk about things, report, argue, describe, tell a story, analyse, compare, gloss, give reasons, justify, and so on. As soon as we are experiencing other beings and things and are able to inhabit and anticipate each others' bodies, movements, and minds, and as soon as we learn to talk in intercorporeal relations, all of them become talk-aboutables. Goodwin's book will be an important source of inspiration for undermining the separations of linguistic and social theory.

2.

By way of conclusion, we return to Goodwin's title and main theses. Did he solve the enigma of 'accumulative invention'? With regard to language and linguistic theory, we think that he did, through his analogy of the "heterotechnic" compositionality of stone-tools and the *ad hoc* assembled linguistic and multimodal resources as well as through his presentation of linguistic reflexivity and his detailed exploration of the

acquisition of language skills. With regard to the fundaments of historical knowledge, he hit the nail on the head, saying that if it is true that any improvised verbal interaction is also a learning process, then we find ourselves in historical time in any of these situations. In situations of verbal interaction, everything salient for learning processes and everything that stabilises our artifacts, our linguistic constructions, and our social relations, is present. If we want to know how "history gets done", how accumulating knowledge and skill develops, how tools are assembled *ad hoc*, and how tools emerge, then nothing is able to instruct us better than the study of verbal, multimodal interaction realised in detailed analyses of audio-visual recordings in the way that Chuck Goodwin has shown us. There is no aggregation and no emergence that starts *from* these situations, for aggregation and emergence can only happen *within* situations, and so we are once again left to find our explanations of the social and the linguistic in them, and only in them. Either "emergence" is a process we can observe, or "emergence" camouflages as a process and is happening off-stage "when we are not looking". The good news is that emergence happens all the time, and we are able to trace it empirically.

However, the difficulties start with concept building, not with empirical observation. Most of the established concepts, as we have already said above, are too rough-grained and fail in their promises of classifications: In fine-grained analyses like Goodwin's, most of the time, the indexical is iconic and symbolic as well, Bühler's three kinds of deixis apply simultaneously, and the conditions of speech act theory do not apply. This does not make the assessment of Goodwin's claims about *homo sapiens* any easier. What do historical irreversibility, the accumulative or incremental usage of ongoingly improvised interaction components, and the emergence of tools through "heterotechnic cooperation" (Reynolds 1994: 412) have in common? We will try to define this common denominator in Goodwin's own words.

As Goodwin demonstrates, human practices employed in interaction are always practices that are continuously talked-about, or, at least, are talkaboutable. Each verbally shaped or verbally-multimodally co-shaped interaction results in a double objectivation, the continuous double objectivation of language. For one, it develops a transience between language and the linguistically referenced world, which is achieved mainly through pointing gestures, deixis, "environmentally coupled gestures" and illustrations of "like this" ("it looked exactly like this", "roughly like that"). Secondly, it acquires a permanent recursivity and reinterpretation of the linguistic variables used, i.e. the transitivity between language and talk about language. In general, we can say that all talk about language and commenting on talk makes an object of language for itself, and thereby it makes it its own medium. Manifestations of these linguistic properties in particular include quotes and comments, the quotability and commentability of each utterance. Quotability and explicability, as evident in the example of Chil and Candy and in others throughout the book, do not come to be added to the ongoing utterance as something external, but are properties intrinsic to the ongoing accomplishment of the utterance itself (or of practices in general). In interactions, all utterances are permanently mutually made and kept quotable and explicable.

In his comment on the Candy and Chil example quoted above, Goodwin refers to the basic statement on reported speech by Voloshinov, without directly citing him: "Reported speech is *speech within speech*, *utterance within utterance*, and at the same time also *speech about speech, utterance about utterance*" (1986: 115; partly our emphasis). Each utterance has to reckon that it becomes commented on by its reparability and quotability, i.e. it becomes the object of a possible repair or comment or of another re-usage in the ongoing interaction.

This is where Goodwin's intuition about the homology of tool-assemblage and verbal interaction accumulation comes into play: Quotability and being-commented-upon (and be they simply a short butting-in or

a repetition accentuated differently), mutual instrumentalisation and change of use as well as combinability are all chips of the same block. What are the parallels to the heterotechnic assemblage of stone tools? In his comment on Heidegger's analysis of *Zeug*—"equipment" (1962)—that he translates as "utensils", Aron Gurwitsch (1979) has reminded us that Heidegger's "totality of involvements", in which the usage of a "utensil" or of "equipment" is embedded, must be conceptualised in a much more flexible way than merely as a physical space like a workshop or a farm, as Heidegger had put it. In the usage of technology there exist ingrained sequences and fixed operational chains, but there are also everyday improvisations, be they in the workshop or at home.

> One can still make use of a spoon in another meaningful way; a physician, for example, does this when he turns the spoon around and uses it to depress the tongue and examine the throat; similarly one can use a box for packing—but when the box is set on end, one can also climb up on it to get something from the cupboard. (1979: 68)
> Is the box the *same* box when, on one occasion it serves for packing my books and is at the center of my vectorial comportment, and on another occasion it is used as an object on which I can stand? … And does the cane with which I support myself remain the same when I use it to reach something, when both times I manipulate it and when, so to speak, it presents itself as an 'extension' of my arm? (1979: 82)

Gurwitsch has answered this question in Heidegger's terms, but against the grain.

> As a consequence, it is already asserted that there is no identity of the utensil-piece in contrast to the changing utensil-totalities and manipulatory situations. The particular utensil-piece is always different from situation to situation in accordance with the utensil-to-

> tality in question; it is what it is only in respect to its usage. What one does with a utensil and what one uses it for *in concreto* is determinative for what that concrete utensil is *hic et nunc*; but it is not determinative for that for which it can serve in other constellations and situations. (ibid.)

These remarks by Gurwitsch touch on Goodwin's question about the laminated or compositional tool from the other side. They entail that for verbal, material, bodily, or mutually verbal-material-bodily work-arounds, ad hoc solutions, improvised aids to understanding, figurative labellings or glosses that are assembled once-only, no other principle is necessary than for inventions that are methodically found and perpetuated, for incremental enhancements or accumulative installations. The nature of human cooperative processes is co-operative right from the start, as Goodwin shows, and can therefore, in one situation or beyond one situation, adopt the property of "accumulative" assemblage that in another situation will vanish or not be relevant at all. This is because by far, most of our innovative improvisational expressions and most of our technical makeshifts have situationally solved our problem only to afterwards vanish into oblivion. And it is because, as Gurwitsch has made clear, there is no identity criterion that determines the identity of the meaning or usage of technical and linguistic *ad hoc* components, that an accumulative history of tools is possible and a quotable language change is happening each day. The box may remain the same, and the phrase may be repeated. The box may be "laminated" as an "ad hoc" stepping stone for once or for longer. Because we can switch between transitory and permanent "utensil-pieces", transitory "utensil-pieces" may become permanent "utensil-pieces", transitory technical work-arounds may become regular devices, and this is how permanent "utensil-pieces" are invented in the first place, and how permanent "utensil-pieces" give rise to new transient "laminations". Because "there is no identity of the utensil-piece in contrast to the changing utensil-totalities and manipu-

latory situations", tools and utterances can be transformed ad hoc, and they can be used to build new incremental resources that can outlast the situation and be part of mutual learning processes. Technical and linguistic co-operative action both thrive on this common principle. This is what we learn from Chuck Goodwin's book about what historical irreversibility, the accumulative or incremental usage of continuously improvised interaction components, and the emergence of heterotechnic tools have in common. The difficulty of understanding his (and Gurwitsch's) proposal seems to lie in the fact that it was all much simpler than we thought.

Goodwin's concept of "co-operative action" does not crucially depend on this identification of the fundamentals of linguistic quotability und human tool use. Still, we believe that his intuition is right and that it can shed light on the highly disputed question about language history in prehistory. Once tools were not only used without identity criterion but were produced in series to adopt different identities (the "blades")—once they were combined and laminated—, a language that was equally repercussive in its quotability, mutual change of use, reparability, and correctability and assistance, either became or already was a necessity. The rigorous change of use of an *ad hoc* assemblage and the rigorous change of use of a verbal gesture (like Chil's) are indeed closely related and we hope that our excursions into Voloshinov and Gurwitsch will help to re-specify this relationship. However, further archeological, cognitive-psychological, linguistic, sociological, and anthropological research is needed to give justice to Goodwin's intuition. At least, now that we have used Goodwin's book to unpack his box of theoretical insights and turned it over and stood on the box to take some quotes from the shelves, we do believe it is the same box after all.

Notes

1 Which, as David Graeber (2014: 95) has reminded us, is the basic definition of "communism".

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Co-Operation is a Feature of Sociality, not an Attribute of People

"We inhabit each other's actions." (Goodwin, cover)

Jutta Wiesemann, Klaus Amann

Rather than philosophizing on classic sociological questions like how society is structured, what holds it together, or how it can function at all, Charles Goodwin repeatedly posed the concrete, empirical question: How is social order continuously manifested? He sought answers to this question by analyzing the minutae of observable human actions. His observations led him to describe the relationships of actors to their actions as a (reciprocal) habitation. Inhabiting means a living experience. As a concept, inhabiting acknowledges the interrelationship between the action taking place at any given moment and its cultural context, which has already been produced, and at the same time is continually being created anew. Goodwin conceptualizes his inhabitants as actors living in the observable present, who constantly draw on the former achievements of their predecessors and make use of available material and cultural resources in order to accomplish their own actions. Furthermore, inhabitants' current actions impact upon others present, so that actors "[...] actively participate in the detailed organization of each other's action as it unfolds through time."(7) Being able to use, adapt, and transform resources from the past and the present enables what Goodwin calls co-operative action. "By building our own actions by using resources provided by others, we live in a world where we inhabit each other's actions." (78) This inhabiting is always conceived of as shared and reciprocal. The mutually constitutive nature of inhabiting our own and each other's actions necessarily implies that actors are al-

ways able to recognise "[...] how another is analyzing and understanding the world that is the focus of action." (319)

Goodwin's starting point and the core of his empirical approach is linguistic communication: "talk". This can be found everywhere in the inhabited social world. As far as he is concerned, it makes no difference who produces this talk, who exchanges it with whom, and in which institutional or other contexts the specific talk arises. For his research, the co-operatively emerging speech is of interest, not the speakers. Nor does he focus on language as a linguistically reconstructed and ordered system. Rather, Goodwin regards language as a resource that is constantly being transformed by those who are obliged to use it together for communication, producing "public" talk as they do so.

While audible utterances – which co-produce mutual comprehension – are thus at the core of his approach to sociology, they are nonetheless always embedded within and dependent upon other actions in a variety of ways. No linguistic utterance is self-explanatory or comprehensible in itself. In other words: I can neither say what I mean, nor can another person understand what I am saying. For something that is said to be understood, certain prerequisites must be met – and these are unique to any particular situation. Each situation has its own configuration of historical, social, and, most importantly, interactively embodied specifities. In particular, the physical-gestural phenomena that accompany every instance of talk must be included in its microanalysis, if that talk is to be understood. "Here, I want to explore the possibility that all of these phenomena are different manifestations of the distinctive ways in which human beings build co-operative, accumulative action in concert with each other." (2) His unifying model of everything and everyone rests upon the notion of accumulation: "co-operative, accumulative action." Social life is a kind of workshop, in which accumulative action is inevitable: it has always been carried out, and always will be. Here, Goodwin's methodologically valuable contention is that this accumulative action can be observed. The same assumption forms

the basis of the classic ethnomethodological premise: that the public nature of social interaction is what makes it verifiable.

As Goodwin elaborates upon the complexity of co-operative action, he draws an analogy to developments in biological cellular research over decades. While DNA was conceptualized for a long time as the language or code of life in which evolution had inscribed itself, the current understanding is that an actual interpretation of that code can only be realized within actual living cells and organisms.[1] What is encoded can only be expressed – i.e., converted into cell activity – in accordance with a real, specific situation. And analogous to what a cellular biologist might describe, a Goodwinian observer does not describe real life as enacted by human actors as cooperation in the sense of deliberate or intentional collaboration. Instead, actions are described as a coordinated series of interdependent actions that occur in time, and bring forth sociality.

Hopscotch and Public Visibility

> "[C]ontextual configurations provide a systematic framework for investigating the public visibility of the body as a dynamically unfolding, interactively organized locus for the production and display of meaning and action." (170)

We know that hopscotch does not normally attract the interest of the public (or of scientists), except when it is done by First Ladies. This photo published by the White House expresses a multi-dimensional political message. There is something 'behind' the medium/image that we can interpret as a message from the White House.

Goodwin draws on a specific instance of "playing hopscotch on the street" to explain his sociological concept of co-operation. He is not interested in what lies 'behind' the publicly visible performance.[3] What he finds interesting sociologically is the visible and audible, the co-op-

Fig. 1: Michelle Obama playing hopscotch[2]

erative how of the performance. As he sees it, this "how" is generated in different ways by actions as they are enacted over time: as talk, with bodies, and with the materiality of the hopscotch grid. The result of his analysis is a microscopically crafted reconstruction of directed or oriented attention. "I will call some particular subset of possible fields that is being oriented to at a particular moment as relevant to the organization of a particular action a *contextual configuration*." (180)

This supposedly trivial example makes it clear that the analyzed visible how cannot be deduced or explained in terms of an inferred intentionality on behalf of the participants, but only from what is mutually "shown" (made visible). "[It] is an ongoing contingent accomplishment, something not under the control of a single party." (ibid.)

Goodwin's analytical goal is not to discover intentionality 'behind' the observable, or the choreographing of individuals/persons. Rather, it is to reveal and analyze the techno-logics that shape the situated

co-operating of sociality. According to Goodwin, interaction ultimately means that visible co-operative action is in progress. "[…] [P]ublic visibility is also crucial to analysis of how the body is used to perform action within interaction." (187) Significantly, this means that the practical actions of a single isolated individual are not enough to produce social praxis that can be understood as such. There must always be a "reflexive awareness of each other" (185) that is itself accessible for observation and analysis.

The "public visibility" of actions is a key methodological assumption for Goodwin, rooted in his own work in social theory. "Public" refers to an interactively necessary, technical characteristic of human action. Whether we like it or not, we make our activities accessible to others when we act in situations in which others can observe us. Goodwin's description of this as a 'technical' characteristic reflects his take on observation, especially with regard to the embodied dimensions of action. At the same time, it is influenced by the way he uses audiovisual recordings, which play a central role in his research.

Goodwin proceeds to develop a profoundly technical conceptualization of human action. Co-operating is the generalized, underlying characteristic of a fundamental, "technical" productive process. Wherever he looks – through the lens of the linguistic empiricist – he sees complex, technical productive processes; processes that only make sense if they are seen as co-operation (both parts of the term are stressed equally: co- and operation). Inherent to this technicist conceptualization of action is a generalized concept of materiality. The latter goes beyond an everyday understanding of materiality as 'matter' or 'substance', as opposed to non-material phenomena such as intentions, meanings, or speech. Goodwin uses the notion of talk in particular to argue that words, tones of voice, gestures, looks and so on must be understood as culturally specific (raw) materials from which social situations can be co-operatively produced. "This process of building new action by performing systematic operations on something created by someone else is what is being

investigated here as co-operative action." (431) "Performing systematic operations" (2) is a technical modus operandi that brings forth sociality.

In his writings on technology and philosophy, Ernst Cassirer had already advocated an approach along such lines in 1930: "If, instead of beginning from the existence of technological objects, we were to begin from technological efficacy and shift our gaze from the mere product to the mode and type of production and to the lawfulness revealed in it, then technology would lose the narrow, limited and fragmentary character that otherwise seems to adhere to it." (20) He continues: "The 'form' of the world, whether in thought or action, whether in language or in effective activity, is not simply received and accepted by the human being; rather, it must be 'built' by him. (24)

Following Cassirer, we can identify the unity in the thematic diversity of Goodwin's work: whatever the context, for Goodwin it is always about the elaborate technical analysis of co-operative 'forms' and 'formations' of (inter-)action. The (paradigmatic) starting point for these analyses is always a visible situation that is witnessed by a co-present observer. Ultimately, sociality is not an abstract notion, but something concrete that unfolds in time, is actively formed, and as such is intelligible.

Thus, Goodwin sees no need to speculate on the hidden origins of human action in the workings of the internal mind. Focusing instead on the diversity of observable forms of action, he is concerned with "arrangements of mutual elaboration". (429)

Further Methodological Consequences and Camera Ethnography

Goodwin's empirical approach demonstrates the efficiency of a radically microsociological (linguistic) strategy of discovery. This strategy strongly emphasizes the situatedness of action. To make situated action accessible for observation and analysis beyond the moment it takes place, Goodwin relies on the audiovisual recording and documen-

tation of co-operative actions. The recording situation itself is a shared 'situated doing' that brings together observers, recording devices, and observed actors. However, these different participants do not usually share the same agenda. The technically-equipped observer, unlike the observed, participates in order to produce and preserve some kind of "substrate" of the jointly experienced activities in a technical form that can be worked with further at a later date.[4]

The situatedness of co-operative actions, however, is about more than just the bodily co-presence of humans in a physical-spatial sense. In our view, participants' ongoing activities must also be understood as that which creates and maintains a shared social place by utilizing various resources. In order to create such a place, participants must jointly make interactional, material, and occasionally technically- or media-related preparations. This is particularly relevant when the situation is not just a face-to-face encounter as would be paradigmatic according to Goffman, but one in which mediatized forms of communication play a central role in restructuring interactional orders.[5]

In our ongoing project "Early Childhood and Smartphone. Family Interaction Order, Learning Processes and Cooperation", we observe media appropriation and use in family settings with children aged between 0 and 6 years old. As a research strategy, we concentrate on the smartphone as the mediator and central focus of interaction processes involving adults and children. As a ubiquitously available, globally distributed and used medium, the smartphone contributes to and fosters the "cooperation" of family members (Schüttpelz 2016). Our conceptualization of cooperation, rooted in media theory, underlies our endeavours to describe the "mutual making of joint goals, means, and processes" (ibid. 6) enabled by media, which we trace in the interactions we observe. Our aim is to observe and identify the conditions within which families use various (not only digital) media, and the practices that they develop. We take a radically empirical stance by observing actual action rather than speculating on intentions or evaluating pre-

scriptively. Following Goodwin, we are less concerned with the individual motives of family actors or the pedagogical effects of what we observe than with gaining an in-depth, structural understanding of actual real situations of appropriation and use. We conceptualize the smartphone as a medium of production – not least in opposition to the idea that it offers limited pre-defined functions, the operation of which adults simply teach to small children as part of a learning process understood as a unilateral imparting of knowledge.

As we observe the use of media, we trace – following Goodwin – co-operative actions as they unfold. These actions become recognizable as necessarily teachable and learnable modes of use. The participants are dependent on one another as they orient, develop, and coordinate their interactive practices. The resources utitlized in the actions that make up this "mutually constitutive" co-operation are – as our observations show – manifold ways of using the body: facial expressions, gestures, and entire choreographies of bodies oriented towards the respective medium.

Goodwin dedicates an entire chapter of his book to an exploration – drawing on research from the past few decades in the sociology of scientific knowledge – of how **professional vision** is established among scientific communities, such as geologists, geochemists, and archaeologists. (Goodwin 2017, Part V: 325-428) "However, to function in the social life of a profession the ability to see relevant structure in a complex environment must be organized, not as an idiosyncratic individual ability, but instead as systematic public practice." (ibid. 349) In our own research, **camera ethnography**, a specific visual anthropological approach developed by Bina Mohn, is a key method that enables us to establish professional vision as a "systematic public practice". With camera ethnography, we aim to see and to show "relevant structure in a complex environment" in sequences of family interaction involving the media we are interested in. The following three stills from one of our research films illustrate this specific way of seeing and showing (Fig. 2).

Fig. 2: We can observe what is visible, including the way that mother and child show each other their awareness of each other (video stills by Astrid Vogelpohl 2017: a, b, c)

These stills are taken from a camera observation made in one of the families we have been working with since the beginning of our research project. As recipients of any text, or indeed any (still or moving) image, readers are dependent on various operations undertaken by its author(s), including their selective decisions. For their part, our camera ethnographers certainly have to ensure that what they create is visible and legible. And that further images/videos of actions observed in this research context will also be visibile and legible. This process of making visible and legible encompasses not only the usual practical, methodological, and technical procedures required for audiovisual research (such as establishing contact/obtaining consent, making appointments, preparing equipment, and so on), but also – and this is what sets camera ethnography apart from other ways of recording video – it requires actively observational camerawork.[6] In any observational situation, the camera ethnographer is dependent on the "public visibility" of the actors' actions. But that does not require an extra effort on behalf of the actors, rather, it is the fundamental, technical modus operandi of sociality to make one's actions visible to those present. Actively observational camerawork requires (in addition to technical proficiency) a researcher to sustain a concentrated, constant ethnographic orientation towards the visibility of actors' actions as they unfold over time. The framing of the first still, **a** (Fig.2), reveals this ethnographic orientation: the camera is directed towards the toddler, woman, and smartphone from a position slightly below the eye level of the mother, who is kneeling in the middle of the room. Mother, child, and smartphone are in focus, and remain so in the two subsequent stills (**b** und **c**). Yet the frame includes more than just these three focused subjects; it also shows the contents of the living room including a range of toys on the right, which the child has already turned away from in still **a**.

The story that this series of three stills tells and makes legible is one in which a child is invited to engage in a joint activity with the smartphone.

Fig. 3: Co-operative action (d, e, f)

In the subsequent series (Fig. 3), the ethnographer concentrates exclusively on showing the focused actors (mother, child, smartphone). The mother's hands release the smartphone, but remain ready to catch it should it fall. The joint activity is made publicly visible by the clear positioning of the camera's ethnographic selection. Still **f** (Fig. 3) shows the changed positioning of the mother and the child in relation to the smartphone as compared to still **a** (Fig. 2).

The image sequence as a whole also serves to illustrate the meaning of "mutual copresence" within Goodwin's understanding of sociality: "Building action in a state of mutual copresence is a central site for the ongoing, dynamic constitution of human sociality, and the place where a host of phenomena, including language and other forms of semiosis intertwined with it, emerge within the mundane social world." (248)

Beyond Language and Text

"However, to function in the social life of a profession the ability to see relevant structure in a complex environment must be organized, not as an idiosyncratic individual ability, but instead as systematic public practice." (349) In the sub-chapter "Calibrating Professional Vision", Goodwin highlights the importance, for diverse communities of experts such as scientists and lawyers, of establishing a shared, standardized professional vision. In relation to his own profession, however, such endeavours are conspicuously absent in Goodwin's book. There is no methodological self-reflection, for example, or deconstruction of what led him to create certain graphic visualizations or to draw particular conclusions. Despite relying mainly on audiovisual material for his empirical sources, Goodwin does not address the active use of the camera as an instrument for creating professional visibility. With our use of camera ethnography, by contrast, we conceptualize what happens during a situation of observation as the first, active phase of a situated production of professional vision, which is followed by further analytical phases of working on and with the observational material. This approach opens

up new perspectives on knowledge and knowledge production, which can be communicated in audiovisual forms that can reach far beyond the realm of written texts or graphic signs.

Notes

1 James E. Darnell, Harvey Lodish, David Baltimore: Molekulare Zellbiologie. de Gruyter, Berlin u. a. 1993, ISBN 3-11-011934-X (4. Auflage. Harvey Lodish: Molekulare Zellbiologie. Spektrum Akademischer Verlag, Heidelberg u. a. 2001)

2 Source: The White House from Washington, DC - P110610CK-0355, https://commons.wikimedia.org/ w/ index.php?curid=46332335

3 In his farewell lecture, systems theory theoretician Niklas Luhmann asserted that sociology needs to abandon the distinction between "What is the case?" and "What lies behind it?" (Luhmann and Fuchs 1994).

4 A further observer watching such a recording situation would be able to discern at least two simultaneous situations: actions of the "first order" and of the "second order", whereby the latter is concerned with encapsulating the observability of the former and fixing it as a stable document.

5 Justifying his claim that face-to-face interaction is the norm from which other situations deviate, Erving Goffman writes: "Such a phenomenon as talking to oneself, or talking to unratified recipients as in the case of collusive communication, or telephone talk, must first be seen as a departure from the norm, else its structure and significance will be lost." (Goffman 1964: 13).

6 A more detailed account is given by Mohn (2013)

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The Making of the World in Co-Operative Action

From Sentence Construction to Cultural Evolution[1]

Jürgen Streeck

Introduction

Although it is of paramount importance to conversation analysis (CA) and he may well have been the greatest conversation analyst since Harvey Sacks[2], the work of Charles Goodwin (or Chuck, as he was known) stands in a tenuous relationship with this school. His early work was unequivocally framed as a contribution to CA, as is evidenced by the title of his first book (based on his Ph.D. dissertation), *Conversational Organization. Interaction between Speakers and Hearers* (1981). But from the beginning, Chuck realised that talk in co-present interaction is a bodily affair, that bodily actions contribute to the structuring and intelligibility of turns at talk. Moreover, focussing his attention on the parties' gaze during the production of single turns at talk, Goodwin realised that utterances emerge as products of *ongoing* interaction between speaker and hearer, rather than interaction clustering only at 'transition places' (Sacks, Schegloff & Jefferson 1974) between turns or during repair sequences when understanding is in question (Hayashi et al.2013). The turn-taking model in CA had generally been understood as suggesting that turns fall under the sole responsibility of their initial speakers—whoever gets a turn to talk has the right to talk it to completion. Thus, in two important respects, his work began outside the mainstream of CA, and perhaps his decision to film mundane human interaction when video technology became available was ultimately most consequential. He bought an early-generation video camera and he and his wife Candy

Goodwin filmed family dinners, picnics, people on chairs watching a Fourth of July parade, as well as family therapy sessions which he observed through a Batesonian lense (Bateson 1972). Chuck's other collaborator and most significant teacher was Gail Jefferson, who taught at the University of Pennsylvania at the time Chuck and Candy Goodwin were doctoral students there. Candy's dissertation supervisor was Erving Goffman, and Chuck attended his seminars as well.[3]

But later, the themes and data for Goodwin's research expanded far beyond conversational interaction. In 1989, the Goodwin's were invited by Lucy Suchman and Brigitte Jordan at XEROX Parc to study complex workplaces such as airline control rooms and the organisation of work in them through moment-by-moment multimodal communication. In many workplaces, it is imperative that workers share perceptions and are able to agree on how these are to be 'read'; in today's workplaces, these perceptions are often mediated by technologies, that is, they are perceptions of representations, not of the phenomena themselves. Goodwin's publications on professional perception among lawyers, police officers, archaeologists, geologists, and others have become his most influential ones, reaching far beyond fields principally concerned with human interaction.[4]

Perception, cognition, speech, gesture, and instrumental action all became folded into a single 'domain of scrutiny', and by making the unusual move of re-reading his entire work in light of his most recent insights, he was able to transform his life's work, just months before his life ended, into a single, coherent, empirical theory of human action, but one that is also at the same time a theory of human sense-making and intersubjectivity as it is a theory of human cultural evolution. My aim in this paper is to bring out, in a nutshell, the integrity of Chuck Goodwin's vision, to explain how to him, the emergence of a single sentence is a moment of interaction and the evolution of human sociality and culture are part and parcel of the same process. Chuck Goodwin possessed a fearless, curious, and wide-open mind. This disposition did

not only make him a voracious reader in multiple fields, but also gave him the courage to study what life brought before him: archaeological digs, oceanographers, family bedtime routines. He followed this jagged path of induction in a rigorous, methodical fashion, never losing his bearings, and always with disciplined attention to the facts of the single case. Perhaps this latter disposition of the mind was inherited from his father, known as Chil, a lawyer.

Sentence construction

Charles Goodwin came on the scene with a paper (Goodwin 1979:98) in which he demonstrated that a single sentence, fluidly uttered by a single speaker during a dinner conversation involving two couples and two children, can upon analysis turn out to be the product of incessant, yet structured, interaction between the speaker and different others, each component of what is at the surface unbroken syntax designed for the particular knowledge state of the listener who at the time happens to look at them.

John: I gave, I gave up smoking
cigarettes::. =
Don: = Yea:h,
(0.4)
John: I-uh: one-one week ago t'da:y.
acshilly,

The sentence "I gave up smoking cigarettes one week ago today actually" is first addressed to the male guest, Don: "I gave up smoking cigarettes", but while Don perfunctorily acknowledges it, he turns his gaze away at the same time from the speaker, John, who then scans the circle and finds his wife to be looking at him. To her, however, her husband's having given up smoking is not news, and by changing the projected trajectory of his turn ('last week') and appending "one week ago today", he transforms his ongoing sentence into an announcement that today is 'a first anniversary' of his accomplishment, which she may not

have been aware of. But he also loses his wife's gaze but finds that of the female guest and appends "actually" and thus transforms the sentence again, this time into a display of his own present realisation that he has reached that first milestone today. The sentence, during the course of its production, is continuously adjusted to the knowledge state of its current recipient.

Goodwin's analysis of this *naturally occurring sentence* was informed by his and his wife's already extensive research on the gaze behaviour of speakers and listeners[5]. This work had demonstrated that speakers seek the gaze of their intended listeners[6] and try to establish a state of mutual gaze at the beginning of their turns. The Goodwins identified a number of turn-construction devices—syntactic breaks, repair-initiation tokens, hesitations—by which speakers actively solicit the gaze of listeners. While these devices of a 'grammar-for-conversation' (Schegloff 1979) primarily and methodically serve to make speakers' difficulties in completing their turn at talk known, they are also performed in the service of broader interactional issues such as managing attention. Here, too, linguistic forms and embodied practices are tightly coupled, and the structure of the talk can consequently not be explained without reference to embodied interactional states and acts.

The impact that the appearance of *Sentence Construction* made on linguists at the time, including the present author, is difficult to appreciate today, when it is not uncommon at all anymore to understand spoken-language structure in connection with gesture, gaze, and so on. This paper was the most effective and consequential attack on Chomskyan linguistics: it showed that (a) what appears to be a single sentence, its syntactic structure generated 'top down' and ordered by transformation rules, is in fact produced in increments; the first sentential unit ("I gave up smoking") is succeeded by components[7] that cannot occur alone, but rather *re*-complete the sentence-thus-far. The insight that turns at talk are frequently produced in increments is such that it has since become a hallmark of research into interactional approaches to

grammar.[8] It means that only some utterances typically have the form of 'complete packages', such as complete sentences, and can stand on their own. These are typically sequence-initial utterances. Everything that comes after them in the sequence is in some way *built onto* the first, full form. It is an increment. From the perspective of Goodwin's later work, we see in this analysis of a single sentence the first stage in the development of his theory of human action, namely that actions, including those performed by turns at talk, are produced by the *lamination* and successive *transformation* of materials provided by different interaction participants (in this case only the movements of their gaze).

The Goodwins subsequently showed that talk in interaction is not just a bi-modal, but at least a tri-modal process: they demonstrated that hand gestures can also be 'official'—attended-to and ratified—components of turns at 'talk', for example when a speaker searches for a word. Conversation analysts showed that word-searches are overwhelmingly completed by speakers themselves. The Goodwins (Goodwin & Goodwin 1986), analysing the participants' bodily actions during word-searches that are not solved 'on the next beat', found that speakers who have trouble finding a word (usually the next), turn their gaze away from the listener, looking to the side or up, thus displaying their status as a non-listener and thereby discouraging talk (including cooperation in the search) by the interlocutor. When they cannot find the word on their own, they return gaze to the interlocutor and make one or several (literally or metaphorically) depictive gestures that in some way embody (or allude to) the meaning of the searched-for word. As they make the gesture, they briefly shift their gaze to their gesture, thus alerting the listener to it. Recognising what is conveyed by the gestures, the listener may be able to propose a word as a 'candidate solution', and the primary speaker accepts, modifies, or rejects it.

When *Gesture and Co-Participation in the Activity of Searching for a Word*, together with its companion piece *Gesture as a Resource for the Organization of Mutual Orientation*[9], appeared in a special issue of

Semiotica, edited by Adam Kendon in 1986, these two papers constituted the only published research on hand gestures in naturally occurring interaction, with the exception of a study by Heath (1982, 1986) on the role of gestures in the sequencing of doctor-patient interaction and a couple of ground-breaking papers by Adam Kendon (1972, 1983), which however (and in contrast to much of his other work) considered gestures as components of the production of *utterances* (see also Kendon 2004), not interactions. Co-operatively organised word-searches constitute moments during which the listener's *understanding* of a gesture is made overt and formulated in words: the word provided as a 'candidate solution' by the listener displays his or her reading of the speaker's hand gesture. Such moments are fairly rare in everyday interaction, rare moments that give us a 'proof procedure' for how a hearer understands a gesture (in talk, every next turn is a 'proof procedure' that demonstrates how someone has understood the prior turn). Distinct responses to gestures occur much less frequently: one can frequently and easily identify the addressee's uptake of *pointing* gestures—the addressee turns their gaze to the indicated target—but how a hearer decodes, say, a conceptual or pragmatic hand gesture (see Streeck 2009: Chs.7, 8) is rarely made public. This makes it difficult to apply CA methodology to gesture research. The roles of gestures in the production of intersubjectivity are therefore exceedingly difficult to ascertain.

Co-Operative Transformation

It was in the context of an analysis of a word-search that Goodwin for the first time noticed the mechanism of *co-operative transformation* that later became the central part of his theory of human action and cultural evolution. Below is the sequence in question. We see that a speaker (Martha) and a non-addressed listener (Susi) complete a single sentence together.

1	Kathy	Was ‘er **dress** right o:n,
2	Martha	u-Her: dress was wh**i**te, (.)
3	Susi	eyelet
4		(0.3)
5	Martha	embr**oi**dered eyelet

It is worth quoting Goodwin’s observations about this sequence at length:

> In line 1 Kathy asks about the bride’s dress. In line 2, after pronouncing the word “white” Martha displays entry into a word search both prosodically and by interrupting the progression of her ongoing talk (Goodwin and Goodwin 1986). Seeing this, Susi, who also saw the dress, produces “eyelet” with a falling prosodic contour to complete Martha’s interrupted description. Susi intimately inhabits the action Martha is producing by claiming the ability to independently see what she is trying to say. The
> word “eyelet” builds upon the emerging grammatical structure of the talk it is tied to both co-operatively and accumulatively by bringing Martha’s unfinished noun phrase and sentence to completion.
> However, Martha does not ratify this as an appropriate completion to the unit she was in the process of constructing. It may well be that “eyelet, “though accurate, was not the precise word she was seeking. Martha and Susi attended the wedding together, but Martha saw something special in the bride’s dress that Susi did not. In line 5 Martha claims the primacy of her epistemic rights [...] by placing the word “embroidered” before “eyelet.” Both what the noun phrase eventually comes to be, and the phenomenal object emerging through time within it (the relevant character of the bride’s dress as something to be assessed and appreciated in a specific way), are the outcome of an accumulative, temporally unfolding co-operative process within which different actors successively contributed dif-

> ferent materials. [...] Susi grasps in a relevant fashion not only the grammatical organization of Martha's talk, but precisely what Martha is thinking about, what she is attempting to tell Kathy, through that talk, i.e. that she is attempting to construct a description of the dress they saw together. (Goodwin 2017: 50-2).

Until the late 1980s, Goodwin, like almost everyone who studied human interaction *in the wild* (Hutchins 1995) up to and at this time, studied *face-to-face* interaction, that is, interaction in which the parties are one another's objects of attention. But this mode of interacting, in which the parties turn away from the world around them and orient fully to one another is only one among at least two fundamental *participation frameworks*. The other has been called *joint attention* (Moore & Dunham 1995), *'with'* (Goffman 1963), and *Mitsein* (Heidegger, 1962 [1926]): the interaction participants together are focussed on an object, a 'third', available to them either in the world at hand or the world in sight. In research on human development, the infant's ability to focus away from the human caretaker and join her in attending to an object at hand has been recognised to be an essential prerequisite for the acquisition of referential language (Baldwin 1995; Tomasello 1995). In the context of interaction studies, turning to interactions in which the parties are turned to, and involved with, the material world had profound implications (see Streeck, Goodwin/LeBaron 2011). Put simply, it dissolves the boundary between communication and the material world altogether, where, before, 'the world' had only appeared as the universe that is being talked about, as object, not fabric of communication. Consequently, it is also no longer possible to distinguish human acts *about the world* and acts *of the world*, that is, direct physical manipulations of objects at hand (Streeck 1996). Jointly understanding an object at hand is frequently the very point of an interaction in scientific practice. Goodwin first studied 'seeing as a situated activity' in an airline control room where airplanes appear as dots on radar screens, grainy images on closed-circuit tele-

vision, and so on, and subsequently in a whole series of scientific disciplines, each endowed with its own history of instruments, categories, and practices of perception: archaeology, chemistry, oceanography, surgery, and geology. Citing both Heidegger (1962) and Wittgenstein (1953), he noted "that human cognitive activity is inextricably lodged within the activities and settings of the lived social world" (Goodwin 1996: 115). Scientific contexts are not different from the interactions of lay people in that there are always historical, shared practices and criteria by which the validity of some perception is *publicly* assessed.

Co-Operative Action

Chuck Goodwin devoted much time during the last years of his life to fundamentally reworking *all* of his prior studies into a single coherent body of empirical theory. The book is the product of an unusual production history: invited to combine some of his most important papers into a single volume and make some editorial revisions or write commentary on the occasion, he revisited and reworked his entire life's work into a single 'narrative', the discovery of one 'great pattern that connects', that is apparent in almost any interaction and yet ties the whole of human cultural and social history together, and that Goodwin came to call 'co-operative transformation' and, finally, 'co-operative action'. The basic conception of Co-Operative Action is straightforward and simple:

> New action is built by decomposing and reusing with transformation the resources made available by the earlier actions of others. (1)

We have already seen this mechanism at play in the construction of spoken utterances, for example when Martha in the 'wedding dress' sequence transforms Susi's noun phrase by inserting a modifier so that the ultimate description is the "outcome of an accumulative, temporally unfolding co-operative process within which different actors successively contributed different materials" (52). But *Co-Operative Action*

reveals in chapter after chapter the pervasiveness of this social form across many domains of human action and socially shared cognition.

Co-operative action in Goodwin's sense must be distinguished from cooperation: "co-operative action differs from cooperation in that it is not restricted to mutual aid; more crucially it provides, in the midst of action itself, a systematic mechanism for progressive accumulation with modification on all scales" (1)

Thus, a boy who during an argument takes the sentence thrown at him—'Why don't you get off my yard?'—and expands it to 'Why don't you make me get off your yard?' does not engage in cooperation, but rather builds a new (agonistic) action by re-using a resource provided by his adversary's prior agonistic act. Such simple expansions (cumulative transformations) can alter the nature of the linguistic action sequence under way and the 'participation framework' that the parties maintain from moment to moment. And yet, such un-cooperative co-operation also constitutes a specific form of sociality in which the parties 'inhabit' each other's acts: "Building action by accumulatively incorporating resources provided by others creates a distinctive form of sociality: it is one of the ways in which we inhabit each other's actions, including those of no longer present predecessors." (31)
Goodwin continues,

> The substrate on which new action is built does not have to be provided by a co-participant; resources provided from tradition are also used, and co-operative action therefore constitutes a form of sociality that comprises both our relationships with consociates as with our predecessors. Simply by using words and constructions that the common language provides we engage with the cognitive practices and cumulative problem solutions of ancestors. Goodwin calls this 'the consequential presence of absent predecessors within local face-to-face interaction. (246)

Goodwin often uses Goffman's term *lamination* to refer to the structure of this accumulation. An example is his use of the term in the treatment of prosody. Goodwin takes intonation contours as quasi-independent semiotic resources that are laminated onto spoken texts to create different interactional effects and contextual configurations. He gives the example of a contemporary actor producing hesitations, repetitions, and pauses as he utters the words 'no fair princess' from Shakespeare's As You Like It. He writes that

> the action that must happen here, Orlando's suddenly falling in love on encountering Rosalind, is made visible entirely through the actor's skillful prosody as he [...] inhabits the line. The laminated organization of human action makes it possible for a single action to be constructed through the intertwined activities of people living four hundred years apart from each other (130).

Even when the participants rely on what appears to be a single modality or resource such as speech, in fact "participants build action by laminating *different kinds* of meaning-making resources together" (238, emph. JS). Even talk is inherently multimodal. When the parties talk during face-to-face interaction, multiple 'complementary semiotic fields' are relevant, including

> 1) the mutual orientation of the participants' bodies toward both each other and the materials they are working with, which creates a public focus of attention and a locus for shared work; 2) language, including relevant deictic terms, organized within sequences of action within human interaction; 3) hands making environmentally coupled gestures; 4) consequential phenomena in the surround that is being intensely scrutinized by the participants as part of the work they are doing together. (238)

This is the contextual configuration that Goodwin calls the 'co-operative transformation zone'. It is realised, for example, in the interaction of senior and apprentice geologists in which rocks are handled and annotated by gestures so that sediments become visible to novices, who thereby not only acquire new perceptual standards and categories, but also learn the embodied practices and stances (postures) that make geological perception possible and visible as a socially shared, managed endeavour. Co-operative transformation takes place also when chemists make normative perceptual distinctions between black and jet black (the latter being laminated onto the former) and expand ordinary usage by finer distinctions such as 'gorilla fur'/'orangutan hair' to identify the certain shades fibres go through as they are being heated (Goodwin 1997). Cooperative transformation—"decomposing, and reusing with transformation the resources made available by the earlier actions of others" (1)—is also the mechanism by which we display how we understand one another's turns at talk (cf. the 'next-turn-proof-procedure', Sacks/Schegloff/Jefferson 1974)[10], and it appears when we examine how certain basic human hand tools are made. These tools, known as *polyliths* (Reynolds 1994), are made from different constitutive parts which transform one another by being joined together. Co-operative transformation, in other words, defines both human actions and their results: "[H]uman tools manifest the same co-operative organization as human action in general (…)" (136).

> (…) [A]ction is built by performing accumulative transformations on materials composed of parts that can be decomposed, rearranged, and added to create something new (including strong opposition to what was created through the arrangement of the earlier materials), which also visibly displays its inheritance from what occurred before. Human tools, as demonstrated most simply in the stone ax (…), have this same organization. The ax is constructed from discrete parts drawn from diverse materials that, like prosody and discrete

> language structure, have complementary properties. The stone, the leather thongs, and the wood handle are placed in an arrangement where they can operate on each other to create something that cannot be found in any of these parts in isolation. The tool comes into existence through the creation of a web of relationships that organize unlike materials. (136)

Goodwin's argument is not that there is homology between core mechanisms in each of the different domains of human action—"the locus for human action is not lodged within a particular modality, such as talk, or language" (136), but that each of these domains is itself constituted by the same basic procedures.

While the basic mechanism of co-operative action may be simple and straightforward, Goodwin shows that is involved in and to a great explains the existence and functioning of a broad domain of human action and cognition and, by the same token, areas of cultural evolution. One such domain is sensory perception, to which Goodwin has devoted much—and his most influential—work (Goodwin 1994; 1997). Like all ethnomethodologists, he refuted the notion that perception is an 'internal' and strictly physiological process. What can be seen is a matter of social consensus and shared perceptual categories as much as it is a function of the structure of the human eye, and perceptions are best studied as agreeable (and contestable) perceptual *judgments* in a community of practice.[11] Agreed-upon categories of perception and the tools and technology that support and augment sensory perception in the modern age are the products of cultural accumulation, driven by problem solving in co-operative action. New perceptual categories are brought into being in professional communities when members in need of perceptual or conceptual refinement produce new categories and labels. Thus, everyone's being and competence as a perceiver is lodged in histories of co-operative action.

The procedural logic of co-operative action, which enables agreement on perceptual judgments via the situated production of new perceptual categories, governs the production of science and scientific observations quite generally, as Goodwin revealed in his studies of chemists, oceanographers, and geologists. And to the extent to which it enables, governs, and explains innovation (as transformative re-use and re-assembly—recycling—of prefabricated parts), it also explains *differentiation*, that is, the appearance of autonomous evolutionary 'subpaths' not shared by the culture at large. The more specialised the perceptual catgories and skills, the more the community is in need of some form of institutional pedagogy (Gergely & Csibra 2006).

> Each community is … faced with the ongoing task of building both the objects and tools that populate its environment (e.g., archaeological maps, measuring cups in kitchens, surgical tools, and classifications of structures within the bodies being operated on) and skilled, knowing actors capable of not only recognizing these objects, but knowing in fine detail how to use them to constitute the activities that sustain the community. Simultaneously the co-operative organization of action provides the resources required to construct such actors. (Goodwin 2017:320)

Conclusion: The Unity of Mind and Nature

'Rethinking context' (cf. Duranti & Goodwin 1992) is something that occupied Goodwin throughout much of his life. In *Co-Operative Action*, he aligned his ethnomethodological understanding of context as an ongoing accomplishment of the parties' actions with Uexküll's concept of *Umwelt* (Uexküll 1957) and thereby transcended the nature-culture divide that ethnomethodology and related 'humanistic' approached had steadfastly maintained. Goodwin saw human sense-making as a continuation of those primary acts of sensation and sense-making by

which primitive organisms such as amoeba propel themselves through the world: by discriminating between toxic and non-toxic or nutritional molecules in their surround. By enacting that distinction, amoebae structure their environment—they make an *Umwelt*, a perceptual world subjectively structured according to their purposes, i.e., their relevancies of sustaining themselves in the situation and the world, just like humans make an *Umwelt* by implicitly or explicitly agreeing on a definition of the situation. Although Chuck Goodwin did not often refer to Gregory Bateson's ideas in his work, he was deeply influenced by them, and his oeuvre can be read as an implementation of Bateson's dictum that mind and nature constitute a necessary unity (Bateson 1979).

Notes

1 I thank Candy Goodwin for providing me with important information and corrections.

2 Reading Sacks' lectures was an important impetus for Goodwin's initial research and video-data gathering. Harvey Sacks died in a car accident at the age of 40. Chuck Goodwin had far more time to implement Sacks' vision and go and make discoveries wherever 'the work' took him. One could speculate where in the field Sacks would have found himself being taken, had he had more time to be carried away.

3 Other supportive presences at the University of Pennsylvania were William Labov and, to a lesser extent and more remotely, Dell Hymes. The present author first heard about the work of the Goodwins when Labov pointed him to Candy's dissertation, *He-Said-She-Said* (1990) during a visit to the Freie Universität Berlin.

4 'Professional vision' (Goodwin 1994) is the most cited article that has appeared in the 130 years of *American Anthropologist's* history.

5 See C.Goodwin 1980; M.H. Goodwin 1980.

6 Rossano (2012) has qualified this finding by showing that the need for mutual gaze is dependent on the activity that the parties are engaged in: not all types of action sequence appear to require mutual gaze; gaze is thus organised at the level of *action sequences*, not turns at talk. Streeck (2014) argues that mutual gaze is a matter of *recognition*, not attention; it displays the need for the recipient's recognition of the type of action or

the content of the talk *ratified* by the addressee.

7 Notice also that Goodwin placed "cigarettes" in the transcript in recognition of the fact that "I gave up smoking" is a complete sentence; by appending "cigarettes" as a re-completer, the speaker may have intended to indicate that his decision to give up smoking does not extend to pot. Goodwin only showed this in the transcript, but did not refer to it in his analysis, in apparent respect for the privacy of the 'subject'.

8 See Schegloff 1979; Ochs / Schegloff / Thompson 1986; Deppermann / Günthner 2015.

9 In that paper, C.Goodwin showed that movements of the hand can organise the interlocutor's gaze: while gestures often attract the gaze of the listener, self-touch, in particular touch to the face, 'drives gaze away'. During word-searches, it can sometimes be observed that speakers perform self-touching actions while trying to find the word on their own and direct their hands to their own gesturing hands when they invite co-participation in the search; Streeck 1988, 1993.)

10 Goodwin describes conversational participation as "a temporally unfolding process through which separate parties demonstrate to each other their ongoing understanding of the events they are engaged in by building actions that contribute to the further progression of these very same events. Participation [...] encompass[es] the practices used by rich, feeling bodies to perform relevant operations on a public substrate provided by others. (135)

11 The conception of perceptions as public judgments according to shared criteria goes back to Ryle (1949) and Wittgenstein (1953).

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On Goodwin and his Co-Operative Action

Jörg R. Bergmann

The first time I heard the name Charles ("Chuck") Goodwin was in 1977 when I spent a year studying at UCLA (University of California, Los Angeles) while working on my dissertation. One of the most intense experiences I remember from that time was a seminar organised by Anita Pomerantz, which was designed as a research seminar and which brought together the bunch of the people in the department of sociology and anthropology interested in conversation analysis or ethnomethodology. The material focus of the research seminar was the recording of a single conversation, the analysis of which was conducted so intensely that after four months the seminar had just reached the end of the first transcript page. Although a video recording of the conversation was available, the seminar decided to work initially just with the audio recording and transcript and to bring in the video only in the subsequent term. Recording and transcript were done and provided by Charles Goodwin, who had just completed his dissertation at the University of Pennsylvania, Philadelphia (Goodwin 1977) but was unable to attend the seminar himself. The transcript, which Goodwin had named "Meat Market", documented the interaction of Italo-American butchers in a slaughterhouse in South Philadelphia (Goodwin 1981: 35f.). The recording showed a few men standing side by side and talking to each other ("Your mother was ravin' about the veal cutlets last night") while at the same time chopping cutlets and throwing single pieces of meat into a container some feet away. This scene with its layered and dovetailing actions came to my mind when more than forty years after my first acquaintance with his name (and after many personal encounters

with him) I started to read Goodwin's book *Co-operative Action* which he had finished a few months before his death.

Over the four decades between "Meat Market" and *Co-operative Action*, Goodwin not only completed an admirable academic career but revolutionised his field of research in a gentle, yet sustainable manner. I shall not recapitulate here Goodwin's academic career and scholarly achievement in detail. Suffice it to say that Goodwin, along with his wife and colleague, linguistic anthropologist Marjorie H. Goodwin, after studying with Erving Goffman at Philadelphia, first taught at the University of South Carolina, and from 1996 until his retirement as a professor at the Communications Department at UCLA. During his lifetime he has published several books and a long list of papers, many of which were extremely influential and got high citation rates. In addition to his extraordinarily successful publications, he was an acclaimed lecturer who was able to mesmerise the audience with his liveliness and commitment. I guess that nobody who ever had the chance to listen to one of his focussed, fastly delivered presentations will ever forget this experience.

The book *Co-operative Action* is Goodwin's last publication, bringing together and building upon a variety of his papers, which he re-worked and re-arranged. But the book is neither simply a collection of already published work nor is its perspective backward-looking. Its main objective is to construct for a series of empirical studies, which cover quite diverse contexts, a single conceptual framework. Instead of imposing an overall theory created out of the blue, Goodwin returned to the materials which he had already analysed and began to identify common organisational practices and ties between seemingly heterogeneous fields, e.g. ties between what archaeologists and lawyers are doing.

Goodwin's work is firmly rooted in conversation analysis (CA) but from the very beginning he was original in his approach and innovative in his methods. Two points should be mentioned:

- When CA started in the second half of the 1960s with work by Harvey Sacks and Emanuel Schegloff, the data which they analysed consisted entirely of audio recordings of telephone or face-to-face-conversations. It is very well possible that this limitation was of help to bring about CA's specific methodological attitude and its sense for interactional details. But life does not happen on a phone line. As necessary as this limitation may have been, it remained a limitation which had crucial methodological consequences. So, when Goodwin embarked on his scholarly career, he decided to use the new technology of "video" and started to record everyday interaction such as dinner table talk, birthday parties, a picnic of friends, family get togethers, or butchers talking during their work. Accordingly, he was the first to introduce the study of nonverbal, bodily activities as a topic in its own right into CA.
- A common feature of the field of CA was a widespread hesitancy to move conceptually beyond the phenomenon at hand. The analysis was entirely focused on and restricted to the data which were given to the reader in the form of detailed transcripts. The analysis should speak for itself, and if valid, it would not need a backing up by references. Goodwin never shared this hesitancy, he referred to concepts from other traditions of research whenever he was convinced that this would shed additional light on the results of one of his empirical studies. The ease with which he tapped into sociological, linguistic, or philosophical theories was a unique feature of his scholarly profile - and helped to make CA accessible for other research traditions.

As I have already mentioned, the main objective of Godwin's *Co-operative Action* is to develop a single conceptual framework which would encompass and bring together the results of his prior studies. He searched for commonalities and general patterns in his own research history and made frequent references to semiotics, Alfred Schutz' concept of intersubjectivity, and other theoretical sources. But compared with his pre-

vious work there is a crucial difference now: In his previously published papers, his theoretical ambitions were attached and, in that sense, were secondary to his detailed analyses of single phenomena of face-to-face interaction. In the book at hand, this relation has been turned around, the numerous empirical analyses that can be found in the book from beginning to end are now meant to serve the theoretical argument.

Goodwin's main theoretical argument is that all social interaction - even when co-interactants are in opposition to each other and perform hostile acts - is basically co-operative insofar as every single action inevitably uses material from prior interaction for its own operation. The indexical features of any single action, its placement, its wording, its phonetic contour etc., provide resources which are re-used - taken up, shaped, transformed, re-composed - in subsequent actions. Since this happens with every new utterance, there is an "accumulation of structure" (31) which manifests itself in the dense coherence of an unfolding interaction and in the progressive aggregation of knowledge and other resources. It is evident that Goodwin's concept of "co-operative action" does not refer to historically or culturally specific forms of doing things together, it is irrelevant whether an interaction effectuates people's benefit or harm; the concept is epistemically rooted on a very deep level and is meant to capture a constitutive feature of our *conditio humana*: "Building action by accumulatively incorporating resources provided by others creates a distinctive form of sociality: it is one of the ways in which we inhabit each other's actions." (31)

Whereas Goodwin uses the hyphen to make a clear-cut distinction between "co-operation" and cooperation, another way to mark this distinction and to capture the aprioristic meaning attached to "co-operation" would be to speak of "proto-cooperation". One implication of such a conceptual shift would be that it makes visible that the concept of "co-operation" is closely related to kindred aprioristic concepts such as proto-sign (Schütz/Luckmann 1989: 151) or proto-morality (Bergmann

1998: 283ff) which share with Goodwin's concept their socio-phenomenological background.

The distinction between cooperation and co-operation - as between sign/proto-sign or morality/proto-morality - is a tricky one. Co-operation, conceived as an *apriori* of human sociality, refers to structures of the lifeworld that precede any empirical forms and cases of cooperative practices or episodes. But how is this concept of co-operation achieved? In phenomenology a concept like "co-operative action" would be generated by "looking" at an object and its "eidetic variation", by disentangling layers of the phenomenologist's consciousness and experience and by imagining that, in doing so, it will be possible to come so close to "the things themselves" that one can directly read their "essence". Goodwin took another path. Instead of introspection, cognitive self-exploration and "eidetic variation" he used the huge variety of empirical cases, which he had collected and already studied during his scholarly life and distilled from them the social entanglement and intermeshing of co-interactants as an ever-present organisational practice.

Thus, Goodwin's theoretical concept of "co-operation" has a paradoxical quality: It claims universal validity as a non-empirical, quasi-transcendental pre-condition of human interaction, yet it is at the same time derived from empirical cases and gains plausibility through empirical evidence. It is this paradoxical concurrency of pre-empirical/empirical that furnishes Goodwin's book its ethnomethodological character. Ethnomethodology has made itself comfortable on a most uncomfortable spot: on top of the fence between sociology and phenomenology, between empirical research and pre-empirical reflection. Garfinkel once issued the ethnomethodological study policy to treat "the objective reality of social facts as an ongoing accomplishment of the concerted activities of daily life" (Garfinkel 1967: VII), but he left it to the reader's intuition what he meant with "concerted" activities. Goodwin's notion of "co-operation" can be seen as a perfect empirically based elucidation and theoretically ambitious reformulation of Garfinkel's expression.

Goodwin's description of "co-operative" action is so general that it is possible to misuse the concept, take it from the area of face-to-face interaction, and transfer it to scientific communication. One could then say: Every new scientific contribution is "co-operative" in the sense that it performs systematic operations on something created by someone else. Whereas in social interaction we "inhabit each other's actions", scientists inhabit each other's texts. Turning this twist on Goodwin himself, one may ask, who is inhabiting Goodwin's texts and how did he re-use, de-and re-compose, and transform the texts of others.

Given Goodwin's strong affiliation with CA, it comes as no surprise, that Sacks, Schegloff, and Jefferson are the most prominent "inhabitants" in his texts. More interesting is what kind of transformative operations on central propositions of CA he has performed. Mostly, these operations have broadened and enriched CA, sometimes, though, they adopt a new course that departs somewhat from the original CA approach.

His preoccupation with gestures and bodily interaction led Goodwin to realise that the simultaneity of activities is of as much importance as their sequentiality. Traditionally, the sequential organisation of social interaction was a tenet of CA, the sequential position of an utterance was regarded to be the main context, based on which an utterance got its meaning. But every utterance is a multi-layered activity, where gestures, body postures, direction of gaze, prosodic features, lexical choice etc. occur in parallel and in relation to each other. CA had to learn from Goodwin that, in addition to the sequential position of an utterance, there are material features, which in his book he called "substrates" (32) and which, like a body twist or a grid on the ground for a jumping game, may serve co-participants as a resource for understanding and for the construction of a subsequent activity.

Garfinkel (1972) spoke again and again of the "local production of social order" and although it seemed clear without saying that "local" was meant to refer to the situated character of the social world, the ques-

tion remained: what is "local"? and how local is local? Video technology enabled Goodwin to observe in fine-grained detail how situational contingencies shape the production of an utterance. And he was able to show that an emerging turn is co-operatively organised by adapting its course to momentary changes like a shift in a recipient's alignment, or the rise of an eyebrow. Goodwin thus confirmed a radical thesis formulated already 1929 by Vološinov (1973: 86):

> Word is a two-sided act. It is determined equally by whose word it is and for whom it is meant. As word, it is precisely the product of the reciprocal relationship between speaker and listener, addresser and addressee.

For the ethnomethodological *façon de parler,* the loose talk of "local production" was quite helpful as a sign of membership, although - or because - it was hardly ever substantiated. With his demonstration that the smallest elements of an utterance are the result of co-operative calibration, Goodwin saved this core ethnomethodological expression from becoming an empty phrase.

Although Goodwin dedicated a good part of his scholarly life to come to grips with and to unfold in detail the local production of situated social order, he seemed to be unhappy that the particular local moment was the main - if not the only - focus of CA. He saw that history - or generally: events outside and prior to the local moment - somehow matter for situated interaction and he was, therefore, looking for ways to show how history becomes relevant in a given social moment. Building on Alfred Schutz notion of "predecessors" and studying the work of archaeologists, he started to analyse how objects in a face-to-face interaction make visible earlier activities of actors who had lived in the past. Here Goodwin's concept of accumulation comes into play and gains prominence. In his view, co-operative action is built not only with interlocutors in a face-to-face situation but also with predecessors, in both

cases, prior actions are used as resources, are re-shaped and made the object of accumulative transformations. The idea (as I understand it) that one can "reverse engineer" a given setting by reading it backward and looking at it as the accumulative result of transformative co-operations is fascinating. It remains to be seen, however, whether this idea of stepping outside of the "local" order production implies such a radical "transformation" that it will eventually blast the methodological frame within which Goodwin's work is located.

In early CA, the notion of "recipient design" was quite prominent and widely used, although it was never thoroughly explicated. It was introduced to capture the various ways in which a party in a conversation display in their talk an orientation to their particular co-participant(s) (Sacks/Schegloff/Jefferson 1974: 727). Goodwin has not only shown that a story is designed differently depending on whether it is told to a knowing or an unknowing recipient. He has also analysed in detail that a speaker changes - co-operatively - an emerging utterance in its course when they realise that they move from an unknowing to a knowing addressee. When Goodwin developed the distinction between knowing and unknowing actors, he was one of the first in the field to see the importance of the unequal distribution of knowledge among co-participants - and in general: the situational epistemic constellation - with regard to the unfolding interaction in any given moment. What he did miss, though, was that knowledge in everyday life hardly ever occurs as neutral information but in most cases is imbued with social-moral ingredients - normative expectations, entitlements, dubious histories, shady sources etc. In earlier work (Bergmann 1993: 99) I showed, e.g. that information conveyed in gossip is by no means neutral information but mostly "morally contaminated" so that actors take certain precautionary measures when they tell - or ask for - juicy stories. A concept of knowledge which has been purged of these dark sides is in danger of failing to recognise phenomena which result from the co-interactants' effort to cope with these more awkward sides of knowledge.

This last remark leads to a more general and somewhat critical comment on Goodwin's theoretical ambition. The term cooperation - and generally the prefix "co-" - comes along with a "positive" semantics and evokes associations of teamwork, interplay, or synergy, insinuating that the partners involved are on an equal footing and have equal rights. Of course, Goodwin's more abstract concept of "co-operation" is meant to strip off just this benevolent semantic aura. But the cases he analyses and the examples he offers range from the successful interaction with an aphasic man able to speak only three words to the sharing of food or the pedagogical building of new cognitively rich, skilled members. But what about the refusal of cooperation, paternalistic modes of doing things together, the enforcement or cancellation of cooperation? And although we may "inhabit each other's action", there is also the possibility of "occupying" the other's action. The accumulation of transformative co-operative actions is a persuasive description of the progression of turn-by-turn talk (although I doubt that it can be blown up to a general model of human evolution). But there are voluntary and enforced stops, blockages, recessions, and the negation of accumulation may sometimes even lead to a higher degree of self-determination. - In short, to me, Goodwin's concept of cooperation/co-operation suffers from a harmonistic bias.

Despite this critical remark, I think that there can be no doubt that Goodwin's book is a landmark in the history of CA and the analysis of social interaction in general. He has lifted the research tradition for which he was a most prominent proponent during his entire scholarly life, onto a new level. Forty years ago, I admired the unknown colleague who had the chutzpah to go to a meat market, to record butchers during their daily work and conversation, and to hope that this seemingly trivial event will eventually help him to understand better what is going on when people interact with each other. Today I am enthusiastic about the last work of a dear colleague, who with his curiosity, his imagination, and his persistence was an inspiring role model for many and who, with

his theoretical reformulations, has enriched our work and furnished it with new dimensions.

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Digital vernetzte Medien werden als kooperative Werkzeuge, Plattformen und Infrastrukturen gestaltet, die bestehende Öffentlichkeiten transformieren und neue Öffentlichkeiten ermöglichen. Sie sind nicht mehr als Einzelmedien zu verstehen, sondern verlangen eine praxistheoretische Auffassung der Medien und ihrer Geschichte. Alle Medien sind kooperativ verfertigte Kooperationsbedingungen. Ihre Praktiken und Techniken entstehen aus der wechselseitigen Verfertigung und Bereitstellung gemeinsamer Mittel und Abläufe. Darum verläuft die Erforschung digitaler Medien quer zur gängigen wissenschaftlichen Arbeitsteilung und verlangt eine gezielte Engführung von Medientheorie und Sozialtheorie.

Digital network media are designed as cooperative tools, platforms and infrastructures which transform existing publics and give rise to new ones. Digital media can no longer be understood as individual media, but demand a practice-theoretical perspective on media and their history. All media are cooperatively accomplished devices of cooperation. Media practices and techniques evolve from the mutual making of shared resources and joint processes. That's why the study of digital media disturbs our scientific division of labour and remains a challenge for the intersections between media theory and social theory.

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