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José Abdelnour-Nocera
Michele Strano
Charles Ess
Maja Van der Velden
Herbert Hrachovec (Eds.)

Culture, Technology, Communication

Common World, Different Futures

10th IFIP WG 13.8 International Conference
CaTaC 2016
London, UK, June 15–17, 2016
Revised Selected Papers

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Editors
José Abdelnour-Nocera
IT University of Copenhagen
Copenhagen
Denmark

and

M-ITI
Funchal
Portugal

Michele Strano
Bridgewater College
Bridgewater, VA
USA

Charles Ess
University of Oslo
Oslo
Norway

Maja Van der Velden
University of Oslo
Oslo
Norway

Herbert Hrachovec
University of Vienna
Vienna
Austria

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Preface

The eighth working group (WG 13.8) of the IFIP Technical Committee 13 on Human–Computer Interaction (HCI) was established in 2008 as a special interest group, and turned into a working group in 2014. The scope of this group is to support and develop the research, practice, and education capabilities of HCI in institutions and organizations based around the world, taking into account their diverse local needs and cultural perspectives; and also to develop links between the HCI community in general and other relevant communities involved in international development and cross-cultured aspects of ICT development. In an attempt to demonstrate links to other relevant communities interested in cultural aspects of ICT, this volume presents revised selected chapters from papers presented at the 10th Cultural Attitudes Towards Technology and Communication (CaTaC) conference organized jointly with WG 13.8. This working conference was held at the University of West London during June 15–17, in 2016 in Brentford, UK.

The chapters included in this volume explore the intersections between culture, technology, and communication, applying different theoretical and methodological perspectives, genres, and styles. Addressing the concerns of IFIP WG 13.8, the following pages include good examples of how to address challenges for design and innovation in the Global South. However, we will also see examples of design for community development outside of the Global South, as a way to understand points of convergence and divergence.

Since 1998 the CaTaC conference series has fostered a distinctive conference culture, one that is remarkably interdisciplinary and critical, on the one hand, but at the same time, exceptionally supportive and collegial. Fast forward 2016, and the CaTaC community still continues to encourage scholars to explore, try out new ideas and approaches, and offer their best critical insights, but always only in a collaborative spirit that rests on our shared conviction that we are all in this together, however seriously our academic lives require us to focus on our own achievements and progress. It was an honor for WG 13.8 to be a co-protagonist of this edition.

We hope this book becomes a resource for the type of discussion topics that took place at the working conference in London. Culture remains a contested concept and phenomenon for humanists and social science scholars, and its value for ICT academics and professionals regularly comes into question. However, the concept of culture provides the signifiers that allow us to reflect on our condition of symbolic beings driven by beliefs and emotions. This is turn allows to think of the need for technologies to be more human, and to be able to do something about it.

November 2016

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On Persuading an OvaHerero Community to Join the Wikipedia Community

Mark Mushiba[1], Peter Gallert[2], and Heike Winschiers-Theophilus[2(✉)]

[1] University of Trento, Trento, Italy
mark.mushiba@unitn.it
[2] Namibia University of Science and Technology, Windhoek, Namibia
{pgallert,hwinschiers}@nust.na

Abstract. Wikipedia, an important bibliography and collaborative repository, is dominated by the Northern Hemisphere, in terms of content as well as editor participation. With an under-represented contribution from Global South editors and especially indigenous communities, Wikipedia, aiming at encompassing all human knowledge, falls short of indigenous knowledge representation. A Namibian academia community outreach initiative has targeted rural schools with OtjiHerero speaking teachers in their efforts to promote local content creation, yet with little success. Thus this paper reports on the effectiveness of value sensitive persuasion to encourage Wikipedia contribution of indigenous knowledge. Besides a significant difference in values between the indigenous community and Wikipedia we identify a host of conflicts that might be hampering the adoption of Wikipedia by indigenous communities. Further investigations into the cultural and collaborative gaps are to be done in order to promote an appropriation of Wikipedia by indigenous communities.

Keywords: Wikipedia · Persuasive technology · Technology adoption · Indigenous language incubator · OvaHerero · Namibia · Value based design

1 Introduction

Wikipedia has become an important 21st century bibliography, outline, and definition of human knowledge. In terms of accessibility it is the knowledge repository of choice for half a billion readers, available in 293 languages and comprising almost 35 million articles. However, the famous statement by co-founder Jimmy Wales, "Imagine a world in which every single person on the planet is given free access to the sum of all human knowledge" [1] is still far from being realised. Although Wikipedia covers a diverse range of topics, this diversity is challenged by its relatively homogenous editor community. The majority of Wikipedians are known to be formally educated white males with technical inclinations [2]. This unintentionally creates a one-dimensional narrative facilitated by the oligarchy of Wikipedia's long-term highly active ("vested") editors' systemic bias. There is little participation from the Global South, the female, the working class, the older generations and the not formally educated, among many other communities. As a result of this systemic bias there is comparatively little [3] and low-quality [4] content about the things that matter to the non-contributing communities.

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Indigenous people in Africa are a typical example of such underrepresented communities, both in terms of participation in, and coverage on, Wikipedia.

One specific indigenous African community, the OvaHerero of eastern-central Namibia, has been the target of Wikimedia outreach programs in an attempt to recruit editors for the English language edition of the online encyclopaedia. These endeavours have been carried out under the Namibian Knowledge Portal (NKP) initiative to promote local content creation. The NKP is a public-private partnership enabling rural schools to enhance their curricular and extramural activities as well as their anchorage within their community. So far training sessions and workshops were organised at a number of rural schools introducing teachers and out-of-school youth to Internet basics and Wikipedia, thereby promoting technology-based knowledge preservation and local content creation. However, past efforts have not been sustainable; the only Wikipedia edits from the OvaHerero were made during the workshop days under the guidance of the instructor [5].

The little progress made in previous Wikipedia outreach efforts led us to explore causes of the lack of adoption as well as alternative ways to recruit and retain OvaHerero editors. It has been widely recognised that cultural logics and literacies are embedded in the strategies privileged by technology design, thereby replicating ways to organise, make sense of, and communicate about the world [6]. Wikipedia is no exception. Certain values and perspectives are embedded in the technology and its usage and fostered through the editor community. We intend to test our initial assumptions [7] that indigenous communities, such as the OvaHerero, experience major cultural barriers to the usage of established collaborative technologies such as Wikipedia. In this paper we therefore present a value sensitive design approach, scrutinising the target users' as well as the technologies' underlying value systems. We then postulate that using a persuasive technique based on explicated motivational factors will enhance the adoption of Wikipedia by the OvaHerero community. We present the results of this limited study and recommend further research. In the next section we first problematise the integration of indigenous knowledge into Wikipedia.

2 Indigenous Knowledge and Wikipedia

2.1 Knowledge Systems

Knowledge repositories exist for all human groups and can take many forms. In "Western" cultures the prevalent method of transmitting, preserving, and codifying knowledge is writing, so much so that written repositories like journals, monographs and encyclopaedias are seen as the ideal way to develop, collect and represent what is known.

There are, however, many different alternatives. Knowledge can be narrated, represented in artefacts, in rituals, in play and dance. Millennia before writing was invented, knowledge was transferred in these ways, and they still played a role centuries thereafter, until and including modernity. [9] Moreover, it is widely recognised that there are vast sets of statements that in principle cannot be expressed in language. [9] points out that not just the writing system deforms knowledge that exists in oral repositories but

that the way of organising information as prescribed by the scientific method, hides important aspects for which we lack a scientific theory. For example, when documenting how a traditional healer applies medicine the botanic name of the plant was captured while the harvest time was not. The general plant part to collect (root, stem, leaf) was captured, the specific piece (young or old, top or bottom leaf) was not.

Indigenous knowledge (IK) is "the body of historically constituted (emic) knowledge instrumental in the long-term adaptation of human groups to the biophysical environment" [10]. IK often is not codified in writing but narrated and demonstrated. Transferring indigenous knowledge requires different generations of the indigenous community to frequently congregate. Due to societal change this prerequisite of oral communication and subsequent knowledge transfer is no longer given for many communities. Urbanisation and change of lifestyle has left the elders-the knowers-behind in their villages while the youth has migrated to towns in search of work and "modern" educational opportunities. They now miss the ancient opportunities to gather knowledge from their home communities [4].

2.2 Digitizing the Knowledge Sharing Processes

The goal of recent digitalisation initiatives of IK has been to produce "more effective technology design to support, serve and preserve the use of Indigenous Knowledge" [8]. Although content sharing services such as Facebook and YouTube have encouraged the growth of collective content, little attention has been given to the homogeneity that pervades most of these platforms. While [11] suggests that cultural forces have a powerful influence on technology adoption, there has been little progress in accounting for cultural differences in collaborative computing. [12] contribute that the Internet's usefulness and growth can be attributed to openness and universality but these principles are currently undermined by the rigidity of collective content platforms. The collective content platforms indirectly exclude certain communities. Indigenous knowledge communities in particular have been largely marginalised and left out of the digital collective content creation movement. The latter is illustrated by the challenges currently presented by including indigenous knowledge in Wikipedia.

Yetim [13] states that technology has strong ethical and value implications and so should involve values in the design process rather than reacting to them after the development of the technology is complete. Indigenous communities are established cohesive groups with shared values. The identity of these communities is challenged when an attempt is made to virtualise these communities. Collective content creation platforms favour individual contributors of the close-knit professional groups. Olsson [14] argues that interactivity fosters collectivity for communities, and that the tool used for sharing can encourage or discourage collectivity and in turn, participation.

Musicant et al. [2] alert us to the fact that Wikipedia is inadequate at promoting or fostering interpersonal communication. This dampens the effectiveness of a community motivation. They further make a strong point by stating that "In both policy and culture Wikipedia is opposed to too much socialising among its editors. This is perhaps best exemplified via the Wikipedia policy page "What Wikipedia is not," particularly the sectioned titled "Wikipedia is not a blog, web space provider, social network, or

memorial site." [2] Policy considerations aside, Wikipedia does allow socialising, particularly among established users that are prolific content creators. This particular aspect of the What Wikipedia is Not policy is rarely enforced for vested editors.

2.3 Challenges of Indigenous Knowledge in Wikipedia

One option of digitalising IK considered by Gallert [3] and Mushiba [15] is to use Wikipedia, in its English language edition or in the local language of the indigenous community. However, as it stands Wikipedians can contribute IK to the online encyclopaedia only if that information is backed up by published written sources. Wikipedia's editor community argues that IK knowledge holders give subjective information that is unverifiable and undermines their convention of acceptable sources. Thus only the small part of IK that has been covered by external researchers and been published in writing can be included in Wikipedia articles. However, the alien researchers might have inadvertently misinterpreted IK and warped its context. The majority of IK that exists within Wikipedia comprises of written accounts of indigenous people and their customs by missionaries, adventurers, travelers, merchants and colonial administrators because these are the only narratives available in writing [8].

3 Conceptual Framing

Having previously [7] confirmed the existence of a conflict between values inherent to current Wikipedia implementations and those of indigenous communities, the challenge then becomes how to support the discovery of competing values and reconcile them while at the same time galvanising a motivation for IK communities to emerge as contributors to the preservation of IK through Wikipedia.

Value sensitive design (VSD), although it does not offer an explicit method to value discovery or value conflict resolution, offers a conceptual baseline as well as guidelines on how to explicate values. With VSD we see an investigation on present values inherent in the current state of Wikipedia and the OvaHerero community in order to address incompatibilities inhibiting technology adoption.

The second, exploratory, challenge is dealing with issues of motivation that impede the emergence of behaviour whereby members of IK communities record IK on Wikipedia. Thus understanding collective content creation contributors' motivation and deploying related persuasive strategies seems to be a worthwhile effort.

3.1 Value Sensitive Design and Information Systems

According to Friedman, Kahn and Borning [16] VSD is a "theoretically grounded approach to the design of technology that accounts for human values in a principled and comprehensive manner throughout the design process" [16, p. 80]. The framework hinges on the concept that we can account for values within the design process thereby enhancing a solution to improve its adoption.

In terms of technical practicality, VSD is considered to be a well-established framework that has seen widespread application in areas like network browser security, urban simulation, large displays and safety technologies [13]. VSD is based on a psychological theory that there are universally held values, although these values may manifest differently in different cultures, and some of them might be entirely culture specific [17]. According to [18], cultural values are "the implicitly or explicitly shared abstract ideas about what is good, right and desirable in a society and are the basis of specific norms that tell people what is appropriate in various situations". The values are interpreted as discrete units that characterise groups. The values that are deemed as cultural values in our study are extrapolated from a broader group of human values, as presented by [16] in VSD.

A non-exhaustive list of human values includes human welfare, ownership and property, privacy, freedom of bias, universal usability, informed consent, accountability, courtesy, identity, calmness, and environmental sustainability [16]. An iterative tripartite methodology which features conceptual, empirical, and technical investigations is deployed within the system design process in order to infer cultural values from the larger group of human values relevant to the specific context [16].

3.2 Contributors' Motivation to Collective Content Creation

[19] showed that 0.1% of the editors (4,400 at that time) contribute 44% of English Wikipedia's value, measured in page word views. Moreover, these editors' activity pattern showed remarkable homogeneity, and it differed considerably from that of the other 99.9%, leading to the somewhat astonishing title of their paper, "Wikipedians are born, not made". The group forming as the encyclopaedia's 'inner circle', consisting of very active editors who contribute at least 100 edits per month, has in the meantime shrunk to 3,300 (Wikipedia statistics, 2016). By all accounts, Wikipedia is authored by a tiny minority, with just slightly over one very active editor per 500,000 speakers of English.

The question of why this very exclusive group of people spends vast amounts of their voluntary time to write Wikipedia has not yet been sufficiently investigated. [20] seems to be the earliest study on this topic but did not go beyond a pilot phase. It pegs the editors' motivation mainly on the values of reciprocity and altruism, using the same conceptual framework as we do, the Tripartite Methodology for VSD. However, Kusnetzov's [20] conclusions are derived from theoretical considerations only, and not from their empirical results. Although there seems to be a relationship between values and motivation in previous Wikipedia studies suggesting that altruism and reciprocity can translate into motivational strategies [20], the relationship remains opaque.

[21] employ a different approach to explaining the motivation of highly active editors. They combine [22] framework to explain motivation in social movement with a classification of task characteristics that [23] found suitable to explain work satisfaction and intrinsic motivation, "the doing of an activity for its inherent satisfaction rather than for some separable consequence" (so defined in [21]). They found that there is a *negative* correlation between engagement and cost-benefit evaluation: Wikipedia's most prolific authors expect fewer material and immaterial benefits than less active

volunteers. Instead, intrinsic motivation was the most important factor explaining activity and engagement to a degree that it positively influenced the perception of task characteristics. Of the task characteristics that independently had a positive influence on engagement, autonomy, task significance, and the variety of skills required to complete it, stood out. Again, Wikipedians are born, not made?

In collaborative cultural heritage preservation, [14] reported that the most prominent motivation to contribute to collective content creation activities in smaller close-knit communities was an intrinsic need to create memories and document them. Although this can be true for smaller communities that are bound by a professional activity or common interest, we are reluctant to assume this extends to cultural communities such as those of indigenous groups because the ties that bind them as community are different from small closed-knit groups. Values in indigenous communities are usually established and advanced, serving as the true social glue between individual members of the community. Cultural studies suggests that indigenous communities would be more susceptible to cultural or community level motivations than individualistic motivations. However the issue of motivation for collectivist versus individualistic cultures is beyond the scope of this paper. Studies on motivation of indigenous communities participating in digitalisation efforts of IK are nearly non-existent in the literature. Kapuire et al. [24] in their long-term collaboration with rural OvaHerero identified the following factors as significant motivators to participate in the development of an IK system: learning technology, appreciation of the common project goal (preservation of IK), the intrinsic pleasure of participation, as well as immediate rewards and expectations of gaining resources.

3.3 Persuasive Techniques

Persuasive technology is a design paradigm that proposes that computer systems, devices and applications can be intentionally designed to change a person's attitude and behaviour in a predetermined way [25]. [26] posit that the fundamental idea of persuasive technology is that it serves as an ambient reflection of the user's environment in the hope that aided by suggestive nudges the user makes a conscious decision to alter the state of their reflection in turn changing their behavior. This method is hailed as one of the most effective ways of engaging users and is part of nearly every feedback or incentive system [26]. As an action oriented framework, persuasive design offers a systematic way to use motivational strategies for the purpose of behaviour change. The most influential persuasive approach has been based on Fogg's behavior model (FBM), which postulates that once a person has sufficient motivation, equally sufficient ability and a well-timed trigger, only then can a target behaviour be achieved [25].

4 Research Approach

Our research is a continuation of previous efforts to introduce rural OvaHerero teacher communities to Wikipedia for local content creation and cultural knowledge preservation. We applied the iterative tripartite methodology common to VSD in order to

extrapolate cultural values, to derive motivational strategies and to deploy a persuasive intervention with technologies. Motivational factors were extrapolated from past literature on Wikipedia. We applied a constructivist approach following the FBM to support the desired community behavioural change.

4.1 Community Participants

Our research is focused on the OvaHerero teachers of the Epukiro Post 3 Junior Secondary School, who were previously part of one or two of the Wikipedia workshops held under the NKP initiative. The teachers at Epukiro are relatively tech savvy, at least in the sense that most of them had smart phones and laptops and accessed the Internet at school. The school was fortunate enough to have received the technological infrastructure that made Internet use possible. Even so, there was a clear lack of technical support, at the time of our visit it had been several months since the local technician had last visited the school. Problems with the lab were simply ignored; this was not surprising since the lab was locked most of the time. Although the lab was equipped with functional computers it was often the case that the network between the them was not configured. Out of the twenty computers forming the school lab, only two were working without any problems. A further three could be made to working with relatively little effort.

Epukiro itself is a rural cluster of settlements in the remote eastern part of Namibia 290 km away from the capital, where a large group of OvaHerero people reside. The OvaHerero have been described as full of racial pride and conservatism. In the earliest pictures and journals of missionaries, emphasis is placed on the enthusiasm OvaHerero have for pastoral culture and how cattle are greatly valued within their traditional communities, enough of this narrative has survived even in contemporary Namibian lore. The Ovaherero are one of the ethnic groups in Namibia that still maintain strong cultural and traditional ties. Despite ongoing rural to urban migration they continue to display significant cultural pride as can be seen in their dressing codes and social habits Kapuire et al. [24] Very little history was written by Herero people themselves, and accounts of missionaries and other settler communities are usually the bedrock of scientific investigations.

4.2 Tripartite Methodology Applied

[16] describes the Tripartite methodology as a process to carry out value sensitive design. The methodology itself features a series of iterative processes sometimes working in tandem to create a final product. The main processes of the tripartite method are conceptual, empirical and technical investigations. It is important to note that the tripartite methodology is not a sequential activity but an iterative and integrative one. There is a strong working cohesion between these processes and this in part due to the fact that each process has valuable learning outcomes that can be used in subsequent processes. [13] advocates executing the empirical investigations first, this process has a

good balance of valuable insight on both the conceptual and technical feasibility or value of a design strategy.

4.3 Conceptual Investigation

A pre-study was conducted at Theo Katjimune Primary School in Windhoek. Although the school is located in the capital it has many socio-cultural traits similar to the target rural school. The teachers are of the same cultural group as the target school. The pre-study in the urban area served to inform the researchers on OvaHerero teacher values and to gauge Wikipedia exposure and interest amongst teachers. Qualitative data was collected with the use of personas, semi-structured interviews and surveys. As part of the studies, discussions were also focused around the practical, ethical and moral issues that teachers had with Wikipedia and technology at large. Some resolutions to early value conflicts were simply discussing conflicts and addressing concerns around content ownership and usability.

4.4 Empirical Investigation

The studies were carried out at the Epukiro Post 3 Junior Secondary School and involved fifteen teachers. Here the studies were used to validate our preliminary pre-study findings and for performing a more refined version of our own value discovery. Different qualitative tools were used to identify values, such as a provocative cultural probe, video interviews with individual teachers, a survey as well as a motivational talk and a planning meeting. Based on the experiences from previous unsuccessful outreach activities in recruiting Wikipedia editors among the Epukiro community, our OvaHerero co-researcher held a motivational talk to emphasise the role of teachers as protectors of IK and the pillars of rural communities. IK was introduced to the teachers as a collection of knowledge that is unique to their lives and their history and as something that will safe guard their identity in an ever changing world. Upon apparent commitment to the cause a group of teachers organised themselves into a committee that made decisions on how they would collectively create IK content. A balance was negotiated between professional duties of the teachers and the Wikipedia project, a significant achievement for value discourse.

4.5 Technical Investigation

The technical investigation involved collecting data produced by the participant's direct interaction with Wikipedia as well as the persuasive intervention. The OtjiHerero Wikipedia Incubator (https://incubator.wikimedia.org/wiki/Wp/hz) was used as a technical platform while Facebook was used as a persuasive communication channel. The collected data demonstrated the effectiveness and progress of the persuasive interventions which aimed at a target behaviour of participants to adopt Wikipedia for collective content creation and uploading indigenous content.

4.6 Otjiherero Incubator

The notability and reliability sources rule of Wikipedia language editions determine what the editor community regard as important and what is needed to anchor the articles. These rules have been established by consensus among all early writers of the encyclopaedia, and by design all people to whom the global editing community now tries to reach out to, were not involved in this development.

OvaHerero culture relies on oral traditions of transferring or contributing knowledge. Forcing "Western" relevance criteria and citation requirements onto this indigenous group is tantamount to insisting that OvaHerero record their culture by conforming to the traditions of another culture, or to forfeiting their own culture in order to preserve it in a form that pales when compared to its original.

Consequently, there was no particular sense of urgency to conform to Wikipedia's rules of syntax and sufficient referencing clauses, and ultimately to contribute to Wikipedia at all, as evidenced by many rounds of unsuccessful outreach activities to this particular group. While the participants desire to pronounce their identity and autonomy, rules on the English Wikipedia actively repress these values by requiring participants to contribute in a way that is incompatible with their own culture.

The teachers did not see the need for these rules and perceive them as distrustful and an attack on their integrity since they felt they had no need to lie about their own culture. Indeed, for an oral knowledge repository the existence of written accounts is inconsequential, particularly as such writings are almost exclusively authored by people alien to the indigenous group. The purpose of written references for the English Wikipedia: to ensure that what is collected there is accepted mainstream knowledge rather than some fringe theory or speculation, does not work for the OvaHerero. Deviating opinions and fringe views of this cultural group are fought at the very occasion of their performance in form of an alternative narrative or a plain rejection statement, but not in writing.

Previous outreach activities for the Otjiherero community were conducted using the English Wikipedia, as English is the official language of instruction at schools, and the one in which both teachers and instructor are fluent. However, new editors have a particularly tough time on the English edition, as a famous experiment by experienced Wikipedia authors [27] posing as newbies, shows. Much of the workshop time was consumed by introducing the English edition's very sophisticated set of rules instead of developing the editing community and the still very meagre local content. Through discussions and a value discourse we understood that the narration of local content is most appropriate in the indigenous language. Thus we considered a shift to the native language Wikipedia incubator. Results of the preliminary studies also suggested that the current state of English Wikipedia defies the development or expression of any kind of intrinsic motivation in our target group. Wikipedia is viewed as an uncharted and perhaps also unaccommodating environment by the teachers.

The Otjiherero Wikipedia (https://hz.wikipedia.org) was created in 2004 along with many other standard language editions for sizeable language communities. Due to inactivity, it was closed in 2007 and its few entries moved to Wikimedia's Incubator (https://incubator.wikimedia.org/wiki/Wp/hz). A Wikimedia language incubator is "a place where potential new linguistic editions for existing open content projects

supported by the Wikimedia Foundation can have their own wikis" [28]. The Wikimedia language incubator serves as a testing ground for wikis that can be graduated into Wikimedia if they show sufficient sustained editing activity by native speakers. The rules are usually more flexible than those found on English Wikipedia. One of the requirements to start a wiki in a particular language is having a valid ISO 639 language code. For a language edition to be promoted from the Incubator, a steady editing activity of three to five native speakers has to be established and maintained for several months.

Thus the Otjiherero incubator appeared to be the ideal environment for our intervention, to train and inspire our target community to achieve steady editing activity. The incubator editing space became one of the key areas critical for value negotiation and resolving value tensions. The incubator allowed the teachers to perform their culture unchallenged, since contributions or edits to articles were in the Otjiherero language and only Otjiherero speakers could accurately edit the text. The latter placated the autonomy and identity value tensions.

All the participants were added to our Epukiro project page on Wikipedia; this allowed us to monitor the activity of each of our participants. Edits were tracked using a revision history function as well as a workaround that allowed us to follow the changes made by any user who was part of the Epukiro Wikipedia project.

4.7 Communication Channel

During the study, teachers were tasked with choosing a suitable communication channel. Due to their previous experience and the pre-established social and community ties on the social network, the teachers decided that Facebook would be the communicative channel between research team and themselves. This decision was reached after a discursive session.

4.8 Persuasive Intervention

The persuasive intervention was performed on a community level and in accordance with the components specified in the Fogg behavior model. The persuasive intervention focused on the established values to enhance motivation. A motivational talk, formation of a Facebook community group and early discussions helped to peak motivation levels. The ability component was enhanced by providing clear instructions on how to perform the target behaviour through the Wikipedia training, technical support documents such as user manuals. The trigger part of the FBM was almost absent in the early stages of the intervention but later encouraging tailored SMSes and Facebook posts provided a trigger mechanism bringing about a confluence of all three factors needed to achieve the target behavior.

The measurable variable was an edit performed by any user from our Wikipedia project group. This variable indicated that an instance of the target behaviour was performed and its frequency determined the efficacy of different stages of the persuasive intervention. There were only two stages to the intervention, the first involved

posting facts and relevant information to trigger for low level motivation while the second phase was more rigorous, using tailored messaging and SMS to engage the participants personally. Recorded inactivity on the Incubator prompted us to respond by posting messages on the Facebook page enquiring whether our team at Epukiro was experiencing any problems.

The monitoring of the behaviour change is part of a longitudinal study but for the purpose of this research it was pegged at approximately one month. For the longitudinal purpose the success of the persuasive interventions would be three full months of weekly sustained activity. This is the criteria set by Wikipedia for a language in Wikipedia's incubator to become active and was explained to the participants.

5 Results: Value Comparison

Although VSD is good conceptual framework it can sometimes be practically lacking. There is no systematic way of accurately identifying, isolating or addressing a plurality of values. It can also become difficult to study cultural values without considering the way they are influenced by professional values. This can be a consideration for further study. Value tensions themselves warrant a complete re- design effort, we only tried to enhance participation with Facebook and Wikipedia but some value tensions require the design and development of a system that is flexible enough to support the ongoing negotiation of values in a participatory space.

5.1 Identity and Pride

During our studies we deployed a cultural probe that also doubled as an English test. The probe tested participants on their views of open Wikipedia authorship by presenting an article "Epukiro", both in English and in Otjiherero, that contained false factual information. As expected the teachers demonstrated a good command of English, the returned probe had corrections made to highlight incorrect information.

Most teachers preferred to review the English probe over one written in their native language. This appears contradictory; During many of the interviews participants expressed the desire to contribute IK in their native language. However, the probe consisted of the original factual content as presented on English Wikipedia, and albeit altered in some places, it contained no IK. Naturally, the teachers were also interested in what was written about their community by outsiders of the cultural group.

The teachers vehemently voiced their dissatisfaction with the inaccuracies of the probe and enquired about how they could correct the source of the information on the probe. Although the probe provoked some anger it inspired much needed dialogue on authorship and other topics that steered the teachers into understanding the importance of their contributions.

The users were also vocal about the historical injustices perpetuated by foreign powers and view some technologies as an extension of that unfair treatment. The latter also indicated a value conflict between more centralised systems and the freedom from bias value.

5.2 Property and Ownership

As reported by [7], for all Otjiherero speakers, property and ownership are very important values with respect to intellectual property. This applies particularly to information regarding their own history and culture. Our studies confirm this for the communities in Windhoek and Epukiro. During the unstructured interviews, participants expressed fears around the issue of ownership. This was highlighted by questions about whether the teachers would retain the control of their IK contributions, fears that were aggravated by the fact that they were made to understand that virtually anybody could edit their text on Wikipedia.

While engaging in a general discussion about the way Wikipedia works teacher's concerns about the possible distortion of their original contributions began to surface. The teachers frequently asked what would stop outsiders from warping the meaning of their contributed text and frequently remarked on the fact that it was futile and counterproductive to contribute information that could be changed by anybody but especially by people who were not members of their cultural community. This presented a value conflict between the trust, freedom from bias value and the openness of Wikipedia.

5.3 Universal Usability

Editing on Wikipedia is a manual process that, unless additional tools are used, requires the modification of a source document which will be rendered by a browser only after it is saved. This type of text processing, although common in the past and still used in desktop publishing, is cumbersome for anyone accustomed to What You See Is What You Get (WYSIWYG) text processing like MS Word or OpenOffice. The inclusion of navigation boxes, formatted references, and tables to Wikipedia articles is particularly unwieldy, and there is for copyright-related reasons no simple way to add own pictures to any text.

Wikipedia started at a time when many content producers for the World Wide Web were "fluent" in HTML, and it recruited it first cohort of editors from this sizeable group. Now in its sixteenth year, its editing interface is archaic, and only learning its basic syntax takes time and effort. This is in contrast to a relatively low level of computer literacy among rural OvaHerero in general, particularly within the Epukiro group [7]. Many of the participants obtained their first computer course from us as a prelude to our earlier outreach activities. Some acquired their literacy from the use of a smart phone, and some had minimal formal training before we arrived, but literally no-one possessed the technical expertise, or even felt comfortable, to use an HTML-like markup language to author text. This apathy can still be seen in the article they developed together (https://incubator.wikimedia.org/wiki/Wp/hz/Omimbonde_Vitano) which is a wall of text whose only formatting has been added by community outsiders.

There are many promising ways to make editing technically easier, both general solutions authored by the editing community or the Wikimedia Foundation and tailor-made applications for our cultural context. Developing and testing such tools is

the subject of some of our further research. For now, we record an important value conflict, as the MediaWiki editing interface is unusable for non-technical volunteers without a lot of training and practice.

5.4 Consensus

The teachers were quite adamant that all contributions on matters of IK had to be well researched with the community. This was perhaps spurred on by the probe articles. They also wanted to consult with each other before any uploading of information could commence. This is what led the teachers to agree on an organisational structure whereby all information was discussed and developed in an offline meeting before it was delegated to a person within the group that would upload it. In subsequent weeks of active group work content from previous consultation sessions was never changed. Every editing activity resulted in an addition of text. Of particular importance to the group was that no unapproved version of their content ever becomes visible online.

This is diametric to how editing usually is done on Wikipedia, where a possibly very rough draft is improved over time by many different editors, some of them specialised in just a few narrow areas of improvement. It is also very common to shorten existing paragraphs, change grammar, wording, and flow of prose. For many Wikipedians, the visibility of how a text developed to what it is today via the page history function, is an important software feature and a relevant proof of the value of their individual contributions. Contrary to that, research in the OvaHerero community shows that individuality has next to no value and meaning, and is negatively connoted [11].

This is a value conflict between the need for the OvaHerero to collectively reach a consensus versus Wikipedia individual-driven contribution mechanism cannot easily be reconciled. In fact, the OvaHerero's organisation of content development is so unusual for Wikimedia projects that, if detected, it would violate the respective username policies of Wiki projects that invariably forbid group accounts. On English Wikipedia, only one group account (Schwartz PR) has ever been approved and allowed to edit, by a special decree of the Wikimedia Foundation. Today accounts whose names hint at shared use are blocked on sight. Due to the copyright requirement of attribution, there is no way for ordinary editors to undo a substandard edit in a way that it wouldn't be preserved in the page history, and thus remain visible for anybody who cared to look. This applies also to talk pages where editing improvements can be discussed. Editors could thus not discuss different versions of articles without at the same time immortalising the wrong wording somewhere in the page history. MediaWiki clearly has not been designed to support the collaboration technique that we found in Epukiro.

5.5 Community Interactions

An interesting situation arises from Wikipedia's anonymous nature and the user's strong need for community. Many users expressed that when participating on collaborative projects they require an easy and casual way of communicating with collaborators on the platform they are working. This implicates a value tension since

Wikipedia contributions are acknowledged to individual usernames, which are often pseudonyms, or Internet Protocol (IP) addresses that identify computer configurations, not individuals. Moreover, casual communication among Wikipedia editors is, although not forbidden, not very common and not specifically supported by site rules and editing tools. Where editors do communicate on Wikipedia their participation is publicly visible which may raise privacy concerns.

This particular value tension was addressed by creating the Facebook group. Here not only can the teachers interact with each other but they are also able to communicate with other Otjiherero-speaking Facebook users who joined the page. The first three weeks of our intervention held the Facebook group as a secret group but we made it public towards the end of our study in an attempt to solicit more discussions. This seemed to work; Outside members sent requests to join the group and put up posts of their own. This is one indication that a sense of community started to develop within our Facebook group.

Dialogue and consensus are the tools which are used to resolve value tension, this is central to any value discourse. We avoided making any hard assumptions towards an effective persuasive strategy. Instead we allowed the participants to engage discursively around the results of our tripartite investigations, constantly making way for internalisation of learning outcomes between our research team and the teachers.

6 Results: Persuasion

Because the target group is constituted of teachers we attempted to inspire an intervention strategy that supported the work practices of teachers, this was to avoid possible conflicts between the cultural values we were reinforcing in the teachers and those of the organization (school). At this stage it might have been useful to rank motivational strategies; however, the scope of this research does not cover measuring the efficiency of individual motivations. We also encouraged teachers to suggest their own motivational strategies. Below we describe the effects of our persuasive intervention.

6.1 Collaborative Article Creation

In the Otjiherero incubator participants decided to make edits to a topic of their own choosing. The chosen topic has the title “Omimbonde Vitano” or “The Five Trees”, a location where the earliest leaders of the Epukiro settlement came to congregate under five trees to discuss matters of great importance to the community.

A single article was edited during our observation; the article was edited on Thursday of every week for five weeks. The Epukiro teachers had collectively decided on this work schedule. All edits were done by a single user who was appointed as the uploader of the article content. The nature of the content is collective but a single uploader is responsible for editing the article on Wikipedia.

Throughout our observation the target behaviour remained consistent at one edit per week, the content of this edit is not analysed but growth is observed in article size, the article size grew from 123 bytes to 2086 bytes in the five weeks. At Week 3-4 a spike

in growth from 740 bytes to 1114 bytes is observed, this time was also the time we implemented persuasive tailored SMSes and agency strategies but the results are too inconclusive to attribute the ramp to the new persuasion strategies. We suspect that the increase in persuasive effort had some effect because in Week 5 we see that article size grows to 2086 bytes nearly doubling the article in size.

Within the time frame of our observation the persuasive intervention was not deployed in isolation, it was a mixture of various formative interventions such as motivational talks and value discourse. It would be inaccurate to single out a single instance of the intervention as the sole cause of the target behaviour. Because of its inextricability the independent variable is regarded as the sum of all formative efforts. We note that editing activities came to a complete standstill after the persuasive intervention was terminated.

Uncommon in most persuasive interventions is that the time of the target behaviour and the manner in which it is performed was pre-negotiated by the participants. The teachers decided when they would upload or edit articles based on their schedules and teaching duties. This potentially undermines the effectiveness of a trigger mechanism. Motivation when it is quickly cultivated as in our case, needs to be sustained otherwise the target behaviour is easily lost. Remote persuasion is most effective but it relies on an established rapport with the participants. Even though Facebook is a good behaviour support system it can become difficult to reinforce the target behaviour because of distractions.

A consideration for future work would be to automate the role of the human behaviour support role that we played. A motivation for instance could be automated so that contributions are visible to the members of an online community and the feedback on the contributions can be relayed back the contributor's mobile phone. This tool can be integrated with Wikipedia and automatically respond to edit history data by selecting a suitable persuasive intervention strategy depending on the performance of the teachers.

7 Conclusion

Wikipedia, as an open and collaborative platform is subject to continuous change embedding values of its active contributors. However as [28, p. 315] critically remarks: "In Wikipedia the design process is ongoing but no longer dynamic or transformative. The design of Wikipedia has become hegemonic, stifling other perspectives and ways of knowing the world." Not only from an epistemological point but also from a value perspective Wikipedia falls short in accommodating indigenous communities. However one of the opportunities currently excluded indigenous communities can make use of are the native language editions, where the likelihood of domination by the existing contributors is practically non-existent.

The lack of Wikipedia editing uptake by OvaHerero teachers has been the starting point of this research. Deploying a value sensitive design approach, we uncovered major cultural barriers for OvaHerero community members to join the Wikipedia editor community. Based on those findings we deployed persuasive techniques, which showed preliminary positive results. However, we argue that closing the cultural gap

between the OvaHerero community and Wikipedia needs further investigations. Special focus should be on the adaptation of Wikipedia itself to become an appropriate technology for indigenous knowledge holders.

As demonstrated, the editing cycle of an article in Otjiherero differs considerably from the ordinary work pattern on articles in some of the major languages of Wikipedia. We expect decisive differences in how OvaHerero will organise their Wikipedia work and how other communities operate. Many of the expectations could be supported by Mediawiki software features, but as long as the Otjiherero language is in incubator, it inherits all software settings from it. In order to have the complete freedom of adapting not just community rules but also the interface, hz.wikipedia.org needs to be reactivated first. Should editing in Otjiherero pick up to an extent that the language edition could be released from the Wikimedia Incubator, OvaHerero rules and expectations could be made explicit. Furthermore, in this case specific technical features could be implemented locally, for instance that article changes have to be approved by a member of a designated group of editors before becoming visible ("flagged revisions") and that the primary representation of content be audiovisual rather than textual. Rules could further be established on who would be allowed to create new pages, and what constitutes a proper citation. In other words, a language edition could be created that mirrors the knowledge representation of the indigenous community, how their knowledge is gained, codified, and transferred. This project stopped short of formulating and formalizing the exact principles by which the OvaHerero community wishes to create the Otjiherero language edition of Wikipedia. We concur with [29] that a participatory approach to design will represent the indigenous communities' values. Thus we promote a participatory re-design process based on the explicated community values thereby resolving current clashes.

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Cultures of Science and Technology in the Trading Zone: Biodiversity and Open Source Development

Lorna Heaton(✉) and Patrícia Dias da Silva

Département de Communication, Université de Montréal, Montreal, Canada
{lorna.heaton,p.dias.da.silva}@umontreal.ca

Abstract. This paper explores the work of building open source biodiversity information infrastructure. We analyse collaboration between a Canadian team and a Brazilian one. In particular we focus on the use of WingLongitude, a GitHub space, as a trading zone within which the two teams co-developed solutions. We show how the choice to work in a neutral space, belonging to everyone, and the use of display, representation and assemblage practices enabled sharing of some infrastructural elements, while maintaining other specificities that best suit their diverse cultures. Working together in this trading zone appears as both a practical accomplishment and a commitment to shared ideals.

Keywords: Biodiversity · Trading zone · Infrastructure · Open source

1 Introduction

Over the past several decades, the world seems to have become a smaller place. We have come to better understand that everything is interrelated, although we may not always understand the dynamics of global systems. At the same time, global problems seem all the more complex, and there is a pressing need to pool resources to meet these challenges, such as climate change, food security or sustainable development. In this context, digital infrastructures play an important role in extending the scope and scale of scientific activities. The ability to deal with enormous quantities of data has improved, spurring a need for systems to support their aggregation and reuse. In the field of biodiversity, research projects increasingly feed data into shared data repositories either at a regional level (such as Canadensys, the Atlas of Living Australia or the Brazilian portal SiBBr) or internationally (the Global Biodiversity Information Facility - GBIF) for reuse. Compatibility, which could be a problem, is addressed on a technical level by internationally recognized standards for metadata. What is less obvious is the work behind the development of this infrastructure for sharing.

This paper will explore the work of infrastructuring [1] in one instance that involved collaboration between a Canadian team and a Brazilian one. In this case, both teams subscribed to ideals of open circulation of scientific information (biodiversity) and shared some of the basic premises of technology development, such as a commitment to and skill with open source development. There are also local particularities

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and some notable differences in how this openness is interpreted. We will show how the socio-political context influences what is meant by open. In particular we will focus on the use of WingLongitude, a GitHub space, as a trading zone [2, 3] within which the two teams co-developed solutions.

The work we present here is part of a larger 4-year study exploring reconfigurations of scientific work in the field of biodiversity. We are particularly interested in the role of digital technologies in changing the division of work, helping coordination, ensuring data aggregation and so on. The centre of this larger project is Canadensys, one of the partners in this collaboration. We base our analysis primarily on information gathered through semi-structured interviews done in person with the Canadian developer (in French), and via Skype (in Portuguese) with the Brazilian counterpart. We were able to conduct all interviews ourselves and in the interviewees' own native languages since our group includes researchers with French, English, Portuguese and Spanish as mother tongues. Like that of our interviewees, our collaborative work also takes place in a multicultural context. French-language interviews were transcribed in their entirety, while the Portuguese interview was summarized in detail in English, and particularly significant portions were transcribed then translated into English. Interview guides were prepared collectively and the resulting material was analysed in our team's working sessions. We also studied the Canadian and the Brazilian platforms as well as GBIF's website, in particular their features, discussions regarding knowledge sharing, and each institution's position statement on data licencing. Finally, we explored WingLongitude, its structure, features and the interactions taking place in this GitHub repository.

2 Relevant Literature

Digital infrastructures such as the Internet play an increasingly important role in scientific activities, and this is especially the case in the field of environmental research [4, 5]. The development of large databases and international Web portals aiming at making ecological science and biodiversity data publicly available has accelerated in the past decade (e.g. GBIF). These initiatives promote full and open sharing of scientific data in line with Open Science and Open Data movements [6]. While new possibilities for sharing and "mining" data across scientific disciplines and research projects have generated great enthusiasm, they also involve significant challenges [7]. In science, data interpretation requires a precise understanding of how, where, and when they were created [8–10]. Knowledge infrastructures must therefore try to capture and transmit this type of metadata.

Building on extensive literatures in science & technology studies, Edwards [11, p. 17] defines knowledge infrastructures as "robust networks of people, artefacts, and institutions that generate, share, and maintain specific knowledge about the human and natural worlds." Large-scale efforts to improve science and other knowledge infrastructures have frequently prioritized investments in technical systems over research on accompanying cultural, social, and organizational transformations [12, p. 12]. This imbalance has led some researchers to stress the irreducibly "sociotechnical" character of scientific cyberinfrastructure [13]. Stemming from the realization that infrastructures

do not magically emerge, Pipek and Wulf [1] first developed the concept of "infrastructuring" to describe the process of making/designing infrastructures in which new systems are adapted to interface with existing ones through combinations of improvisation, work practices, and continuing innovation by both designers and users. A focus on infrastructuring calls for "scaling up" and rethinking the concept of systems design as a local, punctual activity [1, 14, 15].

A localist [16] or situated [17] perspective on knowledge assumes that perspectives are always partial. If there is no unified centre or defined arrival point, the question of how to share knowledge and understandings across boundaries, and despite differences, arises. The field of anthropology has a long experience of theorizing contact with the "other." Mary Louise Pratt [18] first coined the term to "foreground the interactive, improvisational dimensions of colonial encounters […] A 'contact' perspective emphasizes how subjects are constituted in and by their relations to each other [and deals with] interactions, interlocking understandings and practices, often within radically asymmetrical relations of power" (pp. 6–7). James Clifford [19, p. 7] described the museum space as a contact zone between knowledge systems that meet, not as "sociocultural wholes" but as relationally-constituted systems that enter into relation with each other through a historically situated process of displacement. Haraway [17] introduced the contact zone concept to science and technology studies and added a dimension of multispecies contact to describe the multifaceted relationships between dog and trainer in agility training. Inequalities in the distribution of power are a key component in all these readings of the concept, as is the idea of subjectivities that are shaped in the encounter: people leave the encounter somehow changed in a fundamental way. Haraway talks about reciprocal induction. She also draws attention to the space for playful invention that is opened up in such encounters.

While this last element is of interest in the context of open source development, and power inequalities are present at an institutional level, we hesitate to mobilize the contact zone concept because of its emphasis on changing subjectivities. The developers involved are from similar professional worlds, and the knowledge systems involved are not incommensurable. What is more, while new infrastructures are developed, we did not probe the transformational nature of their contact with one another.

Another concept that has emerged in science and technology studies to address the challenges of sharing knowledge across different social worlds and conceptual frameworks and to describe how such sharing works in practice seems more appropriate for our case. Peter Galison [2, 3] developed the idea of "trading zones" as "places" where inter-languages such as pidgins or creoles develop to allow different kinds of practitioners, such as engineers and physicists, to work together despite their differences. The trading zone enables collaborative activity. Unlike contact zones, it stresses the mechanisms through which the exchange takes place and its product. Galison [2, p. 803] explains the metaphor:

> I intend the term "trading zone" to be taken seriously, as a social, material, and intellectual mortar binding together the disunified traditions of experimenting, theorizing, and instrument building. Anthropologists are familiar with different cultures encountering one another through trade, even when the significance of the objects traded—and of the trade itself—may be utterly different for the two sides.

Working together in a trading zone does not require shared interpretations or interests, nor does it assume permanence and stability of relationships.

> Instead, members of different communities coordinate their actions temporarily and locally, navigating their differences in norms, meanings, and interests only as needed. Engaging in a trading zone suggests that diverse groups can interact across boundaries by agreeing on the general procedures of exchange even while they may have different local interpretations of the objects being exchanged, and may even disagree on the intent and meaning of the exchange itself. [20, p. 39]

Open source development has been called a culture of reworking [21]. It is typically characterized by modularity, with multiple participants working in parallel and then assembling the pieces. Individuals participating in open source software development projects typically share values, norms and action principles that are strong enough to ensure cohesion and channel their activity towards a shared objective [22]. Among these core values are a commitment to sharing both information and one's work. Meritocracy based on competence, participative leadership, and freedom of involvement are other key principles [23, 24]. In this "bazaar" context, customizing and tailoring are frequent, and forking – using existing code to develop a different version of a program or to take it in a different direction – is common. Some sites such as GitHub provide hosting to expressly support independent branches, which considerably reduces social, technical, and financial barriers to forking [25].

3 Coding for Biodiversity: Co-development to Build a Global Commons

The Global Biodiversity Information Facility (GBIF) is a publicly funded international open data infrastructure. Participant countries and organisations form the nodes of this network coordinated by GBIF's Secretariat. According to its website, the vision consists of "[a] world in which biodiversity information is freely and universally available for science, society and a sustainable future" [26].[1] Its origins can be traced back to a recommendation from a panel on Biodiversity Informatics in an OECD-organised event in 1999. It was officially established in 2001 and its global data portal was launched 6 years later. GBIF promotes common standards and collaboration across boundaries, including the sharing not only of biodiversity data, but also of skills, experience and technical capacity. One of the ways GBIF has promoted cooperation is through organising and funding mentoring projects. The goal is to "enable [new countries] to more quickly supply data to GBIF and also to have portals for their own countries" (interview with Canadian developer).

Brazil's development of its biodiversity information system (Sistema de informação sobre a biodiversidade brasileira - SiBBr) started in 2012 with a team hired specifically

[1] While GBIF is a colossal open data infrastructure, Slota and Edwards [27] have suggested that its philosophical underpinnings may be as important as the data it aggregates. "GBIF as a social movement, as a political and scientific statement, and as the core of an infrastructure for global work in biodiversity science may well be more useful in guiding the course of global conservation policy than the data it contains."

for that purpose. This group comprised a biologist in charge of managing participation (who was also Brazil's GBIF node manager), two developers – one junior and one senior, a webmaster/content and community manager, and a second biologist who assisted the project director at the Ministry of Science, Technology and Innovation. In the project's first years, most of the team was based in the Laboratório Nacional de Computação Científica (National Laboratory for Scientific Computation), in Petropolis, Rio de Janeiro, because this institution was not connected with any specific field of biodiversity and therefore did not have any vested interests while setting up the country's biodiversity information system. In 2015, they moved to Brasilia to be closer to the decision centre, given that the need to fly back and forth to hold meetings at the Ministry was slowing down the development process. Although the SiBBr team worked and was paid by the Brazilian government, they were not civil servants and were hired through the United Nations Environment Programme. Also in 2012, Brazil joined GBIF as an Associate Country Participant. A mentoring project was set up the following year so that this country's biodiversity information infrastructure could benefit from the know-how of an experienced member, namely Colombia.

Brazilian interest in Colombia's experience went beyond learning how their technologies worked; they wanted to "understand the whole business model of biodiversity data" (interview with Brazilian developer), including the role of contributing institutions (e.g. research centres, botanical gardens), and how to publish data, namely which models and standards are used. In fact, although they customised and installed their own version, the Colombian portal – an old version of GBIF's technology – did not satisfy the Brazilian team. Its code was not easy to handle and it was no longer supported by GBIF. Colombia understood their reservations and they had no qualms when Brazil decided they would rather create their own portal.

In parallel with the mentoring project, the SiBBr team had studied other existing tools that might help them implement their system. Their survey had focused on open source software so that they could reuse available biodiversity information portals among other tools. They evaluated two possibilities: the Atlas of Living Australia (ALA) and Canadensys.

Canadensys is "a network of researchers, collectors, curators, information technologists, students, and educators that shares data on the occurrence and identity of plant, animal, and fungi, and other species in Canada" [28]. The online platform was initially developed with the financial support of the Canada Foundation for Innovation, through a competitive fund for university research, as one component of a vast project to equip Canada with a network of excellence in biodiversity research and conservation and to increase the accessibility of data housed in Canadian biological collections. Originally called the Canadian University Biodiversity Consortium, it brought together 11 universities from across the country. Work began in 2009, and in 2011 Canadensys released its first dataset, VASCAN, the Database of Vascular Plants of Canada. Since then, Canadensys has built a network of distributed databases and provided support to partner institutions, primarily university collections, for digitizing, publishing and georeferencing data on plants, insects and fungi in a format compatible with GBIF. It is housed in the Université de Montréal's Biodiversity Centre, a state-of-the-art building that was also built with CFI funds in partnership with the Quebec government and the City of Montreal's Botanical Garden, where it is located.

In 2014, Brazil finally chose to start collaboration with Canadensys. On the one hand, this decision was based on technological options, since ALA was much more complex and there was more "affinity" in terms of coding practices with the Canadian developers. On the other, it also had to do with ease of communication and receptiveness:

> Canada, from the beginning, from our first interactions with them, they were very helpful, very open, very interested. Neither of the countries [Australia and Canada] had in fact expected that anyone would want to use their portal, their code. It also required a certain amount of work and dedication from their end: to prepare that code so that others could customize and easily use it, and Canada was always very open to this. They were interested and stimulated to have that participation from early on. (interview with Brazilian developer)

Openness may be a general disposition or attitude, but it also has other connotations when it comes to software development or data access. The precise meaning of "open" – what it should include or what considerations should be prioritized – differed somewhat between the teams. What does it mean to build infrastructure for open data? Contextual factors shaped their answers to questions such as how open their systems should be, and to whom. The Canadian team, consisting of one developer and a data manager with a background in biology, had a personal, philosophical commitment to open source development and commons licensing. They regularly explained their position to various potential contributors to Canadensys and were able to convince them to publish their collections using commons licensing. What is more, they were, and continue to be, instrumental in international discussions on the subject led by GBIF and other organisations. More recently, in 2014, they signed the Bouchout declaration promoting more openness in biodiversity. "The mission of the signatories is to promote free and open access to data and information about biodiversity by people and computers and to bring about an inclusive and shared knowledge management infrastructure that will allow our society to respond more effectively to the challenges of the present and future" [29].

Canadensys' institutional affiliation in a research institute means that it is perceived as primarily an academic endeavour and is able to work free of interference from government or industry. Locally, the team is in a position of force to suggest that collections they publish adopt a Creative Commons Zero (CC0) licence, a waiver of all rights, which they posited "guarantees that our data can be used now and in the future" [30].

The Brazilian team, on the other hand, has to deal with questions of sensitive data (for economic reasons and to ensure the protection of endangered species), and the fact that some partner institutions are more or less receptive to data sharing. Although there are Brazilian signatories of the Bouchout Declaration, SiBBr has expressed concerns regarding the ability to legally enforce a license such as CC0 since it is not accepted in all jurisdictions and may be incompatible with publishers' and institutions' internal data policies, a position they argued in a GBIF consultation (April to June 2014).[2] Following a survey by a legal consultant, SiBBr decided to recommend three licences: CC0, like Canadensys, but also CC BY 4.0 (which requires attribution) and CC BY-NC 4.0 (in addition to requiring attribution, it forbids commercial uses). Institutions are nevertheless autonomous in determining the data access rights and are asked

[2] Contributions can be accessed at http://imsgbif.gbif.org/CMS_NEW/DMS_list.php?ID=1230.

to state how much freedom they want to assign to their datasets. Still, openness is encouraged:

> The ideal is to choose the licence that best caters to your needs, but it is important to consider that SiBBr is a platform that aims to support scientific production and policy-making through free access to information on Brazilian biodiversity. As a result, SiBBr recommends enabling published data to be used in the freest and most open way possible, which also allows publishers to have greater visibility and recognition by the users. [31, translated from Portuguese]

More significantly, SiBBr answers to the Ministry of Science, Technology and Innovation. Since they were developing a system for the government, actors from various ministries and at various levels of the hierarchy would have access to the system that was seen to have a role in guiding policy and decision-making. For the Brazilians, then, completely open data access was impossible. It therefore required specific functionalities not contemplated by Canada, such as user profiles with different levels of access to the information.

These differences could have been problematic in co-development, were it not for the flexibility of open source development in general, and one tool in particular. The SiBBr team was already in contact with Canadensys during the mentoring program, and a Canadian developer participated in meetings with the Colombian team. As a result, there was knowledge exchange between the three countries and they created an open code repository – WingLongitude – to help the sharing and co-development of tools between Brazil, Canada and Colombia but also to make them available to other countries working on biodiversity informatics projects. This repository was created on GitHub, reported to be "the world's biggest collection of open source software" [32]. This hosting service includes collaboration tools, such as a wiki and feeds regarding releases and issues. In addition to being the centre of collaborative development, WingLongitude serves as a library and encompasses the "core," with the basic features that interest all participants. Each country then creates its fork project on its local repository by customising the shared version. Canada and Brazil are very active in co-development, whereas some countries or regions, like French Guiana, only use the library.

WingLongitude is considered to be a neutral space that does not belong to any of the countries or their institutions, which also have their own repositories on GitHub. "To reduce frictions, we decided to create a repository that is just neutral. So, it doesn't represent the University of Montreal, it doesn't represent any of the ministries of the other countries" (interview with Canadian developer). The neutrality of WingLongitude is mentioned in its description on GitHub and the developers interviewed highlighted this status.[3] The goal is to enable "a free space for collaboration" (interview with Brazilian developer) that can bypass any restrictions that might arise regarding the

[3] This is not to say that GitHub itself is value-neutral, however. As Akrich [33], Winner [34] and others have noted, technology designs incorporate "scripts" that enable and constrain communication in particular ways. In the next section, the description of the trading zone in action attests how GitHub enables practices that are in line with the values of open source culture and commons-based peer production [35].

relation between institutions. Its name comes from an inside joke among the developers and animal names were chosen to designate coding projects, reinforcing said neutrality.

Although the developers enjoy a good relationship, they are aware of political pressures at the institutional level, as well as differences in how the institutions operate that they have to consider. The collaboration arrangement between partner countries was defined at the institutional level, not by the developers. Both partners have shared information on organizational and political aspects of their work, for instance regarding participant institutions and data management, aiming to understand best practices and help with problem solving. Still, software development has been the main focus of their exchanges. With a much larger team than Brazil and Canada, Colombia has more capacity for autonomous development, and tends to follow the cooperative efforts of the other two countries with less direct involvement. Regarding biodiversity, the Brazilian and the Colombian contexts have much more in common with each other than they do with Canada.

Collaboration between Canada, Brazil and Colombia is regarded as a fruitful one, "here in the Americas we have been able to structure a good collaboration in terms of biodiversity. One of the goals is to connect the community of biodiversity more around that universe of technology and training" (interview with Brazilian developer). This success has led to the development of a new mentoring project, this time involving Canada, Brazil and Colombia to help Uruguay become a GBIF contributor and create a data portal. In one of the workshops in Uruguay, the mentors trained not only Uruguayan technicians, but also representatives from Argentina, Chile and Cuba. Moreover, as GBIF started developing a closer relationship with Atlas of Living Australia, Canadian and Brazilian developers participated in meetings aimed to strengthen interactions between different biodiversity information systems. Uruguay is expected to benefit from these synergies.

4 The Trading Zone in Action

A few specific examples of how the teams of developers actually worked together will allow us to show how WingLongitude acts as a trading zone. Following Kellogg et al. [20], we identify practices of display, representation and assembly to describe what and how they "traded."

Firstly, the teams **displayed** their work, making it visible and accessible to one another. The collaboration between Canada, Brazil and Colombia has been enacted in face-to-face meetings as well as through computer-mediated communication. There is an attempt not to overburden each other with too much communication through too many channels. Email and Google Hangouts play an important role. Screen sharing is one of the features that make the latter so useful to their work, since all the participants can see what the other is doing or trying to explain, rendering the discussion more concrete. Meetings are scheduled around a specific topic and minutes are taken and later shared through Google Drive, allowing everyone access to past discussions. GitHub remains the main collaboration tool given that in a single space they are able to manage the workflow, keep track of issues and their resolution, share code changes and discuss. By using WingLongitude as the centre of their collaboration, the

co-development of the code is made visible not only to each other, but also to the wider software development community. Visibility and its relation to coordinative practices emerged early as a key research issue in the CSCW (computer-supported cooperative work) community. An overview of this vast literature is available in [36].

Figure 1 shows how GitHub displays information about the project's progress over time, in particular the various contributors and the types of contributions. Clicking on the statistics below each person's name provides access to their specific contributions. If we visit the "Issues" page, we can see how the co-developers tried to solve the problems they faced while coding. "Fork" allows us to see the different existing versions of a given project and the changes they have undergone through time. The interface can thus display information on various aspects of the project from multiple views and levels of detail, according to what is sought, facilitating coordination.

In terms of **representation**, the teams used a common coding language in order to make their work legible to others. What is more, the inner mechanics of co-development through GitHub are based on practices widespread in the open source

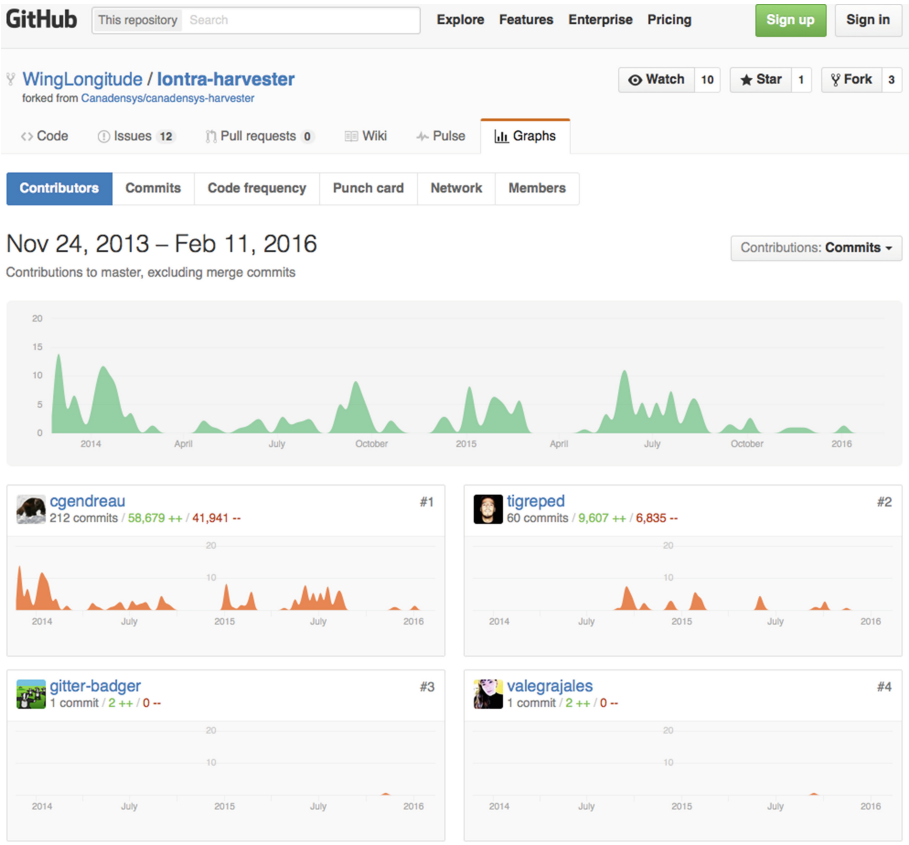

Fig. 1. Contributors and their contributions to a coding project on WingLongitude (note: gitter-badger is a GitHub robot)

world: forking, registering and discussing issues, adding commits (code changes) to the project repository, etc. Regardless of differences in team size or structure and work culture, developers are able to collaborate with a low level of friction. There are still differences in the development of open source software; that is why Brazil was interested in Canadensys: they thought that the learning curve to implement their system would be significantly less steep since they used similar technologies and there was some affinity in coding practices. This proved to be true: using collaboration tools, forking and sharing of coding practices enabled SiBBr to have its biodiversity data portal up and running in a matter of months. As they perfect their collaboration workflow, they expect to help Uruguay to set up their portal even faster. In the words of Donnellon, Gray and Bougon [37] "a shared repertoire of communication behaviors" enables groups to coordinate their actions in the absence of shared meaning. This focus on form over content is emerging as recurrent feature of distributed work on collaborative platforms. For example, Cardon and Levrel [38] identify attention to procedures as a key organizational feature of Wikipedia governance, while the work of Denis and Pontille [39] on OpenStreetMap and that of Demazière, Horn and Zune [22] on the open source community Spip illustrate the development of rules and procedures that enable collective action. In this specific case, the focus on form is all the more expected since what the partners are building is in fact a shell for country-specific content.

Finally, **assembly** of separate contributions across boundaries emerges as an organizing principle in the WingLongitude trading zone. Assemblage is a key element of the open source "culture" [21], and the modular character of the co-development of the biodiversity information systems discussed here enables this assembly. "In the world of software, there is no reason to reinvent the wheel. The best of all worlds is to reuse software. But in order to reuse software, it has to have a modular, intelligent architecture, that is ready for customization" (interview with Brazilian developer). Each country contributes and implements only the modules they find useful. Some modules are shared among the three countries. To give an example, Canadensys now uses the Lontra harvester co-developed on WingLongitude and has abandoned the original version they had created before the collaboration started. In other cases, modules differ from country to country. Canadensys chose not to integrate a Spanish-language interface developed by the Brazilian team although this would have potentially enlarged access to Canadian collections (the Canadian portal is available in English and French, while the Brazilian one has four languages: Portuguese, Spanish, English and French). The ability to aggregate third-party information in the portal is also limited to the Brazilian biodiversity information system. These features are integrated in the fork projects stemming from the neutral repository that is used as a library in a "modules within modules" approach, facilitating customization. Each new country may therefore fork its version and change only the files required to adapt to its needs. The teams can reuse, revise and align their work over time, as their needs change.

This points to one final aspect of the trading zone that merits consideration. The infrastructuring work described here is part of an ongoing, evolutionary process. The biodiversity infrastructures are not conceived of as finished products, but as systems that will grow and change. This focus on ongoing adaptation means that nothing is fixed permanently, and everything provisionally open to renegotiation. Thus, deep commitment and consensus are not required for collaboration. Collaboration can be periodic,

temporary, driven by needs. If disagreements do arise, definitive decisions can be deferred to a later time, as required, something that Kaplan and Orlikowski [40] refer to as "provisional settlements." This flexibility enables work to continue. Nor is there any long-term commitment to working together or continuing down the same path. The multiple combinations of partnering – Colombia-Brazil, Brazil-Canada, Brazil-Canada-Colombia, Australia-GBIF-Canada-Brazil, Brazil-Canada-Colombia-Uruguay – also exhibit differences in permanence and stability of relationships over time.

5 Conclusion

Although the idea of mentoring suggests an asymmetrical relationship, the core of the situation we have described here is not one of unidirectional knowledge transfer, but of horizontal cross-boundary coordination. The choice to work in a neutral space, belonging to everyone, is clear evidence of this relationship. Instead of transferring local knowledge and trying to adapt it culturally, the development teams present their ideas in a form that is legible to the others. The WingLongitude trading zone does not require shared understandings and adhesion to common goals, although this helps – e.g. commitment to open source code and Creative Commons licensing, the underlying premises of GBIF that biodiversity data should be freely accessible. Instead, the teams make their work visible to one another, use a repertoire of shared representational practices (the open source code) and juxtapose their local understandings and working conditions and practices into a collage of contributions. This enables them to share some infrastructural elements, while maintaining other specificities that best suit their diverse cultures.

In order for a trading zone to exist, there must be sufficient interest in the exchange, and sufficient ability to understand one another. The teams using WingLongitude are all concerned with building their respective biodiversity infrastructures, and see collaborative, distributed work as an efficient means toward that end. Although each team maintains its particularities in terms of organizational structure and work practices, they also find "common ground" in their knowledge of open source coding and practices, in their dedication to open sharing of biodiversity data, and in their appreciation of the importance of interconnecting infrastructures at a global level. Working together in this trading zone is thus both a practical accomplishment and a commitment to shared ideals.

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Design as Regulation

Opportunities and Limitations for Sustainable Mobile Phone Design

Maja van der Velden(✉)

University of Oslo, Oslo, Norway
majava@ifi.uio.no

Abstract. Mobile phones have become one of the most unsustainable consumer goods. Social and environmental risks are found throughout the whole lifecycle of mobile phones. This chapter introduces the notion of lifecycle thinking to take sustainability beyond the product towards the larger product-system. Design can play a central role creating sustainable product lifecycles, but is constraint by other modes of regulation, such as law, social norms, and market. This paper explores the opportunities and limitations of design as regulation. The relational concepts of script and affordance help to provide a non-deterministic account of design as regulation. The particular case of the Fairphone 2, a smartphone designed with social and environmental values, will be discussed to investigate design as regulation. The notions of regulatory ecology and regulatory patching are introduced as tools to explore opportunities for constructing a more desirable regulatory regime.

Keywords: Architectural regulation · Circular products · Fairphone · Lifecycle · Planetary boundaries · Rebound effect · Regulatory ecology

1 Introduction

This chapter includes and builds forth on an earlier paper discussing sustainable technology design [1]. The focus is on the design of mobile phones, with the Fairphone 2, allegedly a fairer and more sustainable mobile phone, as the particular case. Mobile phones have become the most pervasive digital technology. For every computer, there are four smartphones on the planet [2]. Market saturation in the industrialised countries was reached in 2006 [3]. In 2012, the number of mobile phones per 100 persons reached 127 in the industrialised world and 95 in the developing world ibid. In the past years, on average 1.7 billion new mobile phones have been shipped worldwide. In the industrialised world, mobile phones are typical replaced with a new one after 18 months [4], even though these phones are technically still functioning. The majority of those phones are not recycled and mobile phones are the electronic device that is the most often disposed [5]. As will be discussed in this chapter, mobile phone production, use, and disposal is connected with significant social and environmental risks. Mobile phones have become one of the most unsustainable consumer products.

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1.1 Sustainability

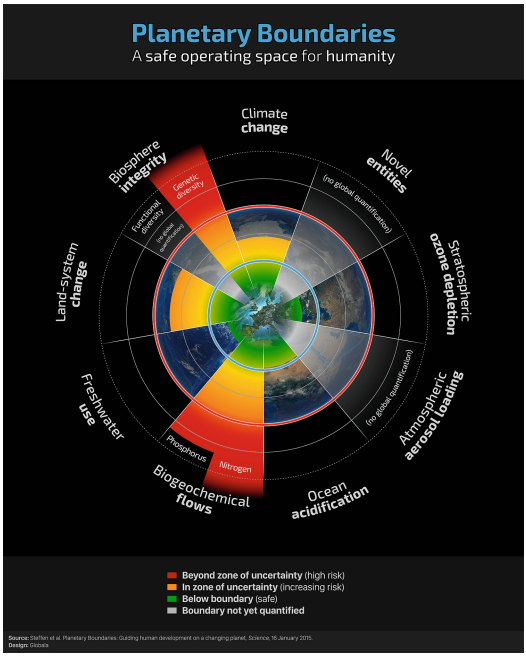

Fig. 1. Published in Steffen et al. [7]

Sustainability has four dimensions, environmental, social, economic, and cultural. This paper will only deal with the first two dimensions, which will be discussed in the form of boundaries. For the environmental dimension, the work of the Stockholm Resilience Centre is of central importance. Their conceptual framework of *planetary boundaries is an* attempt to quantify the safe biophysical boundaries outside which the Earth System cannot function in a stable state, the state in which human civilizations have thrived [6]. Figure 1 shows the nine boundaries that are indentified in earth-system processes and shows that three boundaries are crossed "beyond zone of uncertainty (high risk) and two boundaries are crossed "in zone of uncertainty (increasing risk) [7]. In this context, sustainability can no longer be perceived as "doing less damage over time, but rather by finding ways of living that restore the eco-systems upon which we depend" [8].

Inspired by planetary boundaries framework, former Oxfam economist Kate Raworth translated the social dimension of sustainability into social boundaries or the *social foundation* that protects against critical human deprivations. Raworth combined these two framework into a figure, which she called, somewhat ironically, *doughnut economics* [9] (Fig. 2).

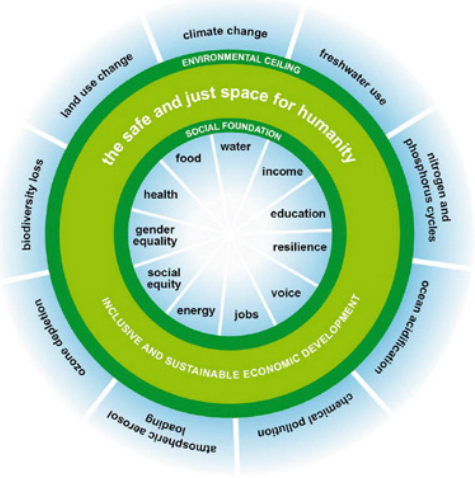

Fig. 2. Published in Raworth [9]

1.2 Lifecycle Thinking

In the discussion of the sustainability of consumer products, the notion of lifecycle has become one of the central concepts. The term assumes a more systemic approach, emphasising that sustainability is more than quantitative measures of certain aspects of a product. A product lifecycle can be defined as the "consecutive and interlinked stages of a product system, from raw material acquisition or generation from natural resources to final disposal" [10]. The term *lifecycle assessment* (LCA) is used for the analysis of the environmental impact of all the stages in a product-system, while *social lifecycle assessment* (S-LCA) is used for the analysis of the social impact of all the stages in a product-system.

A related concept is *lifecycle thinking*. In environmental management, see for example the revised ISO 14001 standard of 2015, lifecycle thinking is presented as taking a systematic approach, considering the environmental impact of the whole product lifecycle, not just the stage of phase or material for which a particular organisation is responsible. It also enables an organisation to understand how its decisions in one phase of a product can have significant environmental impacts in later phases of the product-system. For example, the choice of chemical components in the manufacturing of a product can have severe impacts in the end-of-life phase, when a product ends up in a landfill.

In this chapter, *lifecycle thinking* will refer to a holistic, systemic, and critical approach that guides the design, manufacture, transport, use, and end-of-life of product-systems. Lifecycle thinking is applicable to all levels, from a single product-system, product sector or industrial sector, to that of an economy (e.g. circular economy). Lifecycle thinking can guide consumers, citizens, workers, designers, policy-makers, and industrial and business stakeholders alike.

In order to stay within the safe and just space for humanity, as conceptualized with the planetary and social boundaries frameworks, lifecycle thinking requires a move from linear to circular thinking, both on the level of products as that of the economy as a whole. A product can thus be considered sustainable when the lifecycle of its product-system is located within the planetary and social boundaries. The notion of *circular product design* [11] is gaining acceptance as a central concept in the transition to a sustainable circular economy.

1.3 Regulation

Regulation plays an important role in sustainable product-systems. For example, the regulation of the use of chemicals in the EU,[1] the so-called REACH database; ISO standards, such as ISO 14000 on sustainable development[2] and ISO 26000 on social

[1] Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency.

[2] The ISO 14000 family of standards provides practical tools for companies and organizations of all kinds looking to manage their environmental responsibilities.

responsibility;[3] and the EU legislation on EcoDesign and Energy Labelling.[4] This paper will look at the role of design in regulation and introduce a conceptual framework to discuss the regulatory role of design in sustainable mobile phone lifecycles.

Many authors maintain that 80% of the environmental impact of a product is determined in the design phase [12, 13]. The 80% seems to be based on research that shows that 70–80% of the features and costs of a product are established early in the design phase [e.g. 14]. Thompson and Sherwin [15] deducted that therefore also 70–80% of the environmental costs were established in the early design phase. Correct or not, this statement places enormous power and control in the hands of the designer and the designed product. In order to unpack this power, this chapter will frame this power and control as regulation and ask: what are the opportunities and limitations of design as regulation.

The paper is organised as follows. Section 2 will focus on design as regulation. In regulation theory, design, nature, the built environment, materials, etc., are often dismissed as *regulators* of human behaviour, because they are seen as lacking intentionality. Those who do perceive those as having regulatory agency, often understand the relationship between design and human behaviour as deterministic: they see a direct, causal relationship between a design and its use or impact [16, 17].

Lawrence Lessig's [18] theory of regulation identifies four modalities of regulation, law, social norms, architecture (technology, nature, design, built environment, etc.), and markets. Lessig generates two important insights for sustainable design. Firstly, he establishes the role of architecture as regulator of human behaviour. Secondly, Lessig's theory of regulation introduces the indirect regulatory effects of architecture, that is, architecture can strengthen or undermine the regulatory effects of other modes of regulation, markets, social, norms, and law. This perspective opens up for a relational rather than determinist perspective on architecture as a mode of regulation.

This chapter discusses the concept of *regulatory ecology*, which refers to the constructed regulatory complexity surrounding the lifecycle of a mobile phone. Regulatory ecology is presented as a *figuration* for the complexity of regulation in a product-system, as well as a visualisation or mapping of lifecycle thinking. The concept of regulatory ecology contributes to a relational understanding of design as regulation. Two additional concepts will be introduced to help explore the regulatory ecology of mobile phones, *script* and *affordance*. Script refers to the particular purpose and values inscribed by designers in a product. Affordance refers to the particular properties of a product, which emerge in the relationship between people and their environment.

Section 3 will start with an exploratory mapping of the social and environmental risks in the mobile phone product-system, using the planetary and social boundaries

[3] ISO 26000 provides guidance on how businesses and organizations can operate in a socially responsible way. This means acting in an ethical and transparent way that contributes to the health and welfare of society.

[4] Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products. Directive 2010/30/EU of the European Parliament and of the Council of 19 May 2010 on the indication by labelling and standard product information of the consumption of energy and other resources by energy-related products.

framework as a guide. I will then introduce the Fairphone 2 as a particular case and describe if, and how, these sustainability risks are addressed in the Fairphone 2. Based on the findings in Sect. 3, Section 4 presents a discussion of the opportunities and limitations of design as regulation, informed by regulatory ecology, script, and affordance. This is followed by some concluding remarks and a description of future work in Sect. 5.

2 Design as Regulation

There are different definitions of regulation, mainly as a result of the different disciplinary approaches to regulation [19]. Lawyers have a different perspective than economists or political scientists. There is no particular understanding of regulation in design research, although in the broader field of science and technology studies (STS), several concepts and theories are proposed to understand the regulatory role of design and technology. A well-known discussion on the regulatory role of design was presented by Winner [20], discussing the height of the overpasses in New York, built in the 1930s, which prevented public transportation buses, mainly used by Afro-American citizens, from reaching the beaches. It is not clear if the bridges were deliberately design with racist intend or not, but the effect remains the same. Design can have unintentional consequences that can exclude or result in other negative effects. Winner's point was that artefacts, designed things, can have politics and regulate because of those politics.

Regulation theorist Julia Black [21, p. 11] defines regulation as "a process involving the sustained and focused attempt to alter the behaviour of others according to defined standards or purposes with the intention of producing a broadly defined outcome or outcomes." Koop and Lodge [19] analyzed the definitions or understanding of regulation in different disciplines, such as business, economics, law, political science, public administration, and sociology, and found that 100 out of the 108 articles that discuss the intentionality of the regulatory intervention argued that regulation is an intentional process. Karen Yeung [22] points out that "defining regulation in terms of intentional action" excludes artefacts from having social or political effects. Her proposal to expand this definition of regulation, to include artefacts, is based on perspectives found in STS, in which design, such as technology, is understood as "an assemblage of material objects, embodying and reflecting societal elements, such as knowledge, norms, and attitudes, that have been shaped and structured to serve social, political, cultural, and existential purposes" [23]. According to Yeung [ibid, p. 22] "design-based regulation operates by preventing or inhibiting conduct or social outcomes deemed undesirable".

Lawrence Lessig's [18] theory of regulation supports the possibility of artefacts having regulatory effects. Lessig's theory is based on four modalities of regulation: law, markets, social norms, and architecture. Lessig focuses on the way in which these modalities *constrain* human behaviour, directly and indirectly. Law regulates through a set of commands, backed by the threat of punishment, and markets regulate through price. Social norms regulate through sanctions that members of a community impose

on each other, while architecture regulates through the way the world is (nature) or through man-made constraints (built environment, computer code, design).

As Koop and Lodge [19] discussed, the consensus in regulation studies is that to have a constraining effect, intentional action by humans is required, e.g., law needs the police or the court system to have an effect, while social norms need people to notice and act upon non-conforming behaviour. Markets need two parties to agree to transfer a resource from one party to the other. In other words, laws, markets, and social norms are constraints checked by judgement. They are enacted upon when some person or group chooses to do so. This is different for architecture: once instituted, architectural constraints often have their effect until someone stops them" [ibid, pp. 342–343]; they are self-executing.

Another characteristic of these regulatory modalities is that they have a subjective aspect (how the constraint is experienced) and an objective aspect (how the constraint is observed when imposed) [24]. From an objective perspective, architecture and markets constrain up front, while law and social norms constrain after the fact. For example, a locked door (architecture) or a high price for a television (markets) constrain directly, while entering the neighbours' home (social norms) to steal the television (law) may result in constraints (condemnation by the community or punishment by the court system) later on. From a subjective perspective, there is not much difference between the constraints; they can all constrain us before we act: the more subjective a constraint, the more effective [ibid, p. 344]. For this to happen, constraints such as laws and social norms need to be internalised to have this effect. This is not the case for architecture: the speed bump in the road will constraint our behavior, even if we don't know what a speed bump is or where it is located.

Some law scholars have argued that even though "regulation through architecture is as powerful as law, it is less identifiable and less visible to courts, legislators, and potential plaintiffs [25, p. 1952]. Tien [26, p. 2] argues that it is, therefore, more dangerous: "Law as architecture operates differently: instead of affecting our calculus of choice, it structures the very conditions of action, such as social settings and the resources available in those settings". Tien is particularly concerned about the lack of transparency in computer code, a form of architecture, which can regulate privacy and surveillance. Tien's deterministic perspective on architectural regulation is based the understanding that its enforcement is less public and therefore reducing human agency.

Hosein, Tsiavos, and Whitley [27] further explore Lessig's account of the relationship between technology and regulation. They locate themselves in the field of Information Systems, which studies the design, implementation, and use of computer-based systems. They argue that the "regulatory nature of architecture starts long before it is in place. The regulatory nature of architecture lies beyond its 'artefactual' manifestation and is deeply rooted in human subjectivity" [ibid, p. 88]. Technology can have unintended consequences and it can resist regulation or target objectives that are not supported by law, markets or social norms. They therefore conclude that technology is a particular type of regulation; technology is always a sociotechnical construct.

2.1 Regulatory Ecology

Lessig argues that the relationship between architecture and human behavior is not deterministic: the meanings of forms, designs, built environment, nature, can change and thus their influences. According to Lessig, a constraint doesn't need an agent and his descriptions of the interactions between the regulatory modalities in strengthening or weakening their regulatory action, point to a relational and holistic understanding of regulation, rather than a technological determinist argument as found in Tien [26]. The regulatory effect of law can only be understood within the larger system of regulation, in which law is both strengthened and weakened by the effects of other regulatory modalities. When we add Hosein et al.'s [27] analysis of technology as regulation to this understanding, we can see how technology can disrupt or promote regulation and thus undermine or strengthen certain human behaviour.

Hosein et al. [ibid] argue that regulation has become global. People are no longer bound to the traditional centre of regulation, the state (law), as technology enables shopping, communication, work, etc. to become global activities. Architecture, markets, and social norms play a considerable role in the regulation of behaviour and provide a person with the option to choose or construct a regulatory regime. The authors introduce the notion of *regulatory patching*, which refers to the situation in which "the subjects "build" the regulatory 'ecology' that they wish to be subjected to" [ibid, pp. 365–366].

This notion of *regulatory ecology* describes not only the idea of a constructed regulatory regime. In what follows, I propose two ways to understand and use regulatory ecology. The first is as a descriptive (interpretative) figure to explain the regulatory complexity of an activity, such as knowledge sharing [28], journalism [29], biotechnology [30], and corporate sustainability [31]. The second is regulatory ecology as a critical figure or figuration. Donna Haraway describes figurations as "performative images that can be inhabited" [32, p. 11]. Haraway's critical figures point to the understanding that things might always have been otherwise. In that understanding, regulatory ecology is not a literal or static representation of regulation, but "some kind of displacement that can trouble identifications and certainties" [ibid]. The figure of a regulatory ecology "troubles" accounts of regulation that ignore architectural regulation or that present technological determinist accounts of architectural regulation. As a critical figure, regulatory ecology moves beyond social or technological determinist accounts of architecture, such as technology design, opening a space in which entanglements become visible. As is the case in the more convential understanding of an ecology, each intervention in a regulatory ecology may 're-set' other relations in the regulatory ecology. Maintaining a desired regulatory ecology can therefore require a tremendous amount of resources. Hosein et al.'s [ibid.] notion of *regulatory patching* can be understood as the on-going regulatory work to maintain or repair the desired regulatory regime.

2.2 A Relational Understanding of Design as Regulation

Yeung [22] identifies three mechanisms through which regulation proposes to work: (i) changing individual behaviour; (ii) prevent or reduce the probability of the occurrence of the undesired outcome; and (iii) mitigate the harm. Design approaches that focus on sustainability have addressed each of the three mechanisms. For example, persuasive sustainability design [33, 34] and Design with Intent [35] focus on changing human behaviour; ecodesign and cradle-to-cradle design [36] address the probability of the occurrence of undesired outcome; and design for remanufacturing [37] and design for repair [38] support the mitigation of harm.

All these approaches have an outspoken regulatory agenda. Some, such as persuasive design approaches, are based on formal models of rational behaviour of individuals. Critiques of these approaches argue that design doesn't determine human behaviour and point to the need to understand human behaviour and sustainability from a more comprehensive and holistic perspective, not restricted to individuals and the products they use [39].

What all these design approaches have in common is the intentional manipulation of the *scripts* and *affordances* of product-systems. The notion of *script* [40] is used to describe materials and products that are inscribed with particular purposes by designers - these purposes prescribe the possibilities and impossibilities of the designed without being determinative. When innovators, designers, and engineers define the specifications of a design, "they necessarily make hypotheses about the entities that make up the world in which the object is to be inserted, they thus define actors with specific tastes, competences, motives, aspirations, political prejudices, and the rest, and they assume that morality, technology, science, and economy will evolve in particular ways" [ibid, pp. 207–208]. A material script, such as a speed bump in the road or a hotel key made bulky so that hotel guests deliver it before they go out, enable the *affordances* of the material [41]. Humans and non-humans can follow those scripts, but they can also ignore a script, such as in the example of the anti-sleep bench [42] or re-inscribe a design, such as using a plastic bottle filled with water as a solar light bulb [43].

The second concept, *affordance*, originates in ecological psychology [44]. This concept can explain why material objects have more properties than just their physical properties. Gibson noted the importance of the relationship between the environment and the actions of an organism. Through perception, an organism perceives the affordances of its environment, which influences its range of actions. These affordances are additional properties that emerge in the relations between organisms and their environment. Affordance became an important concept in design. Further exploration resulted in the differentiation between real and perceived affordances [45] and perceptible, hidden, and false affordances [46].

Affordance is not the same as function. Affordances emerge in a relationship and are the property of that relationship. If we look at the already familiar example of the bulky hotel key, and put that key in the hand of a hotel guest, we see that a particular affordance emerges in this situation: putting the key in a coat pocket is constraint by the size of the keychain; leaving the key at the reception is afforded by the size of the keychain. This affordance is the result of a particular *script*, the purposeful design of the hotel key and hotel guests with small pockets. Affordances may also be ignored

(e.g. an hotel guest who puts the hotel key in her large bag) or they may go unnoticed when they don't fit with users' experiences or cultural knowledge [47].

Scripts and affordances enable a particular understanding of situated actions between the social and the material or between people and things. Rather than the determinism found in certain understandings of architectural regulation, scripts and affordances enable a constructivist and relational understanding of design. The scripts and affordances of design, or any other architectural regulation, can be ignored, re-scripted, and re-purposed: they can shape the social, but at the same time they are being shaped by the social.

3 Social and Environmental Risk in the Mobile Phone Lifecycle

The lifecycle of a mobile phone is often described as a cycle of five phases: resource extraction (mining of minerals), production (manufacturing), transport, use, and end-of-life (re-use, recycle, disposal). Transport plays also a role in other lifecycle phases. What follows is a short description of some of the main social and environmental risks found in each of these phases in the mobile phone lifecycle. A risk is defined in this context as *an externality that pose a threat to defined planetary and social boundaries*.

Resource extraction
This phase concerns the mining of the minerals, metals, and rare earth elements, which are used in mobile phones and other electronics. About 40% of the average smart phone consists of metals of which many are rare as well as irreplaceable, 40% consists of plastics, and 20% ceramics and trace materials [48]. Resource extraction is associated with several negative social impacts, such as slave labour, bonded labour, and child labour in countries such as DR Congo and Indonesia [49, 50]. In particular mining in DR Congo is associated with so-called conflict minerals [49]. The environmental impacts of resource extraction for mobile phones, water and soil pollution, are especially the result of the poisonous waste by-products [51, 52], which affects both the miners and the communities around the mining sites [53]. Mineral mining is also water and energy intensive and produces a large amount of green house gasses [54].

Production
Social risks in the manufacturing of mobile phone and mobile phone components are lack of labour rights and low wage labour [55, 56]. Because of the volatility in production forecasts, resulting in batch production, workers experience a lot of overtime and lack of days off. Workers are also exposed to hazardous materials in manufacturing, resulting in serious health issues [57, 58]. Environmental risks in the production of mobile phones are green house gas emission during manufacturing (mainly as result of electricity use) as well as water and soil pollution.

Transport
Transport is a phase in the product lifecycle, in which the transportation of the product to the market is the main focus. Transport is also an important aspect of three other

phases, resource extraction, production, and end-of life, in which it is about the transport of raw materials and components to the manufacturing site and transport of used mobile phone in the end-of-life phase. Once the mobile phones are manufactured, they will be transported from the manufacturing site to distribution centres and from there to outlets and consumers. There is not much research on the social and environmental risks of the transport of mobile phones. Maybe for this reason, the transport phase is excluded from impact assessments, e.g. [53]. The main environmental risk in the transport phase is CO_2 emissions [59, 60].

Use

The main social risk in mobile phone use is health risks related to radiation. In 2014, the World Health Organisation classified the electromagnetic fields produced by mobile phones as possibly carcinogenic to humans, based on a large study by the International Agency for Research on Cancer [61].

Traditionally, greenhouse gas (GHG) emissions during use were based on battery charges. With the introduction of smartphones, mobile phones are much more integrated with the internet. In a wider product-service-system perspective, both the mobile phone network and the servers providing mobile phone services (apps, storage) need to be included. Suckling and Lee [60] show that in that case, the GHG emissions are five times higher and surpass the emissions during the extraction and production phases together.

End of Life

The social and environmental risks at the end of life of mobile phones vary tremendously. In industrialised countries, most mobile phones are stockpiled by consumers, and only 2.5 to 5% of all mobile phones are recycled [62]. *Urban mining*, in which minerals from used mobile phones are recovered, results in at least 50% less energy use than conventional mining and has a higher recovery rate. Stockpiling prevents the recycling of minerals and thus reinforces the social and environmental risks of resource extraction.

Other forms of end of life are re-use, refurbishing, and recycling. Risks are mainly found in the unsustainable recycling of mobile phones and other e-waste [63].

3.1 Fairphone

Extending the life expectancy of mobile phones and creating a fairer – more sustainable – mobile phone lifecycle, is the aim of Fairphone,[5] a social enterprise based in the Netherlands. In December 2013, Fairphone brought its first mobile phone to the European market, followed by the Fairphone 2 in December 2015. Fairphone produces its mobile phones on the basis of *fairness*, which is the core value in its business model as well as its main strategy. Rather than defining fairness, the notion of fair is meant to start and guide a conversation about a socially and environmentally sustainable mobile phone lifecycle [64]. In order to enable this conversation, Fairphone claims to be fully

[5] Fairphone: www.fairphone.com.

transparent about its supply chains and cost breakdowns and publishes reports and videos about its efforts in making the supply chain fairer.[6] Fairphone identifies social innovation as the main driver for its mobile phones [ibid].

The design of the Fairphone 2 differs significantly from other smartphones, in particular because it is the first modular mobile phone on the market. The modular design of the mobile phone supports repairability without the need for specific expertise or tools. Repairability combined with a more robust design is expected to extend the longevity of the mobile phone from 2 to 5 years or more [65].

Regarding fairer materials, the Fairphone 2 is manufactured with conflict-free tin and tantalum (coltan) [66], and it is the first mobile phone produced with fairtrade gold [67]. The plastic casing of the phone consists of 65% recycled plastic. Both the phone's hardware and software are open source, allowing others to develop hardware extensions, software, and operating systems.

3.2 Fair Design

In their reports, video, website, and other media, Fairphone explains how it proposes to address some of the social and environmental risks in the mobile lifecycle (see Table 1). While design is often not recognised as a phase in the mobile phone lifecycle, the Fairphone 2 case shows the central role of design in addressing social and environmental risks. Design refers in this context to functional design, aesthetical design, and material design. In addition to the common functions of the mobile phone, such as communication, camera, storage, etc., the Fairphone 2 has a modular design to support repair. In case of malfunctioning, the different components of the Fairphone 2, the removable battery, main body, the display assembly, rear camera module, receiver module, the speaker module and back protective cover can easily be replaced by the user. The phone also comes with a hardware expansion port, providing the user with a platform to extend its functionality.

In terms of aesthetical design, the Fairphone 2 has some features that make the phone different from other mobile phones. The Fairphone 2 comes with a removable back plate, which also functions as a cover. The back cover comes in different colours, of which several are transparent, thus enabling a view of the inside of the mobile phone, including a motivational message "yours to open, yours to keep" (see Fig. 3).[7] When the phone is charging, the screen portrays the filling grade of the battery as well as some of the features inside the phone, such as the different repairable components with their screws (in blue circles) as well as a small map of DR Congo with pointers to the area where the conflict-free tin and tantalum is mined.

[6] Fairphone resources: www.fairphone.com/resources/.

[7] The first batches of the Fairphone 2 contain the message "one of the first 17,418".

Table 1. How Fairphone addresses risks in the Fairphone 2 lifecycle

Lifecycle	Risks	Fairphone 2
Resource extraction	**Social:** Slave labour and forced labour related to local armed conflict; child labour; health risks related to poisonous dust and hazardous materials exposure; armed and sexual violence for surrounding communities	• Tin and tantalum are bought from smelters that process ore from conflict-free mineral initiatives supported by Fairphone • First mobile phone with fairtrade gold • Fairphone can't guarantee that child labour is taking place in the mines from which it sources its minerals
	Environmental: Green house gas emissions; water and soil pollution	• unknown
Production	**Social:** Lack of labour rights; low-wage labour; health risks related to hazardous materials exposure	• Audit of the working conditions in main assembly factory and components supplier. Implementation plans are in place to remedy some of the issues found [68–70]. • Fairphone didn't use benzene, a widely-used hazardous material in the electronics industry, in the Fairphone 1 [71]. It is unknown if the same policy is used in the Fairphone 2. • Workers Welfare Fund established at main production site [72] • In 2016, Fairphone 2 will be produced continuously instead of batch production
	Environmental: Green house gas emissions; water and soil pollution	• The Fairphone is produced without charger or cables. Standard plugs can be used for charging, which users often already have. • The back plate of the Fairphone functions as a cover; no extra cover is needed.
Transport	**Environmental:** Green house gas emissions	• The Fairphone is shipped without charger or cables. This reduces the weight and, as a result, the CO_2 emissions per phone during transport to the market.
Use	**Social:** Health risks related to radiation exposure are not conclusive	• SAR is relatively low: [a]0.288 W/kg for the head and 0.426 W/kg for the body
	Environmental: Green house gas emissions	• Unknown, but expected to be similar to other mobile phones

(*continued*)

Table 1. (*continued*)

Lifecycle	Risks	Fairphone 2
End of life	**Social:** Health risks related to hazardous materials exposure because of unsustainable recycling practices	• In partnership with Closing the Loop,[b] Fairphone collects old phones in Ghana, Nigeria, Cameroon, Rwanda, and Uganda and ships them for more recycling to Belgium. They are exploring how to use recycled metals in the production of the Fairphone 2.
	Environmental: Green house gas emissions; water and soil pollution	

[a]Specific Absorption Rate (SAR): https://en.wikipedia.org/wiki/Specific_absorption_rate.
[b]Closing the Loop: http://english.closingtheloop.eu/.

4 Design as Regulator of Sustainability

Design plays a central role in creating possible social and environmental risks that may emerge along the product's lifecycle. Such risks can be the effect of choice of materials, range of functionality, technical innovations, durability, etc. The question is, *Can these risks be regulated (controlled, eliminated) with an alternative design, and what are the opportunities and limitations of design as regulation?* Using the concepts of script, affordances, and regulatory ecology (law, social norms, market, architecture/design), this section will explore these questions, based on the alternative mobile phone design of the Fairphone 2.

First of all, it should be stated that the designers of the Fairphone 2 do not argue that they have eliminated all risks. The Fairphone 2 showcases how risks can be addressed in each of its lifecycle phases. An important part of Fairphone's design strategy is transparency [see also 73]. It challenges existing *social norms* in the mobile phone sector by providing full disclosure of its supply chain; openess about unsustainability in the Fairphone's lifecycle - and how they try to tackle these; openness about the Fairphone's hardware and software by providing open source licensing. In addition, by building coalitions and partnerships with organisations working on sustainability issues in the mobile phone lifecycle, as well as with Fairphone owners and supporters, *social norms* about what is a good mobile phone are challenged. A good phone, they argue, in terms of material, functional, and aesthetical design, can also be a fair phone, fair towards people and planet.

This fair design, Fairphone anticipates, will constrain some of the social and environmental risks associated with the mobile phone lifecycle. Design thus presents particular *scripts*, which play a role in the making of our world. Some of the Fairphone 2 features, such as the use of non-conflict minerals and improved working conditions at the manufacturing sites, are difficult to express in the design of the mobile phone. These *social norms* are part of the script of the Fairphone 2, but they can't be perceived when using the phone. They become visible in the Fairphone "story", as it unfolds on the Fairphone website and promotion materials.

A central design feature of the Fairphone 2 is that it has a repair-centric rather than an obsolescence-centric design, which may extend the life expectancy of the Fairphone

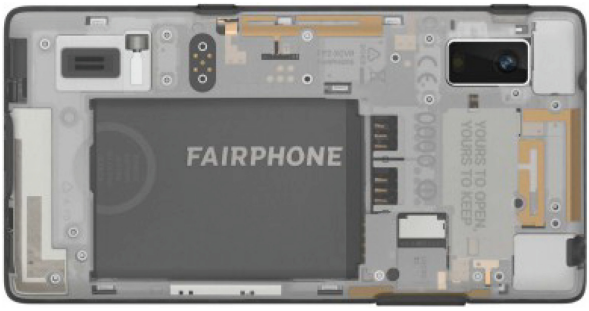

Fig. 3. Transparent back cover of the Fairphone 2

beyond the 5 years of its warranty. The modular design of the Fairphone 2 enables a repairability script, which is however invisible as long as the Fairphone's cover is not removed. On the other hand, by offering transparent back covers, the repairability script becomes partly visible in the form of the two blue switches that enable the disassembly of the screen and the removable battery. However, this script can easily be ignored, in particular when other mobile phone brands, because of their shorter innovation cycles, introduce new aspects or functionalities, which cannot be supported by the Fairphone 2. Research shows that consumers often replace their products before the product needs repair or breaks down. According to Khetriwal and First [74], as cited in [3], such reasons are style references, product feature and technology advances, marketing campaigns, changed family circumstances, and improved financial situation. Wilhelm et al. [75] report that marketing campaigns are the main motivator for young people to buy a new mobile phone, when they still own a well-functioning mobile phone. For some, a mobile phone is also a fashion statement [5], thus owning the latest model is a strong motivator. Also aesthetic design seems to play a role in product replacement. Sääksjärvi et al. [76] found that color and thinness of the mobile phone body can increase product replacement. Owners of colorful, thin mobile phones are more likely to replace their mobile phone for a new trendy one than owners of more traditional mobile phones.

Consumer behavior that results in premature product replacement, which is not the result of designed (planned) obsolescence but of perceived obsolescence. This type of obsolescence is the result of interactions between *markets* and *social norms*. Fully functional smart phones are replaced after 12–24 months with a new mobile phone. New legislation and law suits (*law*) have become one form of regulation that has made progress in dealing with unsustainable forms of obsolescence, e.g. the new anti-planned-obsolescence law in France[8] or the lawsuit that forced Apple to make the iPod battery replaceable.[9] Changing *social norms* about obsolescence may also support Fairphone's repairability script. The recent case of the planned obsolescence of

[8] New regulation in France: http://www.theguardian.com/technology/shortcuts/2015/mar/03/has-planned-obsolesence-had-its-day-design.

[9] Replaceable battery: http://www.girardgibbs.com/apple-ipod/.

working iPhones triggered a public outcry: iPhones stopped working after a software upgrade, which detected unauthorized repair of the home button or the Touch ID hardware.[10] The media described the case as an attack on independent repair shops, which boosted the already growing *right to repair* movement.[11] At the moment, the Fairphone is the only mobile phone that doesn't limit its warranty when the phone is opened and repaired by an unauthorised person (such as the owner).[12]

Telling the Fairphone "story" is an important aspect in Fairphone's strategy to change *social norms*. Research found that product appreciation is affected by the users' knowledge of the intentions of the designer [77]. This knowledge will strengthen the product's scripts as well as open up for new affordances.

A lifecycle perspective, in assessing the social and environmental risks of a product, considers the wider system. The mobile phone product-system is based on two central affordance, wirelessness and portability, which contribute to its wide variety of uses of the mobile phone. The GHG emissions in the use phase are high, but this risk is difficult to address in the Fairphone's design. To decrease GHG, the Fairphone would have to diminish GHG emissions in the part of the mobile phone lifecycle that involves server and network connections. This would decrease central functionalities of the phone, such as storing data on the server and 3G and 4G network connections, which would radically change the mobile phone's affordances. In other words, *social norms* about what is a good mobile phone, in terms of what it affords, indirectly regulate GHG emissions. If Fairphone wants to tackle this risk, other design options need to be explored, for example, continuous visualization of energy use related to charging, network connections, and overheating (*architecture* and *social norms*) and/or increased and more efficient battery capacity (*architecture*).

4.1 The Rebound Effect

In September 2016, the Norwegian Institute for Transport Economics (TØI) released a report on electric cars in Norway [78]. In order to stimulate the consumption of electric cars, the Norwegian government implemented a couple of incentives, such as no VAT on electric car sales car and lower road taxes. In addition, local authorities allow electric cars to use the buss/taxi lane and to use toll roads for free. National and local governments used a combination of *law* and *architecture* to stimulate sustainable behavior in personal transportation. While the number of electric cars has increased tremendously as a result of these incentives, there are some interesting findings, for example:

[10] Error 53 Fury: http://www.theguardian.com/money/2016/feb/05/error-53-apple-iphone-software-update-handset-worthless-third-party-repair.

[11] iFixit: http://www.ifixit.com and Right to Repair: http://www.ifixit.org.

[12] The warranty doesn't cover the opening up of components or replacement of third-party components.

- Many electric car owners own also a gasoline or diesel car.[13]
- Eight percent of electric car owners used to take public transportation to work, but now take the car.
- Electronic car owners drive more than non-electric car owners

TØI mentions that this might be explained with the consumption rebound effect. The rebound effect is an unintended side-effect of the introduction of technology and policy instruments aimed at environmental efficiency improvements, in particular where gains bring reduced costs [79]. Rebound effects are examples of how affordances and scripts can counter each other or how they can be ignored or re-scripted. The physical script of a more sustainable car, such as an electric car, which is embedded in the car in terms of material and functional design, can be ignored, as the socio-technical script of the car, e.g., the electric car as trendy car, invites people to buy the electric car as additional car. The environmental gain of less CO_2 emissions during the use of the car may be countered by increased CO_2 emissions in car production. CO_2 emissions may increase even more when the electric car replaces public transportation.

Laurenti et al. [80] describe how increased efficiency in industrial production can result in lower consumer costs and therefore in increased consumption. Improvements in mobile phone design (lighter, faster, increased functionality, etc.) resulted in increased consumption of mobile phones, leading to increased demand of raw materials (gold, silver, tin, tantalum). Increased prices of these materials fuelled conflicts over the control of mining sites, displaced local communities, and degraded large areas of land.

Rebound effects are also visible in the material aspects of mobile phones. Paiano et al. [81] describe how the weight of Nokia mobile phones decreased from on average 500 grams in 1990 to 85 grams in 2011. The decrease in material inputs in mobile phones, which affects CO_2 emissions and other social and environmental risks in the raw materials, production, and transport phases, were counteracted by increasing demand and resulted in a net increase of material input. Secondly, Paianao et al. show [ibid], the miniaturisation of mobile phones did not led to a decrease of material input per unit. Smaller mobile phones have a larger material base, because most materials are used in the production phase and are not part of the final mobile phone.

4.2 Regulatory Patching

A script, in the form of material or functional design aspects, can play a powerful role in design as regulation, c.f. the famous example of the speed bump in the road. In many cases, however, such scripts can be ignored or re-scripted. Mapping the regulatory ecology around design as regulation to constrain unsustainable mobile phone use is a helpful tool for both designers and regulators.

Figure 4 visualises how other modes of regulation directly or indirectly constrain a repairability script (*architecture*) in the Fairphone 2. While this script proposes to constrain unsustainable behaviour by the consumer, in the form of premature product

[13] The report mentions that some of these electric car owners would have bought a second car anyways, but now, because of financial incentives, chose to buy an electric car.

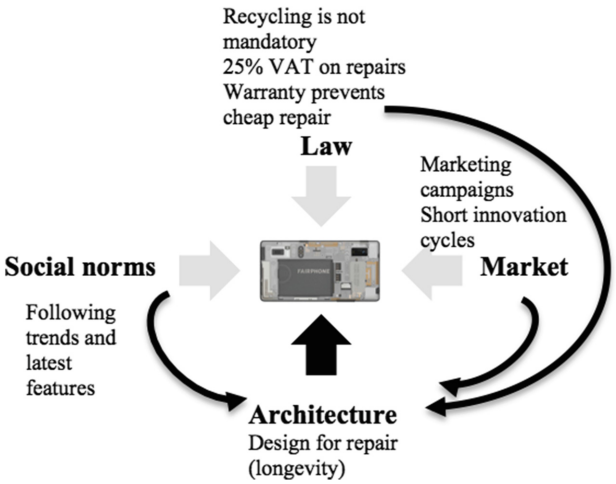

Fig. 4. Indirect regulation (constraints) of design for repair

replacement, its regulatory capacity is constraint in the form of warranty rules (*law*), marketing campaigns (*market*), price (*market*), trends (*social norms/market*), technological innovation (*architecture*), and aesthetical design (*architecture*).

The concept of affordance is especially useful for explaining why a repairability script can be ignored. Gibson's theory of affordances was based on an animal perceiving its environment: "The affordances of the environment are what it offers the animal, what it provides or furnishes, either for good or ill" [44, p. 127]. Repairability may only become visible (perceived) when a product breaks down. Decisions to replace the product are often taken before that, on the basis of other reasons for product replacement, such as new trends or technological innovation.

Gaver [46] discusses the perceptual information of an affordance and argues that perceptible affordance needs to be designed. The already mentioned hotel key with bulky keychain is an example of a designed and very perceptible affordance. In Sect. 2, regulatory patching was introduced as a situation in which "the subjects build the regulatory ecology they wish to be subjected to" [27] While the authors intended the patching of bugs or vulnerabilities in computer code (*architecture*), the meaning of regulatory patching can be extended to other architectural modalities, such as design,[14] or to other modes of regulation, such as law. Designers of sustainable mobile phones and other electronic consumer products can apply regulatory patching when evaluating the social and environmental lifecycle of their design. Regulatory patching may make hidden affordances perceptible, thus triggering or constraining particular behavior [e.g., 82].

The repairability of consumer goods is usually not perceptible in the design, in the form of an affordance, but is part of the script of a product. This script can be strong, as is for example the case in washing machines and cars, and doesn't need to be made

[14] For example, the bulky keychain can be understood as a regulatory patch in a situation where the sign "Please return your key to the reception when you leave the hotel" has no effect.

perceptible. But as a result of market strategies and perceived obsolescence, mobile phones are now perceived as disposable products. Repairability is not a strong affordance of mobile phones, at least not in industrialised countries, thus the Fairphone 2's repairability script needs to made explicit. Fairphone's design interventions, in the form of transparent back covers and illustrative charging image, and strengthened by the "Fairphone story", targeting social norms about perceived obsolescence, can be explained as regulatory patching of the affordance of mobile phone as a disposable consumer good.

Mapping the regulatory ecology of a product-system, can help to make clear when and where different modes of regulation strengthen or undermine each other. In the case of the Fairphone 2, it becomes clear that design (*architecture*) on its own isn't powerful enough to support sustainable behaviour in all of its lifecyle phases (see Fig. 4). Thus, the regulatory framework of the Fairphone requires patches in the form of activities that support the construction of new social norms around perceived obsolescence.

5 Concluding Remarks

Based on Lessig's theory of regulation, this chapter presented design as a form of architectural regulation. Design as regulation is constructed and relational: its regulatory impact is the effect of the regulatory ecology in which it is located. Other modes of regulation can both strengthen and constrain the regulatory role of design. The rebound effect is one of the ways in which sustainable design and design for sustainability can have unexpected unsustainable consequences. Taking a lifecycle perspective (lifecycle thinking) may broaden the design space in which the designed is conceptualised and developed. Locating the design process within the planetary and social boundaries that form the safe and just space for humanity may guide a more reflective process.

The concepts of script and affordance helped to explore how the meaning and use of a designed object emerges in the relationship between the object and its human and nonhuman surroundings. They can help explore the rebound effect and other unintended consequences of design, such as the reasons for ignoring a script or re-scripting a design.

Regulatory ecology played a double role in this chapter. As a figuration, it establishes a network of relations in which the designer and designed emerge. The regulatory ecologies of Fairphone, as a social entrepreneur in the Netherlands, as a story, and as a functioning smart phone, enable a deeper understanding of the complexity of designing circular products for a sustainable circular economy. This chapter only gives a glimpse of what insights the mapping of the regulatory ecology of (unsustainable) activities may provide.

The case of the Fairphone 2 exemplifies the central role of design in the social and environmental sustainability of the product-system lifecycle, but that other regulatory modalities, markets, social norms, and law, can both strengthen and undermine how design can constrain unsustainable behavior. A further mapping the regulatory ecology of the Fairphone 2 may enable a better understanding of where regulatory patching may the most effective.

This chapter presented an exploration in the concepts and cases that inform Sustainable Market Actors for Responsible Trade (SMART), a research project based

at the University of Oslo. One of the activities in this project is the mapping of the regulatory ecologies of significant social and environmental risks (hot spots) in the lifecycle of mobile phones. In this case, our main focus will be on understanding what enables and maintains these unsustainable practices.

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Exploring the Contribution of Design to Mobile Technology Uptake in a Remote Region of Australia

Fiona Brady[1] and Laurel Evelyn Dyson[2(✉)]

[1] Bloomfield, Cape Tribulation, Australia
Fbi_97@hotmail.com
[2] University of Technology, Sydney, Australia
Laurel.E.Dyson@uts.edu.au

Abstract. Some of the most remote communities in Australia have participated in a technological revolution since the arrival of mobile phone networks in 2003. We follow this journey in four largely Indigenous communities in Cape York and the Torres Strait Islands, from the first 2G network, to 3G, and finally to mobile broadband and smartphones, looking at its impact on communication, Internet access, new media use and social networking. In seeking to understand this phenomenon, we conclude that aspects of the design of the mobile system have contributed, including the flexibility of the technology to adapt to the needs of varying social groups, the small portable nature of the devices which allows them to serve a traditionally mobile people and to be kept as personal devices, a billing system which serves low income people, and the multifunctionality of the technology which provide entertainment while also supporting their use of Facebook.

Keywords: Mobile phones · Mobile broadband · New media · Social media · Indigenous people · Aboriginal people · Mobile design

1 Introduction: Problematizing ICT in Remote Australia

Regions such as the Far North of Australia – Cape York Peninsula and the Torres Strait Islands which lie off its coast – have long posed a dilemma to Government telecommunications policy. Existing at the edge of the Australian continent, population density is low, the distances vast, there is little industry apart from the bauxite mines at Weipa, the weather can be extreme in the cyclone season, and the local rats have been known to gnaw through cable. There is therefore no business case for installing and maintaining telecommunications networks and the task of doing so is always a challenge.

However, the need for telecommunications in this region has been recognized for many decades. The earliest phone links to the townships scattered through the region came via radio telecommunications out of Thursday Island, the main centre in the Torres Strait. This was an open line so everybody could hear what everybody else said. In addition to this lack of privacy, there was a wait to get calls through, so communities like Kowanyama, on the end of the line, only used it in emergencies (Manager, Kowanyama Aboriginal Land & Natural Resource Management Office, personal

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communication). When landlines arrived in the late 1980s, telecommunications improved enormously, but were still limited for the most part to services and businesses.

Only a very small minority of Indigenous households in the nine discreet Aboriginal communities in Cape York and those in the Torres Strait Islands subscribed to a home phone. There are many reasons for this documented in government reports, including factors of geography (prohibitive connection costs in remote areas and obstacles to maintenance when technicians have to travel long distances) and issues associated with the mismatch of the design of the telecommunications system with socio-economic circumstance and Indigenous culture (the individual focus of fixed-term billing contracts, the associated difficulty of a single subscriber paying potentially large bills for a home phone connection when cultural obligations make it hard to refuse access to family members, overcrowding in households, the unpredictability of post-paid bills, and the inability of the technology to support mobility of use) (DCITA 2002; RTIRC 2008).

Thus Indigenous residents depended mostly on the public telephone box when they wanted to make or receive a phone call. Later, when computers arrived on the scene, they used the free-access computers in the community technology centres. Computer training and use became part of school life, and also part of the workplace for those with jobs at the local Council or in service offices. (Adults lacking computer skills can still go to the Council Office and ask a clerk to perform tasks like Internet banking for them.) Sometimes special funding was allocated, for example through the libraries, for computer-based projects, but these rarely survived beyond the life of the project, despite being carefully designed to fit with presumed Indigenous cultural strengths.

Real change came early in the twenty-first century. The Government noted in 2002 that some 200 Indigenous communities – from cities to remote regions – then enjoyed mobile coverage (DCITA 2002). Since that time Indigenous Australians have been shown to be willing adopters of what has been dubbed throughout the world the "mobile revolution … this mobile miracle" (Sanou 2013, p. 1). In contrast to the public phone and public computers, this is the first information and communications technology (ICT) that most have personally owned.

This chapter presents a longitudinal perspective of how mobile technology has been taken up by Indigenous Australians in the Far North since our research into the phenomenon began in 2007. We present an overview of the evolving mobile narrative, providing interpretations from design and media studies. The four research sites are Dauan in the Torres Strait, and the Aboriginal communities of Lockart River, Wujal Wujal and Kowanyama in Cape York (see Fig. 1). Their populations are respectively 150, 542, 305 and 1,200. Research was conducted by ethnographic observation; informal and semi-structured interviews and surveys with Indigenous and non-Indigenous residents; and technology assessments and measurements. Most recently we undertook readings of individuals' public Facebook pages from Wujal Wujal and interviewed managers there about this phenomenon. We take a systems design approach to technology, from personal devices, to infrastructure, mobile use, Government policy and billing structures, as well as competing ICT such as fixed-line and public phones and computers.

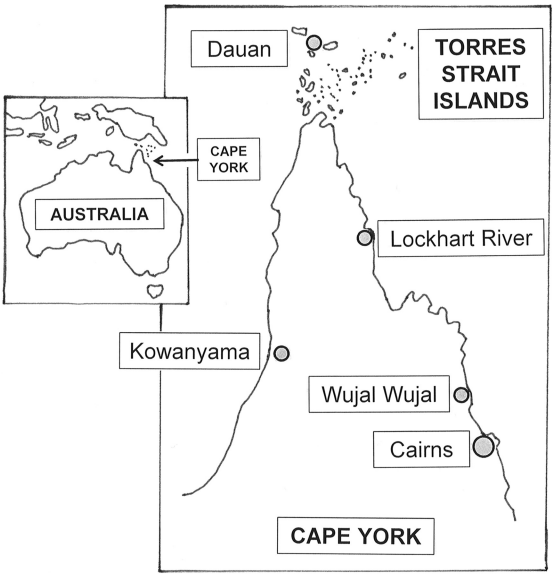

Fig. 1. The four research communities and main city of Cairns

2 Moments of Translation in the Mobile Journey

2.1 Becoming Interested: The First Network

A CDMA (Code Division Multiple Access) service rolled out across the Cape York communities in 2003 (Pearce 2003), run by Telstra, the only provider in remote regions of Australia. The islands of the Torres Strait had to wait two years more (Brady et al. 2008). Despite a general Federal Government mobile telecommunications policy in favour of competition (similar to other English-speaking countries like the USA and UK (Agar 2003)), the pragmatics of remote location and a low population base gave the edge to the previous national telecommunications carrier, with its existing infrastructure.

This offered a voice call and text message (2G) service and was widely taken up by businesses and service providers, as well as by individuals. Many Torres Strait Islanders, for example, became aware of the mobile network even before it was available at home since they had family and friends on the mainland, or could pick up the signal if they lived on the inner islands close to the Australian continent. Most surprisingly, many people on the small outer island of Dauan had bought mobile phones even before their service was switched on, though they were then of no use whatsoever. Later, within a few short weeks of the coming of the mobile network in 2005, it was observed that most adults in the community had a phone (Brady et al. 2008). "Everyone I want to talk to has mobiles. Very hard to contact people otherwise," reported one young woman.

2.2 Enrolling in the 3G Network

About June 2007 a 3G (third-generation) network was switched on. In January 2008 Telstra switched off the CDMA service, thus forcing anyone who wanted a mobile phone to buy a 3G phone. There was a common idea in the communities that "just about everyone has them" (Brady and Dyson 2009, p. 26). In fact, our research in Wujal Wujal showed that not everybody owned a mobile – only 55% of the people we spoke to. Yet this was much higher than ownership of fixed-line phones or computers and therefore represented a major shift in technology access. Similar numbers have been reported in other remote communities by the Tangentyere Council and Central Land Council (2007) and Auld et al. (2012). The latter make the point that cultural norms of sharing mean that almost everyone has access to a mobile when they need it, although our research showed that sometimes people with mobiles avoided sharing with others they deemed unreliable.

As with the earlier service, so with the 3G phones, 100% of the people in Lockhart River and Wujal Wujal whom we spoke to who owned a mobile phone used them for communication – either phone calls or text messages or both – to family, friends, boyfriends, girlfriends, people in hospital, children away at boarding school or for work; to people at long distance or those who lived just around the corner. At Lockhart River a group of teenage girls texted each other "What's the plan?" to find out what was doing on the weekend, while a young mother rang the carer who was raising her daughter far away in the city of Cairns (Dyson and Brady 2009). At Wujal Wujal a mother with children at boarding school had a phone so that "They can contact me. … More for emergencies at school. … I would like to be informed by the school about what's going on … Pretty well talk to them every day", and an aged-care worker said "I need a phone for three clients … I need a phone for clinic or the police … I'm worried about my clients" (Brady and Dyson 2010). One young man employed by the Council used it "for emergency. Calls – call family. Use it for work."

Sometimes the network did not deliver quite what was expected. Managers reported that the old CDMA service had better coverage: "When it works, it's pretty good. Bring me my analogue back. I had better coverage on that than on this digital thing." People complained they couldn't use their phones to make calls or send messages outside the area of the town or line of site of the tower. Coverage could best be described as patchy. At Wujal Wujal you couldn't contact the airport, the sports oval, the telephone exchange, most of the favourite fishing spots or people driving on many of the roads (Brady and Dyson 2009). "I can't ring my Mum," said one woman, "She lives at Ayton," a village near Wujal Wujal. One man said that: "Sometimes I take mine in the bush but don't get enough signal." Another put an aerial on his car to increase the signal and even made calls at home from his car. However, with fixed-line phones in only 7% of Wujal Wujal households (Cook Shire Council 2008/2009), mobile was better than nothing – or better than going out in all weathers to the public phone booth, where everyone could see you and wonder who you were calling.

The great advantage of the new 3G service over the previous one was that it opened up the Internet and a host of new media to Indigenous people. The phones came with a camera, video camera, sound recorder, MP3 player, games, address book, calendar and alarm clock. Our study at Lockhart River was the first to discover just how much use

people made of the new media features of their phones (Dyson and Brady 2009). Often media came up first when young people listed their uses: "I Bluetooth [music], games, text message, ring." Many people listened to music: young people were seen walking around their community with earphones connected to a phone in their top pocket, young men sometimes listened while playing football, and people shared music from the local band. Mobiles provided the music for the Friday night disco at the Church Hall during school holidays: "Some of the kids plug their mobile phone into a speaker to play," reported one teenage boy. Playing games and watching movies, TV and sport on the Internet were all big. Communication was no longer confined to language through phone calls and text messages, but expanded to image through video calling and Bluetoothed photos and videos. User-generated content became important, sometimes working in with traditional cultural practices, such as when a young hunter videoed himself with his prey.

2.3 Mobilizing Over Time

There has been no sign of the "mobilization" of Indigenous residents of these remote communities abating. For example, in Kowanyama the Post Office reported selling 40–50 mobile phones a month, while the Kowanyama Store sold 3–4 a day, when we were interviewing managers in 2014 (Brady and Dyson 2014). One described the dependence of the residents on their mobiles, in the absence of landlines and home computers, as "vital … Their only form of communication to the outside world is their mobile." Even 85–95% of high school children own mobiles, largely because the majority attend boarding school and this was the only way they could stay in touch with family back home. The Community Support Officer with the Education Department noted that, "It's absolutely vital for kids' well-being. The kids get distressed if they can't contact parents. Parents get distressed if they can't contact their kids."

A change in the style of mobile phones sold in the communities has been visible over the decade of our research. In 2008 the standard (cheapest) model was a 3G "feature" phone, with a small screen 3 × 4 cm (1¼ × 1½ in.) and buttons for interaction. By 2014 only a handful of these were in the shops in Kowanyama and they were almost invisible in the community. Instead the standard had become the "flip" phone, once a luxury possessed only by the high-end users. Even more surprising were the touchscreen smartphones, most popular with young people. The cheapest touchscreen models were available for the same price as the flip phones, and almost a third less than the much more basic feature phone sold for in 2008.

The move to smartphones suggests changing patterns of interaction. We had heard of Torres Strait Islanders using social networking sites like Bebo back in 2007, but at Kowanyama *many* young people were using Facebook, usually on their mobiles but also on the public access computers (Brady and Dyson 2014). The offering of laptops and simple tablets for sale in the Post Office may also have been connected with social media, but it was impossible to gauge as we saw none in use publically.

In Wujal Wujal, in our most recent study, there was a perception by a number of people interviewed that everyone was on Facebook. An examination of the public Facebook pages of 10 Aboriginal people showed a great dependence on photographs,

with only two having no images, and two using both photos and emoticons. Commensurate with this exploitation of the visual, very limited amounts of text were used, nearly always in non-standard English, and often with abbreviations typical of text messages which indicated that they were probably using their mobile phones for "Facebooking". The photographs were nearly all of people – either of self or family – and women often had photos of their children, but not of partners. A few people had pictures from advertising of African American musicians or sports idols, and some had an image and message generated by a game they were playing. In a few photos, the person appeared against the backdrop of a local beauty spot. Some displayed photo editing as part of a local football promotion but, other than this, only one person obviously edited her photos to include decoration. The written posts included diary-like entries, for example, to say where they had arrived on a journey or what they were eating, or messages to family or friends, sometimes obviously living at some distance. One young woman posted images of her new baby, while another gave out a birthday wish. One used her Facebook post to memorialize her father, who had passed away, and this person was the only one to include religious content. In terms of specific Aboriginal content, only one featured images and news items of a political nature, namely, deaths in custody and domestic violence – both prominent Aboriginal concerns – while popular pastimes, such as camping, fishing and football, figured in some. Only one Facebook user stood out as having a predominance of beautiful photographs of scenery and an item of bush tucker in preference to images of people: he included lengthy explanations (up to 6 lines of text) in standard English describing what the photos represented.

Interviews with managers at Wujal Wujal revealed that they were all aware of Facebook, but most were only in the process of getting Facebook pages set up to augment their organizational websites. One exception was the Facebook site for the Indigenous Knowledge Centres (IKCs) of the State Library of Queensland: this had been launched and is maintained by the State Library but any IKC around the state can add or share content. For example, the Librarian of the Wujal Wujal IKC shared the link of the "Bloomfield River Oral Histories" and "it got out" to the community. Several issues surfaced as to why not more local organizations had put up a Facebook page. For the Manager of the Bana Yirriji Arts Centre, the unreliability and amount of downtime on the Internet was a problem: "The No. 1 issue is the Internet: you are waiting all day to do something and then have to do everything in an hour, all at once." Generally, there was a lack of time: both the Arts Centre Manager and the person in charge of the Wujal Wujal Aboriginal Shire Council website stated that they had been too busy. Technical issues also surfaced: finding out how to connect the Council website to Facebook was a problem. Decisions need to be made about how to control "inappropriate language", disrespect to the Council or Mayor, and pornographic content.

However, they recognized the value of Facebook. The ease of putting photos and other content up compared to populating the organizations' websites was a major advantage. Whereas the Arts Centre wanted to use it "Mainly for advertising", for example to post pictures of art works for sale at the Centre, notices of workshops they were running and "Go Back to Country" material, the Council realized that it would be a means "For getting the community involved. … We want to feel other people's opinion." This contrasted with the website which was solely for giving out information.

2.4 Mobilizing Service Providers and Businesses

Mobile broadband is a more recent player in the Far North communities, first observed in operation by the researchers in 2014 (Brady and Dyson 2014). Anyone with a mobile broadband account and a dongle or wireless modem can link their computer or laptop to the Internet via the mobile network. In our research in Kowanyama we saw service providers and businesses using it to varying degrees.

The service providers were totally reliant on their mobile voice service for communication and the mobile broadband for Internet access. For example, Jobfind and the Remote Area Aboriginal and Torres Strait Islander Child Care depended on the mobile network and their mobile phones and laptops when their staff travelled to the community for work and so did not need to keep a permanent office fitted out with computers and landline phones in Kowanyama. The mobile phone allowed them to contact clients by SMS, who in turn could contact the service provider if they are were unable to get to an appointment. The slowing of the network at peak times, however, when everyone in the community was on their mobile phones, sometimes interfered with their ability to use their systems efficiently: "Speed is a real issue. … If it was faster, I could actually get things done. It's been five minutes from one click to another," complained the Jobfind officer.

The small shops and cafés mostly had a mix of mobile and fixed-line. Only one shop had gone totally mobile, relying on mobile broadband for all stock orders, electronic funds transfer and email communication, except during cyclones when the systems were moved temporarily back to dial-up. Speeds at peak usage times, though, were again a problem, slowing "regularly at lunchtime, Friday evenings and on Saturdays and Sundays. As soon as they get off work or school, people get on their mobile phones and start text messaging and using Facebook." The slow speeds influenced three other small businesses to stick with landlines and dial-up connections for Internet access, keeping their mobile phones for calls and SMS. A couple of other businesses used mobile broadband for email, whereas the largest enterprises had robust systems based on landlines, ADSL, intranets, dedicated servers, satellite Internet connections or satellite phones. Their main use of mobile technology consisted of making calls on their mobile phones when away from the office.

Ironically, the very popularity of the mobile service was eating into its usability. The Acting CEO of the Council noted that: "More bandwidth is required. Both download and upload are very slow, even if you live right near the Water Tower [where the repeater was located]. It takes so long that you can make a cup of tea while it downloads. … It's as slow as it was when we used to have dialup 10 years ago."

Therefore, the complete "mobilization" of businesses in these communities is yet to come, but may not be far away. Recently Kowanyama and the neighbouring community Pompuraaw joined forces to lay fibre optic cable from their mobile towers to the fibre optic spine that runs up the centre of Cape York. This first project of its type in these two communities should improve bandwidth and speed of service and encourage more businesses to go mobile in 2016. Rather than accept whatever the Government funds and negotiates with Telstra on their behalf, they have taken the lead in deciding their own mobile technology priorities and making it happen.

3 The Design of the Mobile Service

Kevin Warwick (in Jones and Marsden 2006, p. 8) notes the difficulty of design in areas of technological innovation:

> *there's a big danger in focusing too much on what people think they want or need – sometimes, only when they experience a new technology can they articulate its value to them and help shape its development.*

Different approaches to designing mobile technologies for Indigenous Australians have been adopted, with varying degrees of success. One very limited venture was the *Gambara Gamu Biyu* body chart, with which children could interact using a language pen to read off words for parts of the body in nine Queensland Indigenous languages (State Library of Queensland) – enough to hold the attention of children for a few minutes at most when it was put on display in the Bloomfield Library one school holidays in September 2012. The inclusion of more than one language on the resource meant that children were distracted from learning the local language KuKu Yalanji, and comments from parents indicated that it would be better placed in a school as part of a language program rather than the library, where it became more of a toy.

By contrast, is the highly successful Ara Irititja cultural database, which allows members of the Central Australian Pitjantjatjara community to view, annotate and add to an archive of images, video, sound recordings, etc., from a mobile *niri-niri*, that is, a type of complete workstation on wheels. The latter allows the database to be used wherever people are located, "easily moved from community halls to classrooms to bush camps to dry creek beds", or loaded onto the four-wheel drive vehicles used for longer trips (Hughes and Dallwitz 2007, p. 154). The challenge of designing and implementing this system – database, interface, protocols of use, mobile hardware – can be gauged from the fact that it took 2,000 h and over ten years to develop: this allowed the local people to understand the system thoroughly, to review the development process at their own pace and to build a sense of ownership, resulting in its integration into the lives of the people.

Unlike Ara Irititja and some rock-bottom phones and phone cards developed by mobile providers in Africa for poor people to use (e.g., Orange in Morocco), the mobile phones, MP3 players and tablets that Indigenous Australians have are mainstream. We presume that neither the original nor subsequent designers of mobile technology considered the inhabitants of remote Australia in their design decisions. Reading Jon Agar's (2003) history of the mobile phone we note contributions to its development from several regions of the world, particularly the USA, Japan, the Nordic countries, the UK and other parts of Europe. Some of these contributions, like the advances in miniaturization which led to smaller phones that were light enough to carry around, and the development of modern billing structures (pre-paid charging and phones sold cheaply but whose price is then subsidized by airtime) added to the attractiveness of the mobile phone for Indigenous Australians, despite not being designed specifically for them.

Here we consider some of the major characteristics of the design of the technology which our research indicates have made mobile technology attractive to Indigenous people.

3.1 Flexibility

Flexibility must certainly be a characteristic of a technology which straddles culturally and socio-economically diverse groups of people and geographically diverse regions. One of the authors, in an early consideration of Indigenous Australians and ICT, noted that ICT is an inclusive medium, which allows Indigenous users to achieve their own goals: she proposed that it does this through aspects of its design, including lack of traditional hierarchies, absence of prejudice, its interactivity and flexibility, and its breakout of the visual (Dyson 2003). In terms of mobile technology, we would now add to this list the breakout of the oral and aural.

Many years ago Doris Schoenhoff (1993, p. 76) recorded the adaptability and multipurpose nature of computers, which can be applied just as well to mobile phones, the mini-computers of our age:

> *... a unique tool because its purpose is constantly being reinvented by its users. Its power consists in the fact that it is a symbol machine, and its symbols and their interpretations can be altered.*

More recently Inge Kral (2012, pp. 245–246), in a study of the Ngaanyatjarra people of the Australian desert, drew attention to the "spatially-oriented and icon-based structure" of ICT, and how the "logic of the symbol system … the symbolic conventions" have supported young people to become "fearless of technology". Even Indigenous youth with limited literacy skills can move through the necessary interactions with the technology, supported by "standardized alphabetic symbols, left-to-right and top-to-bottom processing interacting with a pictographic symbol system … using icon-based navigation" (Kral 2012, p. 249) Even in the early days of mobile phone adoption people were "extremely capable" at using their mobile phones, according to the Wujal Wujal Post Mistress, "If they don't know, they get their family to help them." Thus any deficiencies in design which made some unable to carry out the more complicated functions on their phones, could be made up for by the social system. Generally there was an impression by older people about the young that, "They know more".

3.2 Portable and Personal

The most obvious characteristic of mobile technology is its small size, lightness and hence portability. This design feature supports the communications needs of previously non-sedentary people to renew for at least some times of the year their culture of temporary mobility or "walkabout" – visiting family in other communities, going camping, fishing or hunting, and escaping from the administrative aggregations of population that still echo the mission days, with their fixed services of housing, health, education and fixed communications.

The portability of the devices means that they have become personal devices, too, small enough to be kept in a pocket or hung around the neck. They allow some measure of privacy in phone conversations – permitting people living in overcrowded housing to take a call outside, without everyone listening in – and a whole world of private music listening: one mother, talking of her music preferences, stated, "For your ears

only' – if the kids don't like it a lot they'll tell you." Importantly, the portability and small size allow owners of mobile phones some measure of control over the devices, to decide *if* they will share them and *whom* they will share them with. One woman, whose nieces and nephews swap the battery and take the SIM card out, recorded that, "Have to keep it on me. My Mum doesn't trust them with her phone – steals her credit." Inge Kral (2012, p. 230) notes that "In an environment predicated upon demand sharing, these are items of personal ownership that don't have to be shared."

3.3 Billing Structures and Cost Management Features

Incomes in the communities are generally low compared to the national average, with high levels of welfare dependency and most people 'living right up to the limit' of their income, as one manager told us. The cost management features offered by mobiles are therefore one of the major reasons for their success compared to landlines.

A feature of the design of the mobile service is pre-paid billing. Some of our interviewees in Lockhart River and Wujal Wujal recounted horror stories of bills in the thousands of dollars that they or others had incurred when buying non-pre-paids when visiting phone shops in town or in the early days of the mobile service when CDMA was in place. Recent interviews with managers at Wujal Wujal revealed that the Indigenous Consumer Assistance Network in Cairns worked with the communities to arrive at a solution when the problem first arose: since the local council owned the shop which sold mobiles, they could control what phones and services were for sale. For a long time now all shops in the four communities have sold nothing but pre-paid mobile phones, and more recently pre-paid dongles for home access to mobile broadband from laptops.

Other features which help keep costs low are the use of text messages instead of calls, the low cost of the most basic 3G mobile phones sold in the community shops, no connection fee compared to landlines, and the disposability of phones compared to landlines and computers, which need a technician to fly or drive in usually from a considerable distance to fix them when they malfunction since there are no technicians living in the communities.

MP3 players or iPods are another well-designed mobile technology which has persisted over time because listening to music is extremely popular in all the communities and the devices are cheap to buy: in 2014 the Kowanyama Post Office was still selling about 20 players per month, some for as little as $20 (Brady and Dyson 2014), despite the fact that many use their phones to listen to music instead. One advantage of MP3 players is that they avoid the recurring costs of mobile phone charges, particularly for children and for adults on low incomes.

3.4 Multifunctionality and Social Networking

The multifunctional design of the 3G phones that were introduced to the Indigenous communities of the Far North in 2007/08 must also be ranked as an outstanding factor in their adoption. The high level of interest in mobile media is not surprising given the

traditional cultural strengths of Indigenous Australians, namely in oral and audio practices (song, music, story-telling and ceremony) and in pictorial expression (painting, sculpture, carving and weaving). Further, new media functions have the advantage that they are always usable, even when the network is down or the owner has run out of credit, a common occurrence in these communities (Auld et al. 2012). Mobile technology thus can play a significant role in personal wellbeing in remote communities with limited amusement options. Mobile technology has joined TV, radio and CD players in serving that essential part of the human spirit – our endless love of music and storytelling.

Mobile phones allow the taking of photos and video which, combined with instantaneous upload to the Internet, has facilitated the explosion of participation in social media. Bronwyn Carlson (2013) notes that Facebook is now an everyday activity for many Indigenous people, and our observations in Kowanyama and anecdotal evidence from Wujal Wujal would appear to support this. The design of Facebook, which makes upload of images simple and allows people to participate without requiring a large amount of textual input, is key. Even responses to posts can be non-textual, for example, a show of emotion through "likes" and emoticons.

Facebook is about communication, but also enables people in these communities to actively and purposefully "build, display, and perform Aboriginal identities", as noted by Carlson (2013, p. 147). We saw on the public Facebook pages of Wujal Wujal residents how this was effected by using images of self, family, friends and local places, as well as comments in a style of non-standard English which appeared to identify them as Aboriginal people (Carlson 2013). Manuel Castells interprets such online manifestations as part of the "constitution of new forms of individual and collective identity", in which identity is seen as "people's source of meaning and experience … the process of construction of meaning on the basis of a cultural attribute, or a related set of cultural attributes, that is given priority over other sources of meaning." (Castells 2010, pp. xviii, 6) Such affirmations of identity become a "fundamental lever of social change" (2010, p. xvii).

Johnny Winston (2013) comments that photos are increasingly used to communicate, construct identity and understand reality on Facebook. Photos are a shortcut for disseminating one's experiences with large numbers of people quickly and easily and are valued because they are seen to provide information and appear to be trustworthy in that they show evidence that an event occurred. In fact, photos predominated on the Facebook pages we viewed. However, depending on photographs for information is dangerous since they can be subtly manipulated in the process of selection. In addition, Winston (2013, p. 3) argues that they are "more ambiguous than written descriptions because they show rather than tell"; they neither connote a fixed idea nor denote explicitly, and so can result in "miscommunication or unintended interpretation of communication when it is used to carry information."

Castells suggests that for a given individual or collective there may be multiple identities and that this is "not a source of weakness but of strength in a society characterized by flexible networks and variable alliances in the dynamics of social conflicts and power struggles." (Castell 2013, p. 258) So while Facebook has become a popular and powerful social medium it must be "read" in the context of this new

medium itself – its flexibility, its ability to create fluid identities, and to convey information, even if at times biased.

4 Conclusion

Matt Jones and Gary Marsden, in their book on *Mobile Interaction Design* (2006), note that people:

> *will not take up a technology unless there is a very good reason to do so. A new mobile product will click with people if it allows them to achieve something significant while fitting in with the other things that fill their lives. On top of these two critical success factors, products should also be pleasing, charming, delightful and enjoyable, rather than annoying, bland, frustrating and dull.*

From the ready take-up of mobile technology by the Indigenous communities of the Far North, it can be seen that it has fulfilled needs that were not answered by the previous generation of fixed-line ICTs – the need for a tool for communication, a medium for exploring identity, and a multifunction device which can play music or games, access TV programs or sport, in short to pass the time enjoyably. The design of the technology – its flexibility, portability, personal nature, cost management features, multifunctionality and affordance for social networking – has contributed significantly to making the mobile phone and MP3 player (and increasingly tablets, laptops and mobile broadband) technologies of choice for these communities.

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Technologies as a Means, Meetings as an End: Urban Interactions of a Migrant Community in Rio de Janeiro, Brazil, Mobilized Through WhatsApp

Robson da Silva Braga(✉)

State University of Rio de Janeiro, Rio de Janeiro, Brazil
robsonsilvabraga2@gmail.com

Abstract. In this paper, I reflect on how uses of new communication technology can transform interactions that occur in the space of a city. I conducted an urban ethnography and analysis of online forms of communication for five months on a group of migrants from the Northeast of Brazil who migrated to the city of Rio de Janeiro, in the Southeast of the country. There were approximately 80 people who joined an online group on WhatsApp, and used the application to mobilize themselves, including attending events around the city, such as private parties, concerts, soccer matches and visits to the São Cristóvão Fair which is a space that attracts tourists, visitors, in particular communities from the North-east of Brazil. I argue that identity is enhanced as ties are strengthened.

Keywords: Appropriation · WhatsApp · Identity · Urban interaction · Brazil

1 Introduction

It's not possible to assert why people use WhatsApp in general. Like every form of cultural consumption, the uses of these tools vary. However, this paper focuses on a group that organize, through this virtual application, with one clear objective: to meet in the city.

In this paper, I reflect on how uses of new communication technology can transform interactions that occur in the space of a city. I conducted an urban ethnography and analysis of online forms of communication for five months on a group of migrants from the Northeast of Brazil who migrated to the city of Rio de Janeiro, in the Southeast of the country. There were approximately 80 people who joined an online group on WhatsApp, and used the application to mobilize themselves, including attending events around the city, such as private parties, concerts, soccer matches and visits to the São Cristóvão Fair which is a space that attracts tourists, visitors, in particular communities from the North-east of Brazil.

The initial idea of this research was to investigate the cultural consumption of migrants from the Northeast of Brazil in São Cristóvão Fair, located in the North Zone of Rio close to the port area of the city. However, during the first few months of investigation (from March to July 2015), I discovered the existence of several WhatsApp groups formed by regular fair-goers. By analysing this virtual phenomenon,

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I realized it would be possible to understand the practices of the fair-goers beyond the space of the fair, identifying their circulation for Rio de Janeiro, using WhatsApp as a tool that enhances their urban interactions.

I have analysed how fair-goers make what I call the "overflowing of the Fair", meaning, spaces within the city that start from the Fair, but then they go beyond, overflowing into different places in Rio.

The WhatsApp application is used as a daily means to connect, reinforces weekly meetings (forró1 shows at the Fair, barbeques at homes of the members, parties in low-income communities (slums), football matches, among other spaces). Social networks are composed of social subjects, using tools that facilitate such interactions (Recuero 2009), for example virtual platforms such as Facebook, Twitter, Instagram and WhatsApp (social medias). I consider that technologies are means, and the meeting is the main objective for the group investigated.

I used an ethnographic method to analyse how a group of regular fair-goers of the São Cristóvão Fair use WhatsApp toshare sentiments about what it means "to be from Northeast". I adopted two methodological procedures: (1) virtual ethnography; (2) and participant observation in meetings organized by the group in the Fair and in other spaces of the city in which I accompanied them and conducted the research over five months (July–November 2015) and of a group of approximately 80 users in WhatsApp.

I consider the internet as a culture and as a cultural artefact (Hine 2004): it promotes specific practices among its users and at the same time, it is used as a tool to suit the wishes and needs of the contemporary world. Furthermore, I do not take into account only online data of the WhatsApp group, but also the everyday uses of the social media from the WhatsApp users, in addition to the sociability that social media provide.

2 Immersion in the Field

It is 10 p.m. on a Saturday when I disembark in São Cristóvão subway station. I'm going to the São Cristóvão Fair. I am looking for a taxi to go from the subway station to the Fair. Like many regulars who take this same route on the weekends, I adopt a similar tactic of sharing a taxi with strangers.. This time, I was fortunate to share the taxi with a girl who tells me that she takes part in a WhatsApp group of fair-goers. She is going there to find the members of that community and so I ask her if I can join the group and I am accepted.

During the field research, I allowed myself to be led by my informants and they took me beyond the space of the São Cristóvão Fair, that I had conceived of initially as the research focus. They invited me to know Rio de Janeiro from their perspective, and how they experience the city daily. I consider that my inclusion in the group was facilitated because I am also a North-eastern migrant who lives in Rio de Janeiro.

At the time of writing, I had mapped at least eight WhatsApp groups formed by fair-goers of the São Cristóvão Fair. I have participated in four groups, interacting more actively with one that is central to the findings presented in this paper.

After a month I was integrated into the group "Os Fechamentos", I decided to make it the main object of my investigation. To start the observation, I sent the following message on September 14, 2015: "Good morning, everyone. Ok? I am doing research

on the São Cristóvão Fair. The research is about fair-goers and their relationship to the Northeast. I want to participate in this group to know the fair-goers better. Would you allow me to do this? The idea is to follow the group here on WhatsApp and at the Fair when you go there, and then I would like to interview some of you. In the research, I will not mention anybody's name or any other personal data. Thanks!"

No one on the group responded to the message, but all participants continued treating me friendly during physical meetings and calling me "professor" like a joke. When I met group members in person at the parties, I personally introduced myself as "a communication researcher who is researching the Fair and the WhatsApp group." Everybody received me well. I conducted interviews with four group members about their life stories, their relationships with the group, and how they use WhatsApp.

Among thousands of files posted in the online group during the five months of daily monitoring I did, I chose to analyse 175 audio messages (songs, audios shared from other people and voice recordings of themselves), 453 images (party advertisements especially in the São Cristóvão Fair, personal pictures of members of the group, photos of the group taken in events) and 957 screenshots of the conversations. As a criterion for selection of audio, images and screenshots that I collected, I only considered information that would help to analyse how the participants engaged in dialogue using the online platform and the space of the São Cristóvão Fair and other areas of the city and how some notions of what it is "to be from Northeast" that are present in their discourses.

3 Ambivalent Identities

I started my research in the São Cristóvão Fair. Located in the North Zone of Rio, near the port area, the São Cristóvão Fair currently receives around 300 thousand people every month. They are generally attracted by forró concerts, pagode1 and reggae2, northeastern food restaurants and the stalls with handmade products. These handmade products mostly are items from the Northeast (in general clay, wood and lace products, as well as food products such as "coalho" cheese, coconut candy ("cocada", in Portuguese), brown sugar ("rapadura", in Portuguese) and "cachaça" – a traditional North-eastern drink used to prepare "caipirinhas3").

The São Cristóvão Fair has never been a place solely supplying regional foods and products in general. It has since the beginning been seen as social space. The forró rhythm appears as a central element to this process of socializing as a group with a regional element as a factor of identification and mobilization.

As noted by the Fair organizers, it is clear that there exists a strong appeal to the concepts of "tradition", "roots", "cultural essence" with several myths about "traditional culture" (clay pots, decoration of June Festivals (a sort of folkloric party very common in Northeast), salted steak ("carne do sol" in Portuguese), cowboy clothes, vegetation from the "sertão" (the most arid region of Brazil, in Northeast), etc.). It is important to note that these representations about the "traditional Northeast" were invented not by this region itself, but by various cultural products (movies, literature books, and music) that were actually made in the Southeast (in wealthier cities like Rio

de Janeiro and São Paulo), with the goal of creating a stereotype about the Northeast as "poor", "traditional" and "rural"(Junior 2011).

It is important to highlight the connection between identity and representation. Hall (2010, p. 345) relates "identity" and "representation" by saying that "[…] identity is within the discourse, within the representation." For the author, the identity "[…] consists in part by representation. Identity is a narrative of himself, it is the story we tell ourselves about who we are". "Identities are a guarantee of class that the world doesn't fall apart as quickly as it sometimes seems. They are a kind of fixed point of thought and of the being, a basis for action, an even existing point in a changing world. That seems to be the last class of guarantees given by the identity to us" (Hall 2010, p. 339).

However, these concepts do not seem to have centrality in the discourse and practices of consumers during this research. They rarely appear. Even with reference to the Northeast as a place of origin, there are various representations; implying symbolic forms that refer to a cultural hybrid that breaks in many ways with folk discourse about what would be " north-eastern tradition". I consider that post-modern subjects who live in a global urban centre (like Rio de Janeiro) experience transient and ambivalent identities (Bauman 1999). In relation to the subjects investigated, this regional identity is temporary, because they recognized themselves as being from the Northeast, but move around the city in various ways like "residents of Rio de Janeiro".

The initial members of the WhatsApp group met at the São Cristóvão Fair, a place where there are many references to "north-eastern tradition". Although the meetings began at the Fair, people have moved to other areas of the city that have no direct connections to that region of the country. So we can consider that the "North-eastern identity" may be understood as an initial element to the mobilization of the group. Depending on the extent in which the group was organizing meetings, they gained new mobilizing elements. Parties, happiness, friendships, and flirting are some elements that unite the group, which do not depend on connections to the Northeast such as those found at the São Cristóvão Fair.

4 WhatsApp: Extimacy as Urban Routes

As with other social media, WhatsApp intensifies the exhibition of privacy, the "extimacy" that previous virtual social networks have afforded, like Facebook and Twitter. From the term coined by Lacan and Tisseron (2001) defines "extimacy" ("extimité" in French) as the "desire of a person to communicate or expose your inner world to the other" (Bruno 2013, p. 68).

Provided you have a mobile device connected to the internet, the application user can keep in contact with several people at the same time, in private conversations or in groups with up to 100 participants simultaneously. Around the city, users can send photos, videos and audio recordings, indicating that they are and not leaving any physical encounters to chance.

As the most popular instant messaging application in the world, WhatsApp offers a multiplatform service, with sounds and text messages (with the addition of emoticons, photos and videos stored on the phone or captured moments before sending), and the

voice connection service. The application also lets you know if the other participant viewed the sent message.

My objective is to identify how this application has contributed to the interactions that are established beyond the virtual space and around the city.

The group "Os Fechamentos" (meaning "ever-present attendees") has in its name the main objective that its members give it: the idea is "to be close", "to be present", to be "always together", "everybody together and mixed" ("tudo junto e misturado", a very common and popular expression in Brazil nowadays). Several times, one of the group administrators complained when people refuse any physical meetings: "Aren't you a 'bro', [swear word]?!".

It is not possible to define the profession and the home district, among other elements that could form the socioeconomic profile of the investigated group because the virtual community has about 80 people, many of whom I did not conduct questionnaires. Nevertheless, some people with whom I spoke to during my observation told me that they work as shop assistants, day labourers, security guards, housewives as well as high school and college students.

Formed by assiduous fair-goers, mostly north-eastern migrants aged between 18 and 40 years old, the group has about three thousand posts per day. That number increases to around four thousand per day from Friday to Sunday (due to the weekend parties). Many of the posts refer to physical meetings they establish in everyday life, with postings of videos and photos of past events. The number of posts increases considerably always after a physical encounter with photos and videos from the event and the comments about what happened. Displays of affection in the virtual group become more intense after the group meets physically. You can see in the following passage (fourth frame) where one of the participants wrote, "my 'bad good' little gang" in the caption of a photo of the group, in an ironic way (Fig. 1).

In the online conversations of the group, as well as in physical encounters, there are constant references to their place of origin, making comparisons between life experiences in their hometown in the Northeast and the lifestyle that they have in Rio de Janeiro. As there are some members who are natives from Rio, with little or no contact with the Northeast, the information about the region also has a didactic purpose (Fig. 2).

A representative part of the posts in the online group are audios with voice recordings of the members. Among the themes that are highlighted in the extracts below, participants mobilize the community to have physical meetings.

> Good morning gang. Today is Friday; the week is starting now, the week of alcohol. Everything is our, [swear word]! LOL (group administrator calling for the weekend);

> I want to see us charter a van and go to "Caldas Country", Goiás state, from October 31 to 1st November. Several bands including "Henrique e Juliano", "Garota Safada" and "Aviões do Forró" (a man proposing a trip to a party in Goiás, state in the Midwest of Brazil; he references, respectively, to a duo of singers from Tocantins state and a singer and a band from Ceará state);

> [Swear word], our group is [swear word] weak, you cannot stand several parties. In the holiday weekend for us and enjoy, but you guys are discouraged. Damn, I'm saying, bro; I don't believe that, guys. You're crazy, bro (a man complaining about the refusal of someone to go to a particular event);

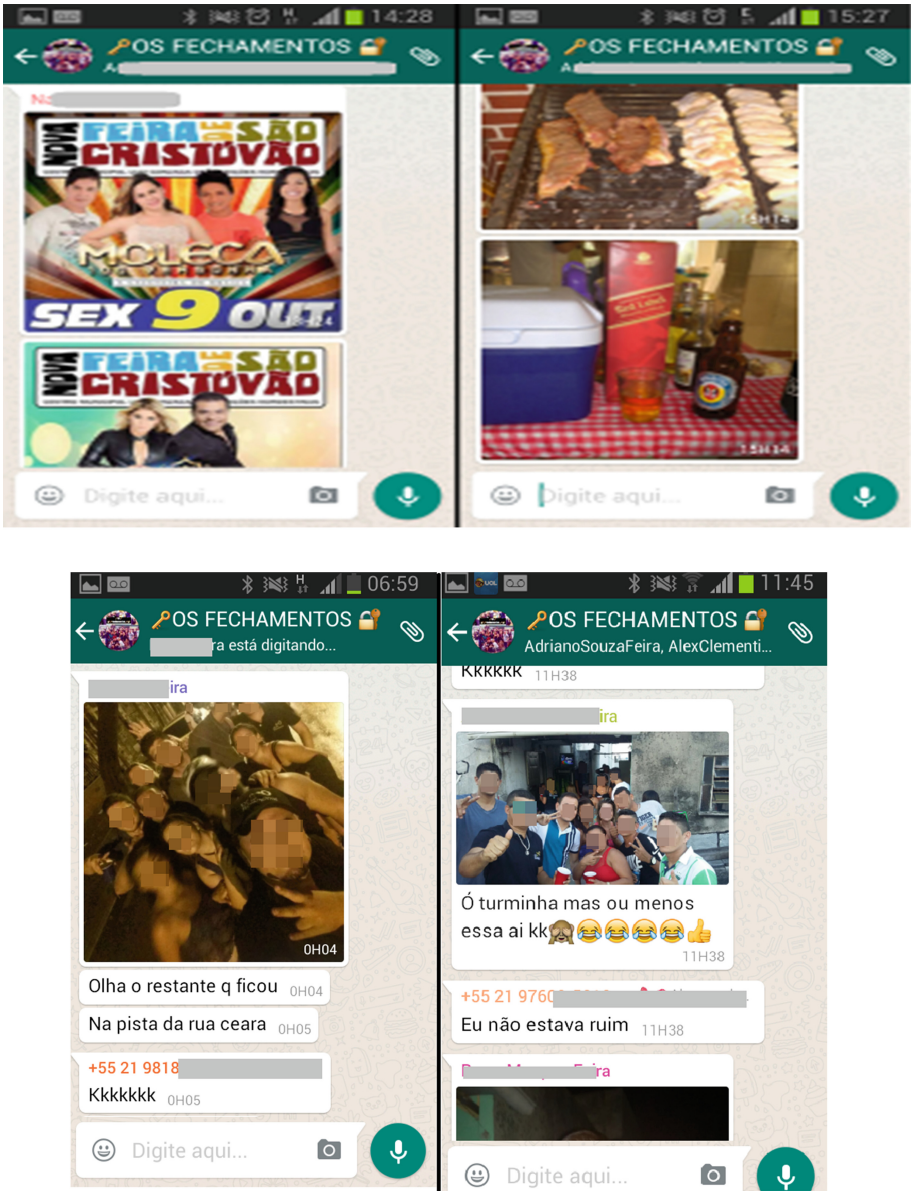

Fig. 1. Posts on WhatsApp group: (1) party advertising at the São Cristóvão Fair; (2) food and drinks in one of the group barbeques; (3) and (4) photos of members on two physical meetings (The conversations of the group are in Portuguese, the official language in Brazil. In the third column: person1: "Look at the rest of the people who stayed on the Ceará street"; person 2: "(laughter)". In the fourth column: person 1: "my 'more or less' little gang" (laughter); person 2: "I wasn't bad".) (Source: author)

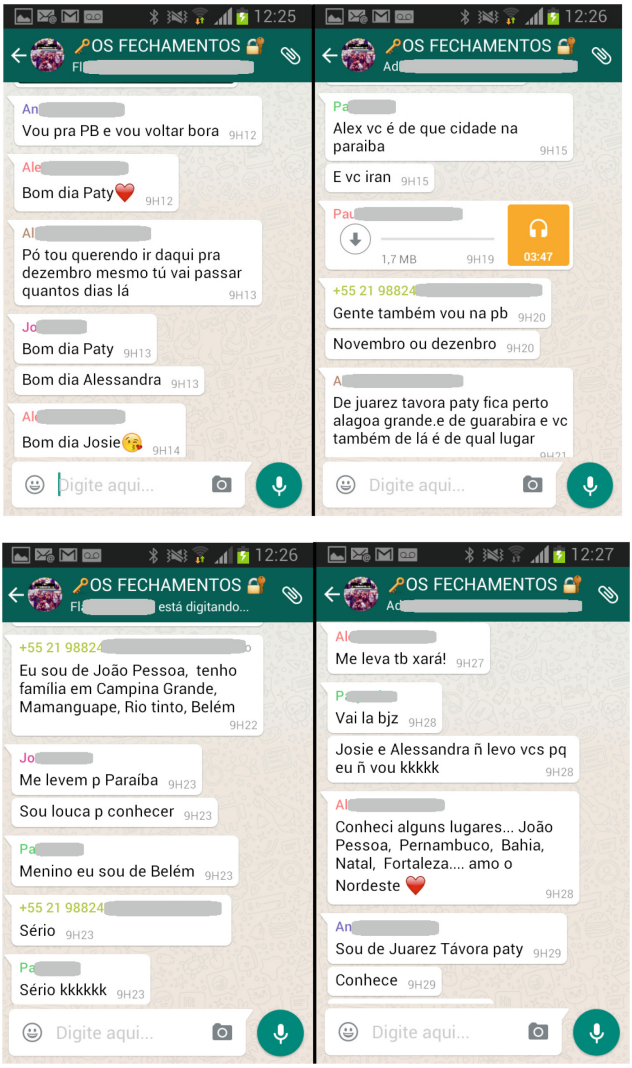

Fig. 2. Conversations about hometowns; above, one participant is from Rio de Janeiro and the others are from the Northeast, but live in Rio (Column 1: person 1 "I'm going to Paraiba (state in north-eastern Brazil) and I will return, let's go?"; person 2: "Good morning, Paty"; person 3: "[Swear word], I wanna go until December; how many days will you spend there?"; Person 4: "Good morning Paty, good morning Alessandra "; Person 2: "Good morning Josie." Column 2: person 1: "Alex, which city in Paraíba where are you from?"; person 2: "People, I also will go to Paraiba, in November or December"; person 3: "From Juarez Tavora, Paty, it's close to Alagoa Grande and Guarabira. And are you from there too? Are you from which place? ". In column 3: person 1: "I'm from Joao Pessoa, I have family in Campina Grande, Mamanguape, Rio Tinto, Belém"; person 2: "Take me to Paraíba, I'm eager to know"; person 3: "Hey man, I'm from Belém"; person 4: "Really?"; person 3: "Really (laughs)." Column 4: person 1: "Take me too, my namesake!"; person 2: "Go on, kisses; Josie and Alessandra, I won't take you because I won't go (laughter)"; person 3: "I know some places… Joao Pessoa, Pernambuco, Bahia, Natal, Fortaleza… I love the Northeast"; person 4: "I'm from Juarez Távora, Paty; do you know?" (Every cities and states that are mentioned are in the Northeast of Brazil, inclusive Belém, that isn't the capital of Pará state, but a city from Paraíba state).) (Source: author)

I got to go, I got to go, and I love it! [swear word]! (a woman proves to be upset because she isn't going to the concert of the singer Wesley Safadão[1] (from Ceará, a state in the Northeast) in the Barra Music Club, in Rio; in your audio, it's possible to hear a singer's song in the background);

Hey guys, you'll post photos, guys, you will be posting everything, guys, and I won't have seen him (the singer Wesley Safadão). [Swear word]… I not even won't have a cup as recordation of the concert (the same woman then);

My bro, I worked so hard every week, I'm just relaxing my mind, soon I'll go away, I'm just enjoying, just enjoying; listen to this (a man is responding to other one who complained to him for not having been invited to drink; in his audio, there is a funk song from Rio (popular-massive gender associated to Rio de Janeiro) in the background, it seems a bar, where women scream singing the song);

Hey guys, good afternoon to everybody, I wanted to invite everyone who is free and who is going to Caju (a neighbourhood) today. Today I'm going there, in my sister's house, by token of her, she called me to go there. From there, I want to take a beer there, in Caju. If someone wants to go, if someone is, we can have a beer (Caju is a popular community next to the port area, close to the São Cristóvão Fair, where lives a considerable part of the group);

Hey man, make a date on a Saturday for us hang out. Do you live in Caju or Rocinha? (Rocinha is a popular community in Rio, known locally as "favela" ("slum");

I'm too drunk, I don't know how to get home, I ask someone to come get me (a man simulating being very drunk in his voice; in the background, it's possible to listening to a song of singer Wesley Safadão and people talking around).

In a hyper-connected society, new communication technologies cause considerable changes in the routine of subjects. However, to understand the connections between virtual and geographical worlds, it is necessary to carefully observe the contexts in which such technologies are consumed. In the case of mobile virtual communication, we need to consider the increasing complexity of the environments in which usersenter in online communication. It is essential to analyse the practices online and offline as interconnected (Hine 2004). In the specific case of this research, analysis of the online group in WhatsApp only makes sense if we find the connections with the interactions that its members have beyond the virtual and how they use the territory of the city in their everyday life.

5 Urban Interactions Beyond the Virtual

Not only does the São Cristóvão Fair need to be understood beyond itself given the context of Rio de Janeiro. The daily practices of north-eastern migrants must be understood within the reality of Rio. Although they are from the Northeast, the meanings attributed to their actions and their discourses are in constant negotiation with their current experiences that are peculiar to the context of a new city.

[1] "Safadão" is "big shameless" in Portuguese, with a sexual sense.

Although it intensified in the late 1990s the "return migration" from the Southeast to the Northeast, is still quite significant to the permanence of migrants who arrived in previous decades and for the more recent flow of migrants. Such phenomena changes the urban landscape of Rio, reshaping the local culture in a significant way. In addition to material presence, North-eastern communities also interfere symbolically in the territory of the city.

During the five months when I followed the group, there were five barbeques on the rooftop of the house of one of the members; six visits to the São Cristóvão Fair with the group; a concert at the Barra Music Club by singers Wesley Safadão and Gabriel Diniz (both from Northeast); and three visits to the Parque União Square (or Esperança Square, in the Complexo da Maré, a slum in North Zone of Rio), where there were concerts by forró bands. Parque União Square is considered the second sociocultural space in Rio de Janeiro of the "North-eastern community" (after the São Cristóvão Fair)1.

The first meeting of "Os Fechamentos" that I went to outside of the Fair was organized by one of the administrators of the group on the rooftop of his home in the São Cristóvão district. There were 30 people and each one gave 30 reais2 to buy drinks and meat for the barbeque. There I met with people that I had only had virtual contact with until that point.

One of the members said she was "carioca" (an adjective used to describe people who are born in Rio de Janeiro), without any North-eastern relatives, but that she was fixated on north-eastern people and said that her last boyfriend was from Ceará state (in the Northeast). She said she could not dance forró and that she could only dance funk from Rio. She participated in a Wesley Safadão fan club, (a forró singer from Ceará). She reinforced: "I don't have any family in the 'North'", as some locals from Rio call the Northeast; as this is how it was referred to within an earlier division of the country. "You just earned a family from Northeast", says one of the group administrators to her, referring to the "Os Fechamentos" group as a "Northeast family" (Fig. 3). The following passage shows the relation of affection that members establish among themselves, the "North-eastern identity" being the mobilizing element.

The event mentioned above began at 3 p.m. on a Sunday and ended at midnight of the same day. From there, 14 people, "the stronger guys", followed in two vans (public transportation) to the Parque União Square, where we remained until 5 a.m. watching 'forró' bands perform. Amidst the celebration of the "success" of the barbeque, two administrators - proving to be upset with the fact that only 30 of the 88 members of the group went to the meeting - warned that they would remove people who did not interact on the virtual space (the "lurkers"). And so they did, as it's possible to see on Fig. 4.

Research developed by Preece et al. (2004) shows that "'lurkers' satisfaction with their community experience was lower than those who post". However, it's not possible to say anything about the lurkers in the community analysed, because it was not the focus of my research. It is only possible to say that those who post and, who have strong community ties, often remove some lurkers in order to encourage the participation of users who communicate little.

Soon after, one of the managers sent the following audio expressing his disappointment with "the guys":

Fig. 3. Conversation between a participant from Rio and one from Paraiba state (this last in north-eastern) in the group "Os Fechamentos" (Column 1: person 1: "(laughs); carioca who loves forró; Wesley Safadão (singer from Northeast); Good evening"; person 2: "Good night"; person 3: "Good evening; I am also carioca, a carioca from Paraiba (this is ironic, because "carioca" is these who was born at Rio de Janeiro)". Column 2: person 1: "(laughter)"; person 2: "Eri (emoticon with kiss)"; person 3: "I don't have any family in the 'North' (says "North", but she is referring to the Northeast)"; person 4: "You just earned a family from Northeast. Good night Marcinha".) (Source: author)

> People don't value things, you know? People don't respect friends. Friends! Many people join the group, but don't make friends… You have to know people here, to meet, to make new friends, to enjoy. It's not only on the São Cristóvão Fair, it's not only that. There's a lot involved, understand? It's a group, it's respect, consideration, to make new people to value it. I don't understand why people join it if they don't know the meaning of it. Why participate? Just to hear things and to take from one place to another? For what? So it's not necessary. So it's better (to remove the "lurkers"), because the group decreases and gets only people who are always together. Those people who aren't together will go out (audio of one of the group administrators, the day after the barbeque described above).

The discourse of the administrator reinforces the idea of "beyond the Fair", what I call here the "overflowing of the Fair". Consciously she mobilizes ties that revolve around something larger than the areas considered strategic to the unity of the group. The Fair and the WhatsApp group are tools that allow for what is central: the

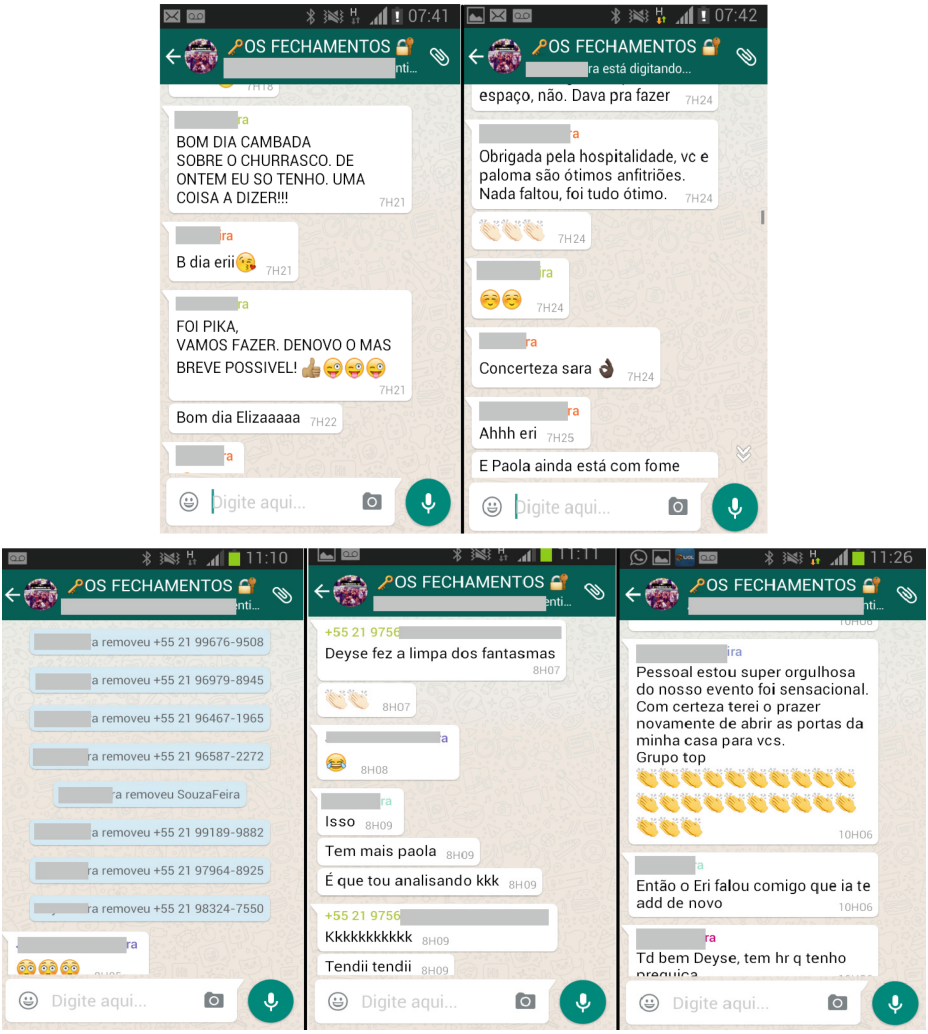

Fig. 4. Participants celebrate "success" of the barbeque; administrators remove "lurkers" (Column 1: person 1: "Good morning gang. About yesterday's barbeque, I just have one thing to say: it was amazing! Let's do it again, as soon as possible. Good morning Eliza"; person 2: "Good morning Eri." Column 2: person 1: "Thank you for the hospitality, Eri and Paloma are great hosts. Nothing was missing, it was all great"; person 2: "Certainly"; person 3: "Hey Eri, Paola is still hungry". In column 3, we see one of the administrators removing several participants who don't interact in the group. In column 4: person 1: "Deyse removed lurkers"; person 2: "(applauds emoticons)"; person 3: "There are more people, Paola, I am analysing (laughter)"; person 2: "(laughs); I get it, I get it". Column 5: person 1: "Guys, I'm proud of our event, it was sensational. Surely I will have the pleasure again to open the doors of my house to you. It's a great group".) (Source: author)

meeting. They are not ends, but means. The "overflowing" built by the group includes the São Cristóvão district, the community of Parque União and the community of Caju, spaces where a considerable part of the members reside and where a considerable part of the meetings beyond the Fair take place.

The places where the meetings take place are important because they refer to the Northeast to some extent. However, they are not central. Having the meetings as elementary, the group has already held four meetings in a single weekend, with a lot of forró and not much funk from Rio. It all started on a Saturday night with a Halloween party held on the rooftop of a member's house in São Cristóvão district, with about 50 participants, some of them costumed. In all events, the group decides whether to share costs or whether each person takes their own drink and meal. This time, the latter option won.

Around seven o'clock in the morning, a group of about ten "resistants" were "asked to leave" because the landlady wanted to sleep. Without wanting to finish the party, we put drinks into buckets with ice and we went out walking and drinking on the streets, screaming, taking photos and posting them instantly on the online group. We decided to take a bus and go to the house of one of the guys of the group, at the Parque União district. It is then, at midday, that this young man would organize a barbeque in another WhatsApp group also formed for fair-goers of the São Cristóvão Fair. The barbeque was on the rooftop of his house, a quadrilateral of about 50 square meters, with cemented floor, aluminium tiles, a toilet, a wash basin and a concrete counter. Under the rooftop, three residential floors: the ground floor, the house of his fathers; in the second, his brother; and in the third, his own1.

The "resistant" people of the Saturday party were gradually dispersing. Some left, others went home to get some rest and then came back, while three people stayed there until the beginning of the barbeque (which was what I did). At the end of the event in the evening, members of the new group plus the last night's group went, "altogether and mixed", to the Parque União Square nearby where there are 'forró' concerts on Sundays usually, with bands that had performed at the São Cristóvão Fair the night before.

Lucky for the excited group, the next day, was All Soul's Day. At midday, a new mobilization began through the WhatsApp group:

> A good party happens without programming, suddenly we make a date, at the last minute, and we make a good play. Where are the guys of the group? Express yourself here, [swear word]. Let's have fun. Today is All Souls' Day, [swear word], today is our day! LOL Let's drink and celebrate, let's have fun, make that barbeque, take a cachaça and chat a little. […] There is vodka, soda and energy drinks. We have to buy only meat and beer […] If ten people accept, the meeting happens (convocation in audio of one of the group administrators).

Each person should bring ten reais to buy meat. The drinks would be the remaining from Saturday's party, and many drinks were left over. And once again, the people were "together and mixed": about 30 people appeared on the rooftop of the house of another member of the group, in Caju district, to the sound of lots of forró and a little funk. Like all events, many photos and videos were posted instantly on the online group.

6 Final Remarks

The group does not make references to the Northeast all the time, but the regional identity element seems to be the moving-force of the investigated group. But this regional identity is not necessarily associated to the traditional culture. Another possible analysis is that online connections are strengthened when the physical meetings happen. It is not possible to understand the virtual community if we disregard the physical meetings that happen around the city.

The São Cristóvão Fair is used by many as a space of confluence for the "Northeastern community in Rio" and is a place of dialogue within technological tools like WhatsApp, which aggregates groups of fair-goers. The "to be together", that was previously experienced mainly in physical spaces (such as the São Cristóvão Fair and other physical spaces in the city), may now be at hand, in a virtual way, in virtual social networks.

Spaces like the São Cristóvão Fair and the virtual groups in WhatsApp are the tools that provide the meeting of a community with specific identity elements. The peculiarity is in the imaginary about the Northeast. The way they think about their regional community and reorganize their sociocultural ties in the territory of a new city. It is a dislocated territorial community which uses strategies to keep in constant contact.

The identity component is enhanced as ties are strengthened. But this identity change was in the beginning associated to elements that referred to the Northeast of Brazil. Now, new data from my research has shown that the identity of the neighbourhood and of the "party-goers" changed as the group identified less with their place of origin and more as party-goers.

In the contemporary world, the identity groups need to reinvent themselves, although they have similar goals in relation to the similar communities in the past: the meeting. People from the Northeast who invented the São Cristóvão Fair in the 1940s in Rio de Janeiro used the tools available to them at that time. Today, the similar and current communities reinvent its wiles, using the new technologies of communication forged by and for contemporary cities.

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Innovation Processes in Indigenous Communities in the North - Cultural, Psychological and Technological Knowledge in Practice

Eva Carlsdotter Schjetne(✉) and Synnøve Thomassen Andersen(✉)

UiT the Arctic University of Norway, Tromsø, Norway
{eva.c.schjetne,synnove.t.andersen}@uit.no

Abstract. The paper addresses psychological knowledge in innovation processes in rural areas in the North. The empirical base is the introduction of an innovation program realized through the University of the Arctic, a cooperative network of universities, colleges and other organizations committed to higher education and research in the North. We attempted to stimulate innovation in the rural villages of Northern Russia using workshops centred on building social capital through psychological knowledge. Our analysis shows that good family health and psychological knowledge among villagers is important for sustaining the innovation process in the North. We also found that technological infrastructure is a crucial but often lacking component in this process.

Keywords: Psychological knowledge · Social capital · Innovation · Technology · Culture

1 Introduction

The circumpolar region has unique challenges. The search for resilient and sustainable communities is shared by all the countries. The activities initiated through the Thematic Networks[1] under the University of the Arctic Aim at strengthening the cooperation between people with cross-border projects and shared practices. The area is sparsely populated, with long distances between settlements and administrative centres. Innovations and local solutions have to be culturally, economically and ecologically appropriate, the locals have to appreciate them and take them on as their own. An innovation process is understood not only as a technical, but also as a social process (Andersen 2013). Further, innovation can only take place in extended and close cooperation between people, both within businesses and other institutions, and between institutions. Such cooperation is likely to require mutual trust and understanding

[1] Finnmark faculty UiT Norwegian Arctic University (Tromsø Norway) University of Northern British Columbia (Prince George Canada) University of Saskatchewan (Saskatoon, Canada) Saint Mary's University (Halifax, Canada) Centre of the Westfjords, Iceland, regional Sakha (Yakutian) partners: Institute of Research in Humanities and in Problems of Indigenous People of the Siberian branch of the Russian Academy of Sciences, the Northern Forum Academy and the Institute of Applied ecology of the North.

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(Andersen 2013). Tödtling (1994) claims that innovation and technological change are created from already existing knowledge and skills, and develop along specific paths. Knowledge and skills are found partly in local institutions and business environments, which can lead to the development of regional paths for innovation development. According to Valsiner (2001; 2005), there is a need for knowledge of psychology as a whole for the study of dynamic, meaning-making human beings. Use of psychological knowledge is necessary to understand innovation processes (Valsiner 2001). For several decades there has been a varying focus on the involvement in different ways of users in development of new products and services, often including a description of users as sources of innovation (Von Hippel 1986). New technological opportunities in the form of mobile units and increased individual user needs are two of the driving forces for this trend today. Information Communication Technologies (ICT) can only affect participation if they are readily available. To secure access to ICT is of a great significance for participation in society, as well as for the development of different public services such as healthcare, democratic processes etc. Mobile communications technology has become the world's most common way of transmitting voice, data, and services, and no technology has ever spread faster. Cellular telephone subscriptions are expected to reach 8 billion by 2016.

The study in this article is based on a project of the University of the Arctic[2] from 2009–2014[3]. Over the last six years, cooperation within the UArctic network grew closer between Thematic Network on Northern Governance and Development, resulting in a Forum for Northern Governance and Development. More villages have been included in the development work, and the project work will continue in the coming years. The use of technology has been an important factor in this work. With this contribution, we wish to amplify what happens during the development of innovation processes by creating a social partnership, uniting academics, villagers, and the use of technology when psychological aspects are taken into consideration. Among the participants in the project we discuss, a group of scientists moved into the villages in Sakha Republic in Russia, and cooperated closely with municipality and regional administration and existing businesses in the area. In such activities, we claim that psychological knowledge can give helpful contributions in the innovation process with use of technology. It is essential to create an atmosphere of trust between the partners and actors in projects, since trust is the basis of innovation and creativity. Based on this the central research question of this article is:

[2] UArctic is a cooperative network of universities; UiT, The Arctic University of Norway (Finnmark University College, Alta), North Eastern Federate University, Institute of Finance and Economics and Development Psychological Aid Centre, Yakutsk, Sakha republic, Russian Federation. The network also include colleges and other organisations committed to higher education and research in the north.

[3] In 2007, a bilateral agreement of cooperation was signed with Sakha State University, now North Eastern Federal University (NEFU), and Finnmark University College. The frame of this cooperation was the Thematic Network on Local and Regional Development in the North, chaired by Finnmark University College and the joint scientific-education project "Innovative Development of the Northern Territories" chaired by the Institute of Finance and Economics (NEFU). The outcome of this agreement was the implementation of five different joint education, research and development projects in Yakutsk and rural Sakha (Yakutia) in Russia in the summer of 2009.

How can psychological knowledge contribute to the innovation processes with use of technology?

We have problematized the psychological aspect in the context of this rural area. More specifically, this study shows how to use different psychological perspectives in the innovation process. We highlight the challenges in use of mobile technology in this perspective.

This article is structured as follows: first, a presentation of the theoretical frame (Sect. 2), and thereafter, a presentation of the method and empirical basis in Sect. 3. Section 4 present the analysis and discussion of the findings, followed by a conclusion of the article.

2 Theoretical Frame

In this chapter, we will present our conceptual framework. We will begin with a brief discussion of psychological theory, which may offer better understanding of different psychological perspectives in the innovation process. Perspectives of social, cultural, and humanistic psychology can provide us with insights in how we can understand innovation processes, for example how close cooperation with municipality and regional administration and existing businesses are key factors for successful innovation in rural area (Aarsæther 2004). We will look closer at the concept of ICT which we have selected as part of our conceptual lens for the discussion and analysis.

2.1 Social Capital Perspective

Social capital refers to the social networks, informal structures and norms that facilitate individual and collective action. Most research on social capital refers to this original definition of the concept, which was made by Bordieu (1986). Research over the last decades has given evidence that social capital has significant effects on the effectiveness and functioning of regional and national governance (Bærenholdt and Aarsæther 2002; Ronnby 1995; 2009; Sørensen and Torfing 2006; Virkkala 2007). Social capital of a community is assessed in three dimensions: a combination of bonding (relations within the community), bridging (relations with other communities) and linkage (relations with formal institutions) (Putnam 2001). Putnam claims that economic growth, health and crime prevention are important sectors where action is desired. Lately there has been a growing interest in social capital and the impact on quality of life for the population. In health research, Åslund et al. (2010) have analysed a large population of Swedish adolescents where low neighbourhood social capital and low general social trust were associated with higher rates of psychosomatic symptoms, musculoskeletal pain and depression. According to World Health Organization (WHO) (2004), depression heightens the risk for suicide. Research over the last years has found that the presence of social capital through social networks and communities has a protective quality on health (Ledogar and Fleming 2008). Individuals who are embedded in a network or a community, rich in support, social trust and open information and clear norms, have resources that help them to achieve health goals. These factors can

discourage individuals from engaging in risky health behaviours such as smoking and binge drinking, behaviours common in the northern regions (Bolin et al. 2003).

According to Bronfenbrenner (1979) psychological and behavioural factors point to what motivates individuals to engage in building social capital and how that engagement is maintained and improved. Such perspectives on social capital highlight psychological concepts and research as a contribution to community development practice. Bronfenbrenner (1979) claims that reframing of social capital theory, using a multi-level ecological system theory framework. Perkins et al. (2002), argue that this ecological framework provides an understanding how individual empowerment works.

2.2 Cultural Psychology Perspective

Cultural psychology plays an important role in understanding forces active in creating social capital (Perkins and Long 2002). These include a variety of other positive community-oriented cognitions, such as communitarianism, place attachment, community satisfaction, pride of place and confidence in the future of one's community. A study among three indigenous communities in Manitoba, Canada has showed how a culture of trust, norms of reciprocity, collective action and participation along with inclusive, flexible and diverse networks are important qualities regarding social capital (Mignone and O'Neil 2005). Shweder (1991) argues that we have to be prepared to have a critical attitude towards our own professional knowledge as well as to be sensitive to local knowledge traditions. To be aware of the cultural aspects in transference of not only psychological, but any theoretical knowledge, is necessary in our developmental projects. In the indigenous regions the primary industries like reindeer husbandry, fishing and hunting are closely connected to ethnic identity and spiritual life. Indigenous children that were separated from their families in Finnmark, Norway has expressed deep feelings of loss, not only regarding people but also nature and place (Hanssen 2006). Thus place attachment is believed to lead people to stay and protect what they cherish most in their communities while mobilising to invest time, energy and money when the community future existence is threatened (Perkins et al. 2002).

2.3 Humanistic Psychology Perspective

Humanistic psychology recognises that human existence consists of multiple layers of reality: the physical, the organic, the spiritual and symbolic and the phenomenological. The humanistic approach has its roots in phenomenological and existentialist thoughts, from Kierkegaard, Nietzsche, Heidegger to Merleau-Ponty and Sartre.

The holistic, multi-dimensional perspective of the Humanistic psychology has generated a wide variety of approaches that expand the range of options for dealing with psychological, psychosomatic, psychosocial and psycho-spiritual conditions. It is emphasized that psychotherapy is not only of value in dealing with bad mental health, but also in promoting good health and psychosocial wellbeing. In this range, we use the perspectives Salutogenetic and Resilience. Antonovsky (1979) describes the salutogenesis concept, how people survive, adapt and overcome severe life-stress experiences. Resilience is a related concept, the result of individuals being able to interact

with their environments and the processes that either promote well-being or protect them against the overwhelming influence of risk factors. Rutter (2008) claims that these processes can be individual coping strategies, or may be helped along by good families, schools, communities and social policies that make resilience more likely to occur. According to Ledogar and Fleming (2008), resilience in indigenous regions, researchers of indigenous health relate to the impact of culture, history, community values and geographical settings.

2.4 Innovation in Information System Research

For more than a decade, the Internet and use of PCs and mobile phones has been accessible to a large number of users and have provided a possibility to experiment with different forms of innovations, and users can both make and participate in innovation activities. The general understanding of innovation is more or less the same, although the definitions differ slightly. A general definition of innovation is: "*the introduction of something new, a new idea, method, or device*", (Webster dictionary, online[4]). The sources of knowledge and innovation are both inside and outside of organizations and social drivers of innovation are important (von Hippel 1995; Tuomi 2002, pp. 23–25). Users have a central role in shaping innovation processes, as they have a strong influence on the social side of innovations, modifying and improving the products, helping to shape technology in all its phases (Tuomi 2002, p. 4). Tuomi (2002, p. 21) claims that technology exists as technology-in-use in the context of a specific practice, and that the starting point for innovation studies therefore must be on the social practical level. Christensen and Bower (1996) claim that various types of innovations involves changes in the application of ICT. Swanson and Ramiller (2004, p. 536) define innovation in technology as "*...the pursuit of IT applications new to the organization*", while Swanson (1994, p. 1072) defines it as "*...the organizational application of [...] Information Technology*". Resembling other types of innovation, IT innovation development is based on different sources that cover a wide range of activities in the IT value chain implying that an information system innovation must traverse through a complex ecology of multiple types of innovative events (Swanson 1994; Lyytinen and Rose 2003a, b). Lyytinen and Rose (2003a) claim that ICT innovation is "*the creation and new organizational application of digital computers and communication technologies*". Innovation and technological development has–to a much larger degree–been viewed because of relationships, networks and knowledge exchange between actors and, internally as well as externally, in an organization (Andersen 2013).

3 Research Method

The research method used in this research is case study in the interpretative tradition. Qualitative research methods are used to understand and explain the social phenomena related to psychological knowledge in the innovational process. This research approach

[4] http://oxforddictionaries.com/definition/american_english/innovate 2013-03-20.

enabled one of the authors to describe and understand personal meaning, social phenomena and the experiences from people through data collecting methods such as interviews and observations in its natural environments (Repstad 1998; Thagaard 2004). By focusing complexity within human understanding according to the development of the situation, Walsham (2002) claims that you may not define the dependent or/and independent variables in the first place. According to Mathiassen (2002), the weakness of practice studies such as case studies, surveys and interviews is that it separates research from practice. In this research use of qualitative methods enabled us to reflect deeper on the experiences from the project and to systematize the insights that were gained during the process.

The project was organized within the U-arctic Thematic Network "Local and Regional development".[5] The aim was to build capacity for sustainable business and community development in remote regions of the Sakha Republic (Yakutia) through integration of theory and praxis-based knowledge and competencies. The development of the work processes was literally "on the ground". Use of mobile technology and PCs was a central tool in this innovation process, sharing and exchanging information. The different project participants/partners were met in their daily life and in their own context. The project developed as a cooperation between the different actors. The different partner's needs and interests were discussed and became a guide for the choice of theoretical approach. Such a way of working became useful for the villagers and the administration. They were free to their use their own strengths in their search for new and positive strategies for the future. This is in line with Heidegger's analysis that we strive to establish a balanced, symmetrical way of cooperating and sharing each other's universe/life world.

The empirical material emerges from qualitative data sources such as individual interviews, observations and document reviews (see Table 1). Combined with the analysis of relevant literature, the workshops guided the remaining data collection processes. A total of 230 interviews were conducted, lasting between 30 min and one hour each. All interviews were based on an interview template developed based on the themes identified in the planning of the project. The project team did the organization of workshops. The project group had access to the project information and data from servers through Internet, which were located in Norway, Canada and Russia.

The project workshop and seminar series was called *Strategies for future development*[6], which followed UiT's Business School[7] activities to stimulate local entrepreneurship in Arctic through new knowledge in economy and business administration. The aim was to highlight that the business entrepreneur does not exist in a vacuum; their success is dependent on financial matters as well as access to ICT, support from the local administration and institutions. However, support and acceptance from family, neighbours and fellow citizens is equally important. A goal for the

[5] A partnership between Finnmark University College (FiUC), Alta, Norway and the Institute of Finance and Economics at the North-Eastern Federal University of Yakutsk, Russian Federation.

[6] The seminars was based on a model developed by Sissel Fredriksen and Tor Gjertsen, Finnmark University College.

[7] https://uit.no/om/enhet/forsiden?p_dimension_id=88167.

Table 1. Data collection methods used

	Type of activities					
	2009	2010	2011	2012	2013	2014
Observation (during participation in meetings and user courses)	Meetings with village administrators and key-persons 8. Village workshops 5 Business school activities 2, 36 participants Autumn conference, Gargia 38 participants	Meeting with village administrators and key-persons, 12 Village workshops 2 Business school activities 1, 22 participants Autumn conference, Gargia: 40 participants	Meeting with village administrators and key-persons: 4 Village workshops 2 Business school activities 2, 16/14 participants Autumn conference, Gargia: 44 participants	Meeting with village administrators and key-persons: 16 Village workshops: 5 Business school activities: 2, 16/16 participants Autumn conference, Gargia: 40 participants	Meeting with village administrators and key-persons: 10 Village workshops: 3 Business school activities: 2, 14/16 Autumn conference, Gargia/Tana 65 participants	Meeting with village administrators and key-persons: 12 Village workshops: 3 Business school activities 1, 20 Spring conference, Gargia/Oktemtsy 80 participants
Interview	Interviews with 42 participants and stakeholders	Interviews with 28 participants stakeholders	Interviews with 46 participants and stakeholders	Interviews with 38 participants and stakeholders	Interviews with 36 participants and stakeholders	Interviews with 38 participants and stakeholders
Document analysis	project documents	meeting notes, emails and reports		user-training notes, workshop documentation		

workshop was to create an atmosphere of social and economic entrepreneurship, but also for the village administrators to see the importance of successful small businesses for the future community development. All information from the workshop was stored via PCs on the server. During the workshop the participants used mobile phone or PCs to share and exchange information. By taking an active part, administrators from the villages develop a growing awareness of the necessity of developing healthy communities to secure a sustainable development in the region. Use of mobile technology in this process became important for building new networks, making friendships and knowledge exchange between the actors in the project. Every workshop, seminars/courses or other project activities were evaluated continuously during the work processes. In the 2014 evaluation report the director of the Institute of Finance and Economics Yakutsk, commented:

> "*a series of psychological seminars and training sessions that became one of the decisive factors in the realization of the project's goals […] topics were youth adaptation, solutions for family problems, the removal of social tension and the growth of trust, openness and the establishment of friendly contacts…*".

Recognizing the motivational power that lies in the connectedness among the villagers to their place, cultural practices and social interactions had an immediate positive effect on the participants in the project seminars and business school courses. In the project period from 2009, our aim was to test if this positive effect of including the psychological dimensions had a lasting positive effect on the innovative processes based on the use of technology. Two psychologists joined the team of scientists.

Special sessions of family-therapy/family work exercises, narrative techniques and sharing of important psychological knowledge, empowerment and creativity was included in the activities. In these seminars, we act as process guides and demonstrate through our teaching the principles underlying the techniques and methods in communication, relation building and family work. The participants explore techniques for communication in exercises using role-play. Like working with families, we have an empowerment perspective in this work. The participants play an active part in finding good coping strategies. We also taught how to analyse and sort out problems and to be aware of the salutogenetic and resilience perspectives. From a community work perspective, we introduced "family–work seminars" to build family therapy competence among local health personnel, social workers, teachers, police and voluntary community workers.

All the participants had their own mobile phone (updated to smartphones during the project period) and PCs. Access to ICT was crucial to exchange, share and provide information from the project seminars and business school courses. Actors who participated were business school students, social workers, teachers, health workers and key persons in the municipal administration. Gender aspects, like women's role in business development became relevant early in the project period. Women were in majority among the participants, and family matters became a theme in many discussions. One specific happening in 2010 illustrates how the project strived to be sensitive to culture and place attachment and flexible to meet the emotional and social needs of our partners in the villages. A devastating flooding, because of ice barriers that had been building up in the enormous Lena River suddenly broke and reached the shore-settlements in minutes. Many homes were damaged and cattle died but luckily, there were no severe casualties among the villagers. Together with the village mayors and their administrations the planned seminars were restructured to meet the new situation and became helpful in other ways than had been planned on beforehand. Another similar situation when the village seminar content was restructured to meet the immediate needs of the villagers. In 2014, participants from the project group visited a north Siberian settlement to arrange workshop on strategies for future development. The village was in great grief. The week before, a young man together with an older man, a father of three children, had disappeared on the river returning from a visit in a neighbouring settlement. Except for the empty boat there as no track of the two men. The participants in the workshop showed a seriousness and concern, not only for the families affected by the accident, but also for the future of the settlement. They were open about the challenges and threats from the severe alcohol abuse, a problem that earlier had been denied. Together with the villagers we helped them to turn the grief into motivation to continue to fight against the private profit oriented sale of alcohol and to support the democratic and transparent village administration initiated by the new female mayor.

Openness, democratic attitudes and support from the village administrations was a critical factor for the projects to end successfully. In one region, we had very little success. It was crucial to exchange, share and provide information with use of ICT. There was a long history of distrust between the villagers and the administration, allegations of corruption, social problems and severe drug abuse. No seminar is alike and develops its own special dynamics. It is our responsibility as process guides to

respect the participants and their contributions and see too, that the participants act the same way to each other's contributions. This is in accordance with the practices of constructive communication.

4 Analysis and Discussion

4.1 Innovation Processes and Building Social Capital: Psychological and Technical

The aim for all the activities conducted during the five year project period was, through empowerment, to build capacity for sustainable business and community development in the 12 villages taking part in the project (some villages had more than one village seminar). From the interviews and observations of working processes, we can conclude that most of the project goals were reached even if the degree of economic success varied. The creation of social partnership between the villagers was successful and both groups gave credit to the heightened awareness of psychological and cultural factors in the communication between the different partners in the working processes. Using psychological knowledge and giving room for dialogue in collaboration, we managed to establish a balanced, symmetrical relationship between scientists and villagers/village administration and between the villagers. A relationship they had rarely experienced, they had expected to meet with an asymmetrical relationship with "experts" telling the villagers what was the "right ways" for future development. Their new psychological insights led to a sense of personal power regarding one's choices in life as well as the development of a sense of collective efficacy, what community psychologists refer to as empowerment (Perkins et al. 2002). This is in line with Andersen (2013) stating that innovation only take place in extended and close cooperation between people, both within businesses and other institutions, and between institutions. Such cooperation is likely to require mutual trust and understanding (Andersen 2013). From the social capital perspective, mutual trust (bonding) eased the joint efforts from villagers and scientists to identify what may help or not, in mobilizing the formal and informal social assets in the different communities.

According to Putnam (2001) social capital is bonding (or exclusive) and/or bridging (or inclusive). Bonding social capital in this study denotes ties between participants in similar situations in the villages, such as immediate family, close friends and neighbours.

Bridging social capital, encompasses more distant ties of "like persons" as loose friendships and social situations of work. Woolcock (2001) claims that linking social capital, which reaches out to unlike people in dissimilar situations, such as those who are entirely outside of the community, enable members to leverage a far wider range of resources than are available in the community (pp. 13–14). ICT has a role to play in building social capital in the bridging function, however that role will depend on how individuals, communities, organizations and governments incorporate ICT into their lives and social structures. Aarsæther (2004) claims that cooperating closely with municipality and regional administration and existing businesses in the area are key factors for a successful outcome regarding a sustainable community. We highlight that

ICT is a key in this work. Tuomi (2002) describes innovation as a network activity in which the traditional conception of organizations was emphasized to a lesser extent. By focusing on the "combinational" and the "organic" model of innovation, in which various competences and developments interrelate, innovation becomes construable as what it is, namely as a social process.

Access to the internet is of great importance for the entrepreneurs in small remote villages. In this respect we will include computer literacy as a valuable asset in social capital. To have effective home pages with the possibility to reach and develop a market for their products and sales through payment facilities can secure a sustainable economy. We have many successful examples from the projects. There were several entrepreneurs specializing in rare niche-products that required unique skills in making and often expensive, materials where the market and people willing to pay a good price were far away in the big cities like Moscow or St. Petersburg. Through Facebook and the Russian versions of social media, they also arranged distribution of the products among social networks. Especially for exclusive and highly priced cultural artefacts and traditionally prepared food.

According to Andersen (2013), choice of technology is an important part of many projects, but strategies, processes, people and culture are also important aspects. Users are often familiar with social media, and they expect to find similar utilities in other settings, not least in the workplace. It is important to develop innovation strategies that address user's needs, possibilities and necessary utilities. Von Hippel (2001) claims that "As toolkits are more generally adopted the organization of innovation-related tasks seen today, especially in the field of custom integrated circuit development, will spread and users will increasingly be able to get exactly the products and services they want – by designing them for themselves (p. 256). The challenge is the broadband and mobile infrastructure in the Sakha republic. It is unevenly distributed, some of the areas we worked in were well (or became good during the project years) covered by both broadband and telephone networks, while other areas are almost without any coverage at all, with difficult satellite solutions. In the close cooperation with municipality and regional administration, institutions and both existing businesses and new entrepreneurs in innovation processes regarding future community development technology and internet access plays an important role.

4.2 Different Psychological Perspectives in the Innovation Process

Our research question was whether psychological knowledge can contribute to the innovation processes with use of technology. Humanistic psychology has since 2009 served as a guideline for building relationships in all communicational activities. The holistic, multi-dimensional perspective made us aware of the interaction between individuals and communicational technology regarding the psychosocial wellbeing among the villagers and their relations regionally, nationally and globally. Spare time was used on social media, online games and television. We found that there is a need to finding ways to implement online public services more accessible to participants in villages. The costs for online publishing and make essential public service information available online in languages of major ethnic minorities, is low. This does not only give

practical access barriers, but also introduce a psychological benefit in the form of strengthening the feeling of not being overlooked and of having a stake in the administrative community system.

Our analysis shows that psychological wellbeing and empowerment of the village families and their children is equally important in both economic and social development regarding sustainability. When we were confronted with mental health and family problems meeting both administrative staff and the villagers they appreciated the way we could offer both help and education in family-therapy techniques.. In addition to being great personal tragedies for the victims of violence, drug- and sexual abuse and suicide, the social relations and the level of trust within the community was threatened. In the villages mentioned earlier, struck by the disasters and tragedies, cognitive and social psychology together with the psychotherapeutic knowledge we shared with the involved people had positive effect and strengthened the ties in the innovation processes.

Analysing the interviews after the seminars show that the participants become more able to interact with their environments by using technology. In line with Rutter (2008), we also found that these processes could be individual coping strategies, or could be a strategy for families, schools, communities and social policies that make resilience more likely to occur. This is in line with Satir (1967; 1972), who claims that there is hope for a better future for even the most troubled families.

All the participants comprised a varied group based on their different cultural and social traditions in terms of whether our origins were Norwegian, Russian, or belonging to the many Sakha indigenous tribes. The various interests and preferences of these users had to be handled appropriately through the innovation process. In our business development projects we had to deal with challenges related to environmental psychology and identity of place. The development work in several communities we visited had to deal with environmental challenges. Mining and exploitation of oil resources in the arctic region will have a profound impact on primary industries as well as the psychosocial wellbeing of the local population. In the indigenous regions, the primary industries like reindeer husbandry, fishing and hunting are not only important economically, but also regarding ethnic identity and spiritual life. The analysis of the observation in the study, highlight that cultural knowledge was important for understanding forces active in the innovation processes for a positive outcome of the business projects. Knowledge of the local community, organization and unique local culture(s) and practices became important in the cooperation with the participants.

As participating observers, we had to be aware of our own role, and be able to utilize the respondents. This is in line with Wadel (1991) and implies that you have to have knowledge of your own culture as well as the informants' culture, in order to interpret data coherently. Some of the challenges we found were related to the ability to interpret and understand the social structure of the community. We were able to formulate better questions to our working partners and received answers that were more informative. Communication can make invisible aspects of culture more visible, such as norms, beliefs and values. In the continuous evaluations of the innovations work processes, and from the interviews we learned that misunderstandings and conflicts were few and both scientists and participants mentioned that the working processes had been exceptionally constructive compared with earlier working processes.

5 Conclusion

The study shows that understanding psychological aspects can help community developers to identify what may help or not, in mobilizing a particular community's formal and informal social assets. In such innovation process, use of technology can be a rational driving force for meeting the challenges faced by organizations in the change processes. Use of technology in cooperation with municipality and regional administration and existing businesses can be a key strengthening democracy and social capital, and were use of methodological triangulation can contribute to richer and more detailed knowledge of these phenomena.

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Reconceptualising Personas Across Cultures: Archetypes, Stereotypes & Collective Personas in Pastoral Namibia

Daniel G. Cabrero[1(✉)], Heike Winschiers-Theophilus[2], and José Abdelnour-Nocera[1,3]

[1] School of Computing and Engineering, University of West London, London, UK
daniel@personas.technology, jose.abdelnour-nocera@uwl.ac.uk
[2] Faculty of Computing and Informatics, Namibia University of Science and Technology, Windhoek, Namibia
HeikeWinschiers@gmail.com
[3] Madera Interactive Technologies Institute, Funchal, Portugal

Abstract. The paucity of projects where persona is the research foci and a lack of consensus on this artefact keep many reticent about its purpose and value. Besides crafting personas is expected to differ across cultures, which contrasts the advancements in Western theory with studies and progress in other sites. We postulate User-Created Personas reveal specific characteristics of situated contexts by allowing laypeople to design persona artefacts in their own terms. Hence analysing four persona sessions with an ethnic group in pastoral Namibia –ovaHerero– brought up a set of fundamental questions around the persona artefact regarding stereotypes, archetypes, and collective persona representations: (1) to what extent user depictions are stereotypical or archetypal? If stereotypes prime (2) to what degree are current personas a useful method to represent end-users in technology design? And, (3) how can we ultimately read accounts not conforming to mainstream individual persona descriptions but to collectives?

Keywords: Personas · Stereotypes · Archetypes · Collective personas · User-Created personas · User-Centred design · User experience · Namibia

1 Introduction

Persona is a designerly communicational artefact in Human-Computer Interaction. Persona was originated by Cooper [1] as a representative of a specific group of users sharing commonalities when interacting with technology products or services [2]. Persona thus endeavours to inform design on the needs, requirements and aspirations of each of these groups of users regarding technologies or technological innovations. Paradoxically, however, some utilize persona to capture user-data that they then build upon assumptions and not on actual grounded data [3]. Besides Nielsen and Hansen [4] indicate a scarcity of empirical research on personas as research foci, which as a result

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endures a lack of consensus on what this artefact comprises, as well as in many researchers and practitioners' reluctance to embrace it in design decision-making [5].

Experiential paucity is greater outside technology dominant settings [6], with persona mainly deployed following User-Centred Design (UCD) mainstream approaches –be this qualitative, quantitative or a mixture of the both [7]. This is a rather dangerous procedure as it can lead to users' misinterpretations through misrepresentations. Nielsen [6], a persona advocate and expert, ultimately questions whether different cultures may understand personas differently; while from India Chavan [8] acknowledges conceptualising designerly tools, techniques and methods like persona vary across cultures, as otherwise data captured by a method originated in one culture, if deployed in a different setting, it will taint this data, thus final outcomes may no longer legitimately correspond to the authenticity and veracity of the latter cultural milieu.

To further advance persona empirical research in cross-cultural sites this paper presents, debates and reflects on User-Created Persona (UCP) sessions in rural Namibia. This specific study condenses the findings presented at CaTaC by Cabrero et al. [9]. The study holds persona as research foci, while it belongs to a larger project where personas are co-created with urban and rural Namibian societies from different ethnic groups, namely ovaHerero, ovaHimba, Ovambo and Khoisan [10–14].

The core objective of the larger project is to discern cross-cultural representations of the persona artefact, and as such to attempt answering the following questions: (1) how do different Namibian populaces take-on, understand and co-create persona artefacts capable of representing their technological needs, requirements and desires; (2) what cultural assumptions may emerge regarding typical creations and depictions of personas and how these differ or mimic usual values, guidelines and concords, and (3) whether the persona co-design process, be it undertaken with users, may depict legit persona proxies relevant to the design of useful and gratifying technologies.

To answer such queries we began to co-design personas with ovaHerero citizens. In this process we encountered a set of additional questions regarding stereotypical, archetypical and collective persona events and depictions: (4) to what extent user representations are stereotypical or archetypal? If the former primes, (5) to what degree then are current personas still a useful method to think about users of systems designed or in the process of design? And, (6) how can we ultimately interpret accounts not conforming to typical individual persona description but to collectives?

Given the above questions, this manuscript first explores literature on personas, stereotypes, archetypes and collective personas to frame our accounts of UCP depictions. Second we propose the methodological approach related to the findings in the paper. Third results are presented as stereotypical, archetypical and collective portrayals. Fourth a reflection and a commentary regarding UCP as co-designed with ovaHerero pastoral communities tackle the concepts and the data presented, and scaffold our argument to guide the paper and the possible consequences regarding further theoretical and empirical research on personas in cross-cultural milieus around the globe. Ultimately a set of conclusions emerging from the data presented draw a close.

2 Persona Introduction and Conceptualisations

A brief literature review clarifies the persona concept and the distinctions between archetypes versus stereotypes, and between collective versus individual personas. Scaffolding from literature, findings across sessions are then framed to offer an account of the paths within the wider project and that keep persona research evolving.

2.1 Personas

Persona is a designerly tool generating from the UCD philosophy [1]. It works as a communicational proxy of groups of individuals sharing technological commonalities. Persona holds vital benefits such as (i) creating a solid understanding of target-users; (ii) providing early design requisites; (iii) introducing or reinforcing design thinking; (iv) enabling focus on users' goals and traits, and (v) portraying dimensions of the ecosystem where users operate. Further benefits of persona are stated in Cabrero [10].

Persona though holds on to a tendency by designers to use tacit [3] or explicit [1] assumptions on the users, instead of data grounded from user-research processes [15]. Persona also lacks an agreement about its definition, creation and its deployment [2], as well as it lacks on empirical research outside technology dominant settings [6]. Ultimately persona misses involving users in its creation and final representation [16]. As such, persona does not sustain a solid enough degree of scientific reliability [17], for what many designers feel reticent to use personas in design decision-making [5].

2.2 Archetypes vs. Stereotypes

Originally persona is held as an archetype of the end-users technology is aimed at [1]. Jung [18] defines archetypes as universal mythic characters residing in the collective unconscious of people across the world. Nielsen [15] claims archetypes as comprised of personality traits built on ideals of basic human patterns appearing as blends of stabled features defining the individual person. Archetypes according to Nielsen, thus, relate to three main dimensions typifying psychological preferences of an individual: extrovert-introvert, sensory-intuition, thinking-feeling [ibid]. These traits and dimensions Nielsen continues arguing that hold potential to communicating relevant user-data to the technology design process [ibid].

Stereotypes, however, are but shortcomings personas can easily result into [19]. Stereotypes are simplified clichéd ideas that express the way humans categorize people who are [or seem] alike by providing social images as synthesised reasons on why 'others' act as they do [15]. Under this situation it is not bizarre that Marsden and Haag state personas in design *run the risk of re-inscribing existing stereotypes and following more of an I-methodological than a user-centered approach* [20, p. 4017]. Ultimately, Nielsen claims that a persona resulting as a stereotype towards designing technological tools becomes *a so-called flat character with only one character trait and who does not create engagement or identification* [15, p. 62].

2.3 Collective Personas vs. Personas

Where persona acts a proxy of a set of users sharing commonalities about technology, Collective or Collaborative Persona (CP) comprises groups and communities by including relevant data informing the design of tools intended for collaboration [21].

CP dissimilates individual-based personas, amongst other features, in holding on to (1) multiple inter-related individuals playing specific if intertwined roles and duties; (2) a focus on collective goals and elaborating individual ones affecting collective's; and (3) new attributes characterizing collaborative aspects of the group's work [22]. Thus CP is aimed to groups with common behaviours, problems to solve, and interactions amid themselves as cultural or traditional groups. CP solves pitfalls whereby designers create collaboration tools by using methods focusing on individuals [ibid]. This is so for CP strives to lead to tools that are well-targeted at the group by addressing specific interactional properties of different types of collaborations in order to improve tool adoption of collaboration tools [ibid]. Thus this is an important shift in the culture of creating and deploying personas towards the design of technologies.

Furthermore, Gaudioso et al. [23] point out that collective portrayals of users often (4) involve considerations of dynamic social factors such as interactions and relationships between users currently not present in individual models such as UCD personas; (5) allow for an individual's degree of satisfaction that may importantly impact upon other group members through either emotional contagion or through conformity; and (6) allow to make visible challenges on physical, cognitive or social skills, as well as factors such as experience and availability. Ultimately, practitioners prefer CP when technological aims and collaborations are at stake due to the advantages this type of artefact provides [24].

2.4 User-Created Personas

Persona is typically deployed within UCD. This means UCD methods, techniques and artefacts such as persona are exclusively created and solely utilised by design experts. However, a main disapproval upon the workings of UCD as a philosophy in design, and by extension on the persona artefact, is that it neither grants users with methods, nor with artefacts capable of bringing about cultural and contextual nuances with which laypeople can achieve full appropriation of the technology design process [25].

As such persona empirical studies outside predominant settings are mainly carried out by designers themselves, usually following UCD guidelines and concords [26]. Functioning through methodologies originated somewhere else encourages ways of thinking and logics that may be far from those of milieus where a project is deployed. This enhances the prospect of using guesses and assumptions in cross-cultural design; it also endangers persona providing reliable user data to technology design processes.

A recent emergence of persona projects has, though, either pinpointed this situation or taken an active part in tackling the issue of *seeing 'us' when looking at 'them'*.

As design methods, tools and techniques differ across cultures [8], and due to the lack of persona research [4], we argue involving users in persona depictions will aid eliciting major cultural elements for the diverse societies where UCP is positioned.

This scaffolds from our theoretical appreciation [26] and practical study [10–14], and from inspiring, hands-on projects such as those presented as follows:

Lecomte et al. [27] deploy frugal re-design to create prosthetics for underprivileged amputees in Vietnam, and claim that when creating and deploying personas local knowledge must be taken into account and adopted. Their persona representations embrace dimensions of the ecosystem, for which they conclude that there is an imminent need for a locally situated awareness to respond to *new questions on the personas role and into collaboration for articulating implicit, local, embedded and grassroots expertise with more formalized information and methods* [ibid, p. 1].

In the Malaysian jungle Zaman and Winschiers-Theophilus [28] adopt and adapt the persona artefact in a Participatory Design project with some Long Lamai youth. Researchers propose creating depictions of local youth and elders in the surroundings by creating personas that possess a name, a gender and a set of usual characteristics. This facilitates the design process to first draw upon participants' necessities regarding styles of communication, and in turn it enabled the suitability of local affordances to co-design an SMS App based on a local disappearing signs' language.

In the attempt to co-create personas in rural and urban Namibia, our theoretical appreciation has in turn ascribed to what Chavan points out [8] in that persona is a westerly conceived method that either needs adaptation or full redesign when deployed somewhere else [26]. This we have observed through practical studies with persona as research foci, and whereby results have shown vital differences between UCD persona as it currently is and the methods to elicit data representative of the users for whom technological products or services may eventually be aimed at [10–14].

To reach a persona cross-cultural dialogue in design, thus to avoid misrepresentations, we then promote UCP for users to create self-representations aimed to support design processes. UCP works as an instrumental way to enable laypeople exploring and creating ways in which they desire to be depicted towards technology designs that, ultimately, strive to become useful and gratifying in people's daily lives.

Inspiration about UCP comes from *World Machines* defined by Light et al. *as a new archetype for systems that draw together computational powers to connect, sense and infer with a social agenda of crossworld collaboration… to raise the profile of tools that maintain a collaborative agenda and resist a tendency towards networks as giant surveillance and marketing devices* [29, p. 1]. Thus UCP aims to avoid cross-cultural misrepresentations by enticing heterogeneity and a myriad of respected viewpoints.

3 Methodology

The lack of persona empirical research beyond dominant sites is an irregular situation that can easily lead to user misrepresentations by seeing 'us' when looking at 'them'. In Marsden and Haag [20] terms, this is but to do with the very *person perception*. The methodology of our findings frames such perception via stages presented as per (1) context, (2) data collection and (3) analysis of the different sessions.

3.1 Context

Four sessions held with pastoral ovaHerero communities between 2014 and 2015 attempted to identify their cultural variant representations of personas. Sessions occurred in three different villages in the Omaheke region in the East of Namibia – Okomakuara, Erindiroukambe and Otjinene. A snippet about ovaHerero comes as:

OvaHerero comprise around 10 % of Namibia's populace (200,000). They do not seem to have developed historic, literary or artistic heritage, while literature on them is scarce and mainly focuses on the German genocide between 1904 and 1909 [30]. Today, ovaHerero are concerned with their kinships and wealth conveyed in cattle counts, though only elderly and some infants live in rural areas. Other kin have "temporarily" migrated to urban areas in search for further careers beyond agribusiness.

The aim was to explore and test UCP by building on and sharing benefits of persona via immersive, participated, experientially gained community design practice.

3.2 Data Collection

In the 4 sessions a set of assorted methods to elicit personas was gradually scaffold. The methods utilised were deployed chronologically and they did evolve as follows:

(1) a focus-group in Okomakuara with 8 female ovaHerero elders in October 2014;
(2) a 'persona' session in Erindiroukambe: 4 male elder and 1 youth in October too;
(3) a scenario narration in Otjinene with the same female above in November of 2014;
(4) a focus-group in Okomakuara with 4 male and 1 female elder in March 2015.

Worth noting, we did not intend to co-create personas at once but to probe diverse methods to find if data elicited would respond to queries proposed as in page 2 above. Also worth noting, methods did not focus in particular technologies but in the study of persona as the research foci per-se. However, as sessions with ovaHerero groups amounted we realised the complexity of our attempt in co-creating personas from a methodological and conceptual view. We observed occurrences of archetypical, self-stereotyping and collective representational accounts. At this point in research though, we can only speculate the cause for such variants by posing the following questions:

(4) To what extent user representations are stereotypical or archetypal?
(5) If stereotypical representations prime, to what degree are current personas still a useful method to represent end-users in technology design? And,
(6) How can we ultimately interpret accounts not conforming to mainstream individual persona descriptions but to collectives?

3.3 Analysis of Different Sessions

To answer the queries above this section groups sittings as per archetypical, stereotypical and collective accounts/depictions as they emerged. Thus Archetypes comprises

(1) a focus-group in Okomakuara in October 2014 with eight female elders, as well as (4) a focus-group also in Okomakuara with 4 male and a female elders. Stereotypes: (2) a 'persona per-se' session in Erindiroukambe with 4 male elder and 1 youth and (3) a scenario narration in Otjinene with 1 female. CP covers sessions (3) and (4).

3.3.1 Archetypes

In Okomakuara 8 local ovaHerero females engaged in a session inspired by the relevance of things that matter in October 2014. The first part was on *concrete things* that matter; the second dealt with *wishful possibilities* for future User Experiences (UX). The objective was two-folded: to introduce oral, visual and tangible stimulus via a tablet device to elicit relevant UX, and to then corroborate the UX by enticing partakers to think of possible futures based the concrete things as possibilities for progress. Two foreign facilitators carried this 2-step method with local researchers translating.

The sitting began presenting a family portrait from the tablet to provide intercultural interaction, trigger stimulus and elicit UX features scaffold from the abstraction of the family as a concrete concept for inspiration, meaning and design thinking (Fig. 1). Sequentially participants unanimously stated their love for and comfort with their families. Next they got asked about their likeability of flowers. Once a participant conveyed her love for flowers the rest tailed on endorsing such feeling.

In the next part of the session participants got enticed to convey *wishful possibilities* with no guidelines or a defined starting point. A participant conveyed her family discomfort due to her brother-in-law possessing the cattle she lost to widowhood and tradition, while her daughter firmly supported the livestock regain (Figs. 2 and 3). When further enquired about having flowers, they stated that none but the mother and daughter above (neighbours of another village nearby) had or looked after flowers.

By having proposed the above two-step method around *concrete things* that matter and then *wishful possibilities* for future UX, initial statements of family niceness and flora attention gave way to prompting issues of family disputes to do with legacies and tradition, and to the fact that flora barely exist in such a dry settings.

Thus this session initially provided misguided archetypical indications on mythic features and characters inherent to the collective unconscious of these participants. Apropos technology design this could have led to false results and misunderstandings. However outcomes also hinted the collaborative efforts through the collective behaviour in answering to the questions provided. On the other hand the session provided a

Fig. 1. Families

Fig. 2. Flowers in a tablet

Fig. 3. Mother-daughter discuss family issues.

relevant glimpse into things that matter to the participants when aspirations where let free to participants' own choice of expression.

In a subsequent session in March 2015 in Okomakuara a focus-group compounded of 2 female and 4 male elders devised a scenario of their choice where a young woman got pregnant and the father took-on the fatherhood. Participants described the young woman as raised by her mother while learning household chores and duties; whereas the young man was a gentle person capable of looking after the homestead and cattle, and taught farming by his father. Despite the amount of detail provided throughout the storytelling exercise, participants claimed nowadays this is an impossible scenario for youngsters are all gone from the village in pursuit of further careers in urban settings. Participants keep recurring to the past indicating previous generations dedicated to crafts such as stick-makers and horse-trainers which they yet appealed now as extinguished. They also claimed that in spite of the changes undergone in recent times responsibilities in the village for the youth are still but the very same. So when male youth come back to the village during school holidays they are still taught cattle managing, how to slaughter a goat, and how to look for cow-footprints. Participants argued such skills as still paramount even if usually living in the capital. They also exhorted that for urban girls to become women they must nurture the way they walk as ovaHerero and to be properly groomed. Participants also detailed despite school 'trains' children, these must follow tradition and customs when in the village and that, for instance, *the sun may not rise while one is still in bed!*

Regarding fun activities participants stated young men as hunters, horse riders, and catching cows and putting them down; also going in the field to look at the cattle. For girls it was about milking cows, fulfil domestic tasks, and playing *catching-the-girl*.

Lastly, when confronted with activities like football, modern music, earphones and technology, one participant stated those are bad things due to the amount of time they take away from youth. The others, though, said it is not all bad by any means.

Thus this session demonstrated conflicting archetypes with incompatible realities.

3.3.2 Stereotypes

In Erindiroukambe four elders and one youth met in a focus-group in October 2014. The session aimed to co-design personas per-se. It was led by a western researcher, while a local facilitator translated and accommodated the questions proposed.

Participants were first explained the concept of personas as typical people in the village and then they were asked to describe those. The conversation drifted into a self-stereotypical account of ovaHerero men (reiterating the significance of the men's hat, stick and chair as recurrently noted in other sittings stated in Cabrero et al. [14]) with a further emphasis on the ecologies of the context (i.e. homestead, holy fire, cooking fire and cattle) rather than the persons themselves. Next, participants were asked to focus on individual traits, which they did not understand. Subsequently they were asked to portray themselves as individuals. After a further lack of comprehension, they allocated themselves desirable features such as "the elder", "the youngster" "the naughty one", "the humorous one" and "the doctor or wise man" (Fig. 4).

This session in Erindiroukambe eventually showed a lack of understanding of personas, drifting into self-stereotyping and also over-simplifying archetyping.

In the attempt to avoid stereotyping, an ensuing session held in November 2014 in the town Otjinene enabled us to propose an elder woman to describing other persons through storytelling an initial scenario. The scenario was about her having first seen a school-girl passing-by in front of her homestead, and sometime later the father of this girl also passed-by asking the elder whether she would have seen his daughter around.

The elder stated that her recount on the facts would vary if the girl was in a hurry, looked calmed, or held a jumping rope, as she would look different in each situation. She also claimed that if the girl was in a group, the narration would be subjected to whether she had, for instance, committed a mistake, as in this case she was bound to be surrounded by others and put in the spotlight. As for the girl's physical appearance, the elder argued the girl being clean, well-dressed and groomed, and also respectful.

Fig. 4. Five participants; five one-single traits.

Then the elder got further asked to comment on the girl having become a woman. She claimed she would be a good wife looking after the house, though she remarked the woman would probably hold on to her personality as acquired during childhood. To clarify on traits and adopted behaviours she went on contrasting a good girl -the one detailed above- versus a bad one -clubbing, drinking, looking scruffy. Eventually she drew and coloured the school girl and the woman on a notepad (Figs. 5 and 6).

In comparison to the girl's the good woman's description did not bring about as many emotional states. This we argue because of the conformity to her social role within the ovaHerero culture. On the contrary, the settling of the contrast with the bad one who goes clubbing, drinking, and that looks scruffy provided detail entailing implicit emotional states through the traits depicted.

Fig. 5. Participant drawing

Fig. 6. Final drawings of school girl & woman.

4 Reflections and Discussion

We run four sessions with ovaHerero in pastoral Namibia to find whether persona conceptualisations carry cultural variants. This has brought up a set of vital questions around persona in relation to archetypes, stereotypes and collective depictions.

During such sessions we realised the complexity of our effort to elicit personas from a methodological and conceptual angle, as we observed such occurrences of self-stereotyping, archetypical and collective accounts, thus the further queries posed in this paper. Currently though, we can only speculate the causes for such variants.

4.1 Archetypes

Archetypes have come about in both sessions Okomakuara in that the mythic characters still reside within this particular collective when describing an ideal set of female and male youngsters, as well as when collectivising the information provided about family relationships and ecologies such as flora. Rather than unconscious, though, the people depicted, the young man and woman in pregnancy, have come as fully acknowledged in the existing situation. They have thus arise as argued by Nielsen [15] in that they have compounded of personality traits built on ideals of basic human patterns expressed as combinations of stabled features describing individual persons. This has been similar in Otjinene, whereby the elder woman clearly referenced dimensions characterizing psychological preferences and traits of an individual such as the school girl being extrovert or introvert depending upon the emotional situation, as well as via the array of possibilities she offered to this scenario regarding feelings. Equally the grown-up woman was described as ‘the humble wife’ as found through many ovaHerero narratives, thereby bordering amid archetypes and self-stereotypes. However these dimensions and traits have shown to be engaging to the participants’ conception of legitimacy, and which, besides, upholds tradition on ovaHerero milieus.

Thus we would argue that the above characterisations can be capable of communicating relevant user-data to the design process as it has been stressed by Nielsen [15]. Yet this needs further analysis on realities, underlying values and archetypical traits.

4.2 Stereotypes

As seen in the sitting in Erindiroukambe, participants also showed a tendency towards self-stereotyping. Nielsen states to avoid stereotypes, as they create flat characters with one only trait which does not create engagement, nor identification [13–15, p. 62]; However considering for example the representation of a ovaHerero elder through his hat, stick and chair reoccurring through different sessions and locales seem stereotypical, yet they carry a much deeper meaning and significance within ovaHerero culture. Thus we could argue that in a cross-cultural context, self-stereotyping does contribute to empathy towards and understanding of the users. In all sessions individual accounts have pointed towards commonalities of the different communities.

4.3 Collective Personas

The mythic features and characters inherent to the collective unconscious of the 8 female participants in the first session in Okomakuara hinted the collaborative efforts via the collective, unquestioned behaviour in answering to the questions prompted.

Describing other people rather than deriving attributes from themselves played well with ovaHerero communities in engaging participants and avoiding stereotyping. This also provided vital insights on traits, emotional detail and physical appearance. In such settings the persons described were mostly related to others over a narrative.

Since we observed a strong sense of community and aptitudes toward working scenarios of interrelated people, we hypothesize that collaborative persona seem more suitable to ovaHerero communities than individual persona representations.

5 Conclusion

In an attempt to engage Namibian pastoral ovaHerero communities into UCP sessions we soon encountered incomprehension about the concept of persona per-se, while exploring cultural variants did not allow us typifying typical persona descriptions. Thus we deployed different triggers such as probes and narrations. While probes and meaning designation to objects clearly failed, narrations showed to be more fruitful. Yet in a cross-cultural setting, tendencies of stereotyping and archetypes need a deeper analysis to ensure that interpretations of narratives are contextualized appropriately.

Reoccurring descriptions like the hat, stick and chair of the ovaHerero male elder are good indications they are indeed illustrative cultural markers and not stereotypes. This has been set by our own observations and by local ovaHerero researchers alike. A similar case emerged in the depiction of the ovaHerero female elder. Moreover descriptions of conventional individual personas seemed inappropriate within the rural, collectivistic community contexts in Namibia. An indicative of this has been the

interrelatedness of the characters hinting at collaborative persona, opening possibilities for deploying Information Systems that allow interactions where multi-user environments hold the potential of introducing relational elements like emotion, motivation and satisfaction. Thus, we argue that collective persona can help to address challenges on modelling groups and therefore community collaboration.

However, and to reach a persona cross-cultural dialogue in design thus to avoid misrepresentations, we postulate that UCP brings out specific characteristics of the cultural setting by allowing laypeople designing persona artefacts in their own terms. Hence we promote UCP for users to create self-representations aimed to support design processes, as UCP functions as an instrumental way to enable laypeople exploring and creating ways in which they desire to be depicted towards technology designs that will ultimately be useful and gratifying in their daily lives. The above concepts and methods will be pursued in detail in upcoming research.

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Communicative Ecologies and the Value of MyFireWatch to the Community of Kununurra

Lelia Green(✉) and Donell J. Holloway

Edith Cowan University, Perth, WA, Australia
l.green@ecu.edu.au

Abstract. This paper is the culmination of a research project involving four fieldtrips to the remote northwestern Australia town of Kununurra. The primary purpose of the research was to engage Kununurra's visitors and residents in a participatory methodology for scenario based design to create a community-focused version of a professional fire mapping service, FireWatch. The research resulted in the development of MyFireWatch, a map based website which shows fire hotspots derived from satellite images across Australia, bringing this critical information to non-specialist users. The review of the take-up of MyFireWatch was conducted some 13 months after its launch in Kununurra, and the twelve interviewees involved were very positive overall. Their major concern was that visitors to Kununurra – especially backpackers and the senior self-drive tourists that Australians call 'grey nomads' – might not know about the service. A review of the tourist-focused sites in Kununurra reveals that organisations that promote tourism are reluctant to inform tourists about the potential dangers of their holiday destination. Thus, the culture and communication practices of tourism organisations are demonstrated to undermine the usefulness of otherwise valuable technological advances.

Keywords: Wildfire · Tourism · Remote Australia · Scenario-based design · Emergency communications

1 Introduction

Between 2012 and 2015, a number of research trips were made to Kununurra in the northwest of Western Australia. The aim of this research was to identify need and demand for a community-focused version of FireWatch, a professional fire mapping service provided by Landgate, which is an agency of the Western Australian government. The research visits also incorporated a participatory design approach to incorporate community feedback to the ongoing design of the community-focused website. This research resulted in the development of MyFireWatch.[1] Designed for community use, MyFireWatch was launched in Kununurra in 2014, and the final fieldwork trip was carried out in August 2015 to assess community response to the service; and the take up of, and feedback on, the new site.

[1] http://myfirewatch.landgate.wa.gov.au/.

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The information underpinning the FireWatch services provided by Landgate is based on near real time satellite data. It provides map-based information which is relevant for bushfire safety planning in Australia. Although called bushfires in Australia, these fires equate to what are called wildfires elsewhere and some of the respondents cited use both terms interchangeably. The original FireWatch site had been used for many years by fire- and land-management specialists and had been tweaked on a number of occasions to accommodate requests from experts in these areas. Accordingly, it was technical in nature and today a separate service, called FireWatch Pro, continues this commitment to professional users. The vision for this research project, which was funded by ARC Linkage grant LP110200020 (2011-14) and research partner Landgate, was to create an alternative FireWatch site for public use, particularly aimed at people living, working and travelling in remote and rural areas where fire safety and protection services may be less available. A scenario-based design was first used to construct a prototype site [1]. This site was then tested and refined using iterative, participatory methods which acknowledge the politics inherent in design [2]. To do this, the researchers carried out qualitative interview-based fieldwork, as well as side-by-side user-based testing, in the remote Kimberley community of Kununurra. The interviews gained information about existing bushfire safety and mitigation communications practices so that MyFireWatch could complement these risk mitigation strategies and support their effective operation. The side-by-side, user-based testing further analysed and refined the design of the website. This chapter engages with the question "What cultural factors are influencing the take up and use of a participatory-designed fire information site" and draws on data from the final set of interviews carried out in August 2015. Discussion of the background to this research and the research methodology follows below.

2 Background

During the initial scenario-based design process a range of potential users of MyFireWatch were researched and identified, as well as some ancillary ways in which the service can be used, and a series of stakeholders. It was subsequently found that although the research participants most at risk of experiencing a fire-related incident were Kununurra residents, they also had the greatest resources available to deal with that threat in terms of social connections, knowledge and information, and skills and experience to deal with such an eventuality. Visitors to the area tend to fall into two categories: cash rich and time poor (package tourists) and time rich and cash poor (backpackers and grey nomads/self-drive tourists). Package tourists are constructed as being essentially under the protection of locals: they pay to live in facilities staffed and managed by front line service providers and travel in organised groups to experience particular aspects of the Kununurra environment within a given timeframe. Even so, and somewhat ironically, the most recent and arguably highest profile fire incident to threaten life in the Kununurra area involved cash rich/time poor tourists. The 2011 RacingThePlanet bushfire tragedy horrifically injured two participants [3] and harmed a number of others, leading to a 330-page Western Australian Legislative Assembly report arising from a government enquiry into the disaster [4]. The issue here was not

that the tourists, in this case ultramarathoners, were not supported by professionals, but that the professionals in question were not locals and lacked the experience and expertise to understand the fire ecology of the area [5]. Although the organisers did not use the (then) FireWatch service to discover critical additional information about the visible smoke in the neighbourhood on the day of the race, the site was used in the subsequent forensic investigations of this bushfire tragedy [6].

Kununurra locals construct backpackers and grey nomads (self-drive tourists) very differently from package tourists. Because of their longer term engagement with their travel experience, these visitors prefer to experience the locations to which they travel without a managing/mediating influence and do not want (and sometime cannot afford) to pay local people to care for them as if they were proxy residents or guests. Backpackers and grey nomads need to rely much more upon their own awareness of the environment and its risks, and many of them have a range of appropriate technologies and skills to manage these. Thus, the challenge of choosing a tourist town like Kununurra as the research site highlights the need to reach out to a range of different populations who may be well or poorly integrated within the structures of Kimberley-based fire management service provisions. Interviews with independent tourists and tourism stakeholders indicate that independent tourists travelling in remote Australia are, in general, experienced users of geo-based technologies and platforms such as the Bureau of Meteorology website, satellite phones, and a variety of GPS devices. This finding aligns with the high use of geospatial technologies in the tourism industry both by tourism operators and tourists themselves. Correspondingly, geo-based technologies are an integral part of modern day fire suppression and mitigation practices. Thus, self-drive tourists' familiarity with geo-based technologies facilitates their ready use of the MyFireWatch site. Both the independent tourists and tourist operators interviewed for this project indicated that the MyFireWatch site is a useful addition to their repertoire of geo-based technologies, not only for personal security but for planning tourist events, trips and treks [7].

The Kimberley region in Australia's remote northwest is one of the most sparsely populated areas on earth. The lack of population centres goes hand in hand with an absence of specialised services available to support the small, permanent population centres. There are no professional fire fighters routinely employed in these communities. Apart from a few Department of Fire and Emergency Services (DFES) and Department of Parks and Wildlife (DPAW) employees who carry out fire mitigation and suppression as part of their professional duties, emergency firefighting services are largely provided by volunteers, who have other employment responsibilities [8]. This absence of a readily available 'responsible other' shifts what is termed the 'locus of responsibility' [9] from the professional service provider (the non-existent full-time fire fighter) to the person who may need the service (the tourist or the local resident). In remote areas it is expected that people will assume far more personal responsibility for their own safety in emergencies and disasters, such as flood, cyclone, and fire, than would be expected in a city and other more populated areas. Given this expectation, however, it is particularly important that travellers understand this increased personal responsibility and have accurate and readily available information available as required. Both visitors and residents need knowledge about expected levels of responsibility, resources available to support informed decision-making and the appropriate

technology required to receive this information (radio, web access, geo-located phones etc.) [7]. In planning communication strategies to reach tourists and other visitors, it is important to understand their information seeking behaviour and to appreciate the additional pressures of delivering vitally needed fire safety information to the public in times of fire stress.

The information seeking behaviour of tourists in times of disaster or crisis range from the use of more traditional broadcast channels, such as television or radio, to the increasing use of internet-based information services. Two major internet-based trends have been identified in terms of analysing tourists' use of information services during times of crisis. These are the use of social media and the use of official/authoritative websites as sources of information. The use of social media by tourists significantly increases during a crisis [10–14]. This reliance upon social media is especially true of international tourists who may be unfamiliar with the local language and/or have difficulty identifying and accessing authoritative information in their locality [15].

When tourists do seek official or authoritative information online, there can also be a mismatch between tourists' perceptions of where they should find these sources of information and where this information is actually located. In particular, tourists may assume that tourist information bodies are providers of disaster/crisis information for tourists. New Zealand research shows that tourists frequently use Tourist Information Centre websites (i-Sites) as popular information sources, including disaster or crisis information, despite these centres only being "charged with providing tourism products advice (and bookings) rather than discussing severe weather information (although most display the weather forecast)" [16]. Given these findings, significant attention has been paid to what might be termed the 'communicative ecology' which supports bushfire information.

Sless argues that "each of us, as individuals or as members of communities, inhabits particular communications ecologies" [17]. These environments for interacting can also be seen as relating to specific circumstances, such as the communicative ecology relating to bushfire information. An examination of the communication options and practices available to people living in and visiting Kununurra reveals that communication around bushfires depends upon three layers of connectivity within an adapted version of Hearn and Foth's construction of communicative ecologies [18]: (i) technological connectivity; (ii) informal social connectivity; and, (iii) formal professional connectivity.

The technological layer of connectivity supports all but face-to-face communication. This varies according to the individual person and the technology they have available for use, and according to the place, and the infrastructure it has to support a range of communication options. The informal social layer of connectivity requires an understanding of who knows what in which circumstances along with an appreciation of the optimal informal networks through which to access that information. These skills tend to develop alongside knowledge of place and people, and mostly characterise residents who have lived in an area for an extended period of time, across different seasons, and who have developed a series of interlocking social networks and patterns of mutual reliance and shared obligations.

The formal professional layer of connectivity relates to communication within the various emergency services and, where appropriate, between the various emergency

services. Although, as noted previously, these professional emergency service roles are often taken by volunteers, such volunteers are working as volunteers in positions which would be filled by dedicated paid specialists in an urban context. Unfortunately, visitors may not understand the differences between the paid professionalism of emergency service providers in the cities and the dedicated service of volunteer emergency responders in remote and regional areas. Similarly, not all communications links between professional services in remote locations are as seamless as they maybe in more populous contexts [19]. The emphasis tends to be on secure communications within an emergency service (such as fire response), rather than effective interchanges between emergency responders (such as between fire and ambulance services). In addition to the different kinds of use that volunteers in these services make of secure and siloed communication channels, is the less flexible and more fragile range of options for connecting with interested publics in remote areas. If visitors used to city-based responses to emergency situations expect that all roads leading to a fire will be blocked by people with 'Diversion' signs advising drivers of alternative routes available, they may well be disappointed. In remote areas this only happens on main roads. The chances are that local people have used their nuanced but informal social connections to identify who is doing what and where their own service and resources are most required and will be most help. Locals might well assume that a visitor can see a smoke plume in a distance and would not take a road that heads towards it. At the same time, a visitor might assume that a road is safe unless it is officially blocked. These are the kinds of miscommunications that reveal the different workings of people's separate communications ecologies.

It was noted above that the three levels of (i) technological connectivity; (ii) informal social connectivity; and, (iii) formal professional connectivity discussed here represent an adaptation of Hearn and Foth's [18] construction of communicative ecologies. These scholars suggest, in their editorial preface to a special issue of the *Electronic Journal of Communication*, that a communicative ecology is composed of "agents that are connected in various ways by various exchanges of mediated and unmediated forms of communication [20]". The three layers they argue that characterise communicative ecologies are:

> A technological layer which consists of the devices and connecting media that enable communication and interaction. A social layer that consists of people and social modes of organizing those people – which might include, for example, everything from friendship groups to more formal community organizations, as well as companies and legal entities. And finally, a discursive layer which is the content of communication – that is, the ideas or themes that constitute the known social universe that the ecology operates in [18].

Our conception of such communicative ecologies does not assume Hearn and Foth's [18] shared "known social universe" since it is here that we distinguish the significant differences between individuals' communicative ecologies. Issues that we identified as a result of the MyFireWatch project include an assumption that people often make that they understand the contents of another person's communicative ecology without examining the parameters under which that ecology was developed and operates. Instead of this comfortable assumption of congruence we identified a critical mismatch within the Kununurra context around expectations of emergency

service-driven communication. This mismatch was most pronounced when comparing the on-the-ground knowledge of local people who use both informal social and formal professional networks to negotiate life-impacting situations, and the assumptions made by many visitors. What visitors understand to be professional practice is constructed as a national attribute of the emergency service profession concerned (e.g. fire response; ambulance service), but does not reflect the specifics of the local communicative ecology. In fact, formal professional communication systems can be expected to differ as greatly between remote and urban Australia as informal social networks do [19].

Our construction of a communicative ecology acknowledges the critical importance of the discursive context [21] but sees this as key to the defining problematic of differences between individuals' communicative ecologies. Critically important in any understanding of the context of emergency communications in remote areas is the difference between informal social networks of communication, from which visitors know they are excluded; and formal professional communication, which visitors erroneously assume they understand from their experience of professional practice in their home context. An awareness of the MyFireWatch site is part of the message-process which flags for visitors that emergency service provision in remote and regional Australia might differ significantly from their experience of emergency services in the city. Thus one of the roles of this site is to underline the differences in fire management between city and country and to identify the greater role (and expectation) assumed of proactive choice and responsibility when it comes to people taking the steps necessary to avoid the dangers posed by wildfire. Another of the aims of MyFireWatch is to improve, and add to, the publicly available channels through which emergency information is made available for people to use when formulating their plans for responding to the risks posed by fire. We now consider, within the Kununurra context, the three layers of the communicative ecology posed above: (i) technological connectivity; (ii) informal social connectivity; and, (iii) formal professional connectivity. (Please see [21], for a detailed consideration of the discursive layer.) Taken together, these layers of connectivity support the community-based circulation of information around bushfires in the Kununurra area.

3 Communication Ecology of Bushfire Information

3.1 Technological Connectivity

By the time self-drive visitors and backpackers reach the Kununurra area, they will have travelled through parts of remote Australia and be aware that mobile phone services are patchy and critically dependent upon the geographical coverage of their specific service provider. Compared to the situation in most cities, the communication technologies and networks underpinning the communication ecology in the bush are extremely fragile, coupled with fewer options for a 'plan B'. These uncertain communication options go hand in hand with the requirement upon people to be more self-reliant, with the possibility of severe consequences for poor choices, or poor access to information services.

John Storey, a local resident who helped with the logistics of the 2011 Kimberley RacingThePlanet Ultramarathon, underlined the challenge posed by technological connectivity in his evidence to a Western Australian Parliamentary Inquiry into the incident when he said:

> This area is incredibly difficult for communications. The Army, in their exercises in 1992, had trouble with communications. The Chinese satellite phones that they [RacingThePlanet] had in 2010 let them down. Everywhere else in the world, right across the Gobi, right across the Atacama, they have mobile coverage, whereas they did not here. All your UHF, VHF, HF are line of sight and do not work in those ranges. They learnt that. I know this time [2011] they came back better prepared. I do not know what they had, but they did have a lot of satellite phones, and this time good Iridium ones and the Thuraya ones [22].

With mobile phone reception limited to the town area and with emergency service communications between first responders such as DFES (Department of Fire and Emergency Services), the police, ambulance services and local council often being technically incompatible, communications during extreme fire conditions in the Kimberley region is problematic. Accordingly, residents have a sophisticated awareness of multiple channels and networks of communication that can help provide a 'back-up plan' in times of crisis. Such complex networks may include two-way radios and satellite phones, knowing which people have access to critical communication resources and how to contact them.

3.2 Informal Social Connectivity

Often discounted in analysis of emergency communications during fire events are the local, informal communication channels that characterise on-the-ground emergency response efforts. Activating and harnessing these channels includes visiting, phoning, texting or radioing neighbours during a fire emergency to ensure people's safety and to organise collaborative fire suppression efforts. Although comparatively informal, these complex communications support community members in "the critical period before emergency service responders can appear on site. In this situation, it is often local knowledge that underpins improvised grassroots communication networks that inform and organise the neighbourhood" [23].

Gail expresses the confidence that Kununurra residents often have in their local – volunteer – firefighters:

> We have got the local fire brigades. We know we can ring them. The local fire brigades seem to work very well together even when they're spread across the valley. The communication between those people and their core people are long-term people who know the area and know the seasons, know the quickest and easiest back ways to get into various places when they need to. So I think that for the small amount of risk we perceive the town being in, they do very well and it's [the fire mitigation measures are] well prepared and well maintained by property owners.

In regions like the Kimberley, where visitors and tourists are operating outside community networks, the dry season poses a range of risks. Patchy communication channels, coupled with the well-resourced but silo-ed emergency service providers, create the context within which the information provided by MyFireWatch can make a

critical difference [8]. Even so, many newly arrived tourists fail to appreciate that the huge wilderness areas that they look forward to experiencing have limited emergency services and tiny populations. At the same time, the local acceptance of regular seasonal fires as a routine occurrence can give an impression that they are not a significant issue when, in fact, they are.

3.3 Formal Professional Connectivity

Participants in this research project revealed their frustration about the information and communication silos that characterise formal communications between emergency service providers, especially during times of fire emergency. First responders seem unable to communicate with each other at a local level, due to incompatible communication technologies and/or their vertical decision making process. Thus firefighting volunteers can communicate with each other and with base control, but not with the ambulance service; and vice versa. This is because emergency organisations have given priority to secure internal communication channels and thus work within a framework of vertical integration.

While neighbours and local emergency workers want and need to work together, these aspirations are confounded by organisational systems which mirror out-dated military models of management and decision making, sacrificing interoperability in favour of security and confidentiality. This approach is diametrically opposed to the dispersed leadership and decision-making models employed in social connectivity settings, and by contemporary military organisations in times of battle or emergency. Indeed, the findings of the RacingThePlanet Inquiry documented major shortcomings in this respect:

> Upon receiving Dr Waite's call [RacingThePlanet's medical director] and being told that people were burnt, the FESA Comcen [fire and emergency services agency communications centre] operator directed Dr Waite to hang up and call the ambulance. It appears from the Committee's evidence that FESA Comcen then took no action to alert FESA's regional officers as to a possible incident in their area. FESA Comcen did contact St John Ambulance a couple of minutes later to see whether they had received a call. However, upon being informed that St John had not been contacted by Dr Waite, FESA Comcen's response was that 'we will just have to wait for her to ring back' [24].

The Inquiry's findings include, as recommendation 8, that: "FESA, WA Police and St John Ambulance establish a uniform protocol for handling multiple emergency responses that does not involve callers having to make multiple calls to 000" [25]. Most Australians usually resident in urban or regional Australia in 2012, would have taken such interconnectivity for granted. It would seem unthinkable in other Australian contexts that bystanders supporting two critical fire casualties with life-threatening injuries would need to call an ambulance, separately from the fire service, and then ring a third time to connect with police.

More recently, the Waroona Fire Special Inquiry, which investigated bushfire in the mid-southwest of Western Australia, recommended greater efficiency in the integration of local knowledge and local resources. The Waroona district fire occurred in January 2016 and burnt more than 69 000 hectares (170 000 acres) of land resulting in the loss

of two lives and 121 homes in the small town of Yarloop. The Inquiry's recommendations were made in response to public feedback regarding the top-down and siloed responses and actions by State-based organisations (such as DFES and DPAW). This feedback suggested that these bodies failed to respond to the fire event in a timely manner or to incorporate local knowledge and expertise as efficiently as possible. Recommendation 15 of the report endorses the creation of a Rural Fire Service "to enhance the capability for rural fire management and bushfire risk management at a State, regional and local level" [26]. If established, the leadership structure for this entity will be regionally based and operate in collaboration with volunteer Bush Fire Brigades, Local Government, the Department of Parks and Wildlife and the Department of Fire and Emergency Services [26].

The findings from our research in the Kununurra region of Western Australia endorse a move to integrate the formal and informal layers of communicative ecologies. This integration will require significant thought and planning when implementing the Waroona Fire Special Inquiry recommendations. This is because there is a risk that another formal layer of governance at times of fire emergency may perpetuate complicated, barrier ridden communication structures (both at a social and technical level), rather than freeing these to be more inclusive of local needs and knowledge. Even so, the harnessing of community expertise is likely to reduce flawed, incomplete or untimely responses to bushfire emergencies.

3.4 MyFireWatch: Promoting Communication and Community Cohesiveness in Remote Communities

A comparison of historical interview data from the 1980s, and from the recent series of FireWatch interviews, indicate that living in remote Australia with its on-going communication difficulties has given rise to a hardy community within which resilience, flexibility, and interdependence compensate, to some degree, for the vulnerabilities associated with remoteness, especially at times of emergency and crisis. Interviews conducted in the late 1980s and the early 2010s reveal the on-going importance of relying upon neighbours, friends and local communication networks, a phenomenon termed "microgeographical exchange" [19]. In fact, the resilience and ingenuity of people living in remote communities who creatively integrate a series of old and new technologies counteracts to some degree the fragility and/or patchiness of each individual communication technology which, in concert, makes up the communications ecology of the area.

The provision of multiple channels of communication and the effective use of these channels is now a well understood core principle of emergency communications [27–30]. Organisational use of multiple communication channels to notify the public about emergencies such as bushfires mean that more people are reached, and some of the gaps caused by difficulties or breakdowns in communications are addressed. Despite the calls for the use of multiple channels of communication during bushfire emergencies, consecutive investigations and reports regarding disaster management in Australia point out the lack of supportive and/or alternative communication technologies and formats in regional and isolated communities [8, 31]. The 2015 bushfires which

occurred in the remote Goldfields-Esperance area of southwest Western Australia, where community members reported that they lost all their mobile communications during the peak of the bushfire "in an area where coverage was already considerably patchy" [32, 33], provide a recent example of this.

In the case of remote northwest Australia (more specifically the Kununurra region) non-town local residents already work with a mix of online and offline communications systems. These include landlines, mobile telephones, satellite telephones, long and short range radios and the internet which, when combined, augment community communications, especially in times of emergency. The MyFireWatch site is an additional communication source, accessible on a range of devices, and therefore provides a further early warning option in areas where people often rely on word of mouth from visual sightings to be kept up to date [34]. This is the context for the 2015 evaluation of the MyFireWatch service, a year after its launch.

4 Methodology

The development and deployment of MyFireWatch was informed by a social construction of meaning approach [35], supported by social learning theory [36] and an understanding of the co-creation of knowledge [37]. It also engaged with the literature around 'communities of practice' [38]. This conceptual framework asserts that people's social interactions help form the meanings that they develop for themselves and share with others as a way of understanding and explaining their actions, their motivations and their position in the world. As Burr puts it, "In writing this book, then, I am contributing to what might be called 'the social construction of social constructionism'" [39].

The subject of land/resource management in relation to bushfire is a highly-charged political area with divergent community groups constructing local practices of burning off areas of vegetative growth as either (1) something that is managed successfully (for the preservation of assets), or (2) as something that needs to be managed more effectively (for the preservation of biodiversity and the cultural value of the landscape). These differing opinions can be ascribed to those professionals who make decisions about fire mitigation and management on the one hand, and the residents who are affected by the impact of these fire mitigation approaches on the other hand [21].

The results below indicate that talking about fire, fire mitigation and MyFireWatch provides a (not always constructive) channel through which residents and other participants can reframe and restate their existing opinions around the politics of fire and fire management. The methods adopted for data gathering over the entire length of this project included scenario-based prototype development and side-by-side user-based testing of the prototype site (e.g. [1]); participant observer time spent with interviewees accessing online data concerning fire information (e.g. [23, 33]); reviews of bushfire investigations and reports (e.g. [40]); and, in-depth interviews which were then transcribed to provide a text based data set which was interrogated for emerging themes (this chapter; [7, 19, 21, 41]).

Both this chapter, and the precursor conference paper which it develops, and upon which it is based [41], concentrate on the Kununurra townspeople's responses to MyFireWatch and include contributions from tourism professionals who live and work

in the Kimberley. Twelve participants took part in in-depth semi-structured interviews about the MyFireWatch service which were then transcribed and analysed to identify relevant themes [42, 43]. With only 4,573 people recorded as resident in the Kununurra townsite in the 2011 census, and with restricted numbers of these being adults working in the roles attributed to the interviewees, some details have been left vague to allow 'plausible deniability' on the part of the actual participants whose names have been changed in the record provided here. This paper deals only with residents' perspectives; [7] focuses more centrally on the tourist experience.

The evaluation research reported here made clear that people in Kununurra believe their experience of wildfire represents a different kind of risk compared with wildfire in the more heavily populated southern parts of the continent. This perception also gives rise to concerns and comments about the various categories of visitors to the Kununurra townsite, including tourists on packaged trips, backpackers, and grey nomads. More controversially, the research project provided an opportunity for town-based residents to make comments about their constructions of local Indigenous culture, and the stories that some residents circulate about Aboriginal fire practices. Finally, a number of contributors provided commentary on the value of the MyFireWatch website itself and were able to contextualise its contribution within the daily life of Kununurra's residents and visitors.

5 Empirical Data

5.1 The Kimberley Constructions of Fire

Ken summed up a majority view that fire in the Kimberley generally poses a different set of challenges compared with what happens with a big fire in the south.

> Wildfire in the Kimberley is not the same as wildfire down south in the tall forests, and putting aside for one moment the RacingThePlanet disaster, generally the grass fires we see in the Kimberley are slow moving, slowish moving, and not of huge intensity. So the prospect of being trapped out, either on the road or on a bush track, or something like that, I think is probably much lower than it would be in mountainous Victoria or the southwest of WA, for instance.

Denise agrees: "fires up here are so different to like down south or over east where a lot of the tourists are from". She describes her view in more detail by saying, "most of the fires don't really affect people here, in that you almost never have a house or something burning down, because I think they are a lot easier to control." However, when she tries to work out why she thinks this, she isn't really certain: "I think, I guess, the timber is quite different. I can see some of the fires that happen around maybe Margaret River or around Perth area where the bush is like very, very dense, whereas up here it's a bit more sparse, and yeah, I think they just burn differently". She adds as an afterthought, "I don't really know what difference it makes, but yeah".

Mark is pretty sure that he knows what the difference is: "the difference between the Kimberley and elsewhere in the state, that month by month [time-based information regarding previously burnt out areas available on the website] is terribly important for

us, because what might have burnt in February may well burn again in October". On the other hand, Mark notes that an area that

> burnt in August will not burn again in October [... that's] irrelevant in the Great Southern because we're talking scars lasting years [in the southwest] as opposed to being primarily grass fields driven by high rainfall. The Kimberley burns every year so we're on a year-by-year cycle as opposed to potentially a 20-year cycle.

One implication of this is that the amount of material available to burn is much less in the northwest than it is in the south. Mark's view of the MyFireWatch site is that "it's one tool. We must be educating people to supplement what that gives us with what the eyes give me, and equally the next step: 'if unsure, stay safe'". Eric underlines the importance of the visual check: "You do get your bushfire warnings, but a bushfire warning doesn't mean anything to anybody if you can see smoke in the distance. And up here smoke in the distance can mean, well, twelve kilometres down the road you're in the fire."

Ness agrees that people require a range of information sources, saying that the shire puts "notices on Facebook if there is a fire that the community needs to be aware of… [linked to] it must be the FESA [Fire and Emergency Services Authority of WA, now DFES, Department of Fire and Emergency Services] site, I think. We link to that site for the most up-to-date information. So we advise people to go to that site." This mix and match approach to resources and complementary information is in line with the kind of materials that Mark would like to see made available: "so for me where we were a little bit lacking was the other bits and pieces that sit beside the [MyFireWatch] tool, if that makes sense".

Visitors sometimes express surprise at the ways in which Kimberley residents manage their fire risks. Gail quotes some visitors as saying "well, where's the fire crews? Why aren't they putting it out? You know, at home in the Blue Mountains there'd be […]". Gail's response is "Well, guess what?". She feels some impatience that people can be visiting Kununurra because of the beauty of its wilderness areas but be ignorant of the implications of having a tiny population in a huge geographical area. She acknowledges that "people don't understand. People from over east in highly populated areas. There's so much country [here], they just let it burn […] You go on a scenic flight and the pilot goes to someone, "'Oh, there's a fire down there.' 'Oh yeah.' 'That's been burning for three weeks'. There's a level of nonchalance about it as well that concerns people".

Jane reinforces this perception of lack of concern. "I think we all become a bit immune to wildfire in the Kimberley because it's an everyday kind of occurrence in the dry". Whilst generally agreeing, Mark's understanding of townspeople's responses is more nuanced: "my interest in being preventative is directly proportional to how frightened I was last year. So you get a fright, you're particularly interested for a period of time and we slip back down the slippery slope into apathy, and I think that's human nature with respect to many things, be it cyclone, be it fire, be it flood, be it financial crisis, be it whatever it is". The implication of this is that MyFireWatch is also relevant and useful as a preventative/preparatory tool in proportion to the perceived risk that fire poses to Kununurra residents.

5.2 Tourists and Time Poor Holidaymakers

Kununurra and the Kimberley region are marketed as beautiful locations, attracting both wealthy (but time poor) tourists and longer-term, more cash-strapped, visitors: "You've got Tourism WA and Australia's NorthWest and local businesses all pumping millions of dollars into marketing the area, to bring visitors". Gail goes on to express her concerns around the ways in which the Kununurra area is advertised:

> the perception of the tourist coming and the images that we put into our marketing is our waterways, our waterfalls have beautiful palm trees, our gorges. They expect to see something different than what they get [… because] it's savanna. It's technically part of the savanna way. It's maybe dry tropics, it's not wet tropics, which you wouldn't think sitting here because you've got a lush tropical garden that's well watered.

At least one local understands the challenges faced by holiday-makers. He says: "I'm a photographer, an amateur photographer, so it affects me when I'm trying to get nice dry season photos. The smoke in the air is probably the biggest thing, the smell that you get in the dry season when we've had a big fire season". This resonates with Gail's perceptions: "you have people come on a special photography tour, or you have professionals who come to get great photos for marketing, and they'll stay here three or four days and get up in the air because of the haze". These considerations have a knock-on effect for tourism operators. "When they got here they wanted to do a flight. And they said, 'Well, hang on a minute. What's all this smoke doing because I don't want to pay all this money to go on a flight and [not] be able to see anything'" (Wendy).

> They can't get that hero shot of sunrise or the hero shot of sunset because there's so much smoke haze. So, yeah. It is a risk and a challenge for tourism because we put out, you choose an image, you choose what you're portraying. You put it out there, and then go, please let them not burn everything close to town. You know, you take a risk and you've got to […] you're never going to know, but the fire haze in the sky, the, you know, everything from scenic flights to cruises to self-drivers are affected (Gail).

For people with front-line connections with tourists, the MyFireWatch site helps provide informed commentary about what to avoid, and also, the best places to visit. As Ken says: "we've done exactly the same, even this year, you know, planning a bush walk out there and say[ing], 'No. That's all been burnt. We won't go there'". This view contrasts with Ursula's appreciation of the regenerative powers of the bush:

> I like going past when it has burnt and [I've] seen the green flush come back because it's that bright green and there's not been a drop of rain and it's just incredible that mother nature can spark things back into action without a drop […] but it's still, I don't know, I feel sad when I go past and it's all black and you just think, 'Oh, it's just terrible'. But yes, it takes a full wet season, and to the middle of the next dry season, before it looks attractive again because it is very, very rocky terrain and the grass kind of softens that.

These perspectives indicate that Kununurra residents who work with time poor/cash rich tourists are particularly aware of the need to manage visitors' positive experiences of the Kimberley wilderness. Even in circumstances where wildfire has compromised the beauty of the locality, the town residents' knowledge of relatively regenerated areas is harnessed to deliver the best possible holiday experience in the face of environmental

restrictions that may in fact be present at that time. The impressions of time poor/cash risk visitors are seen as being the responsibility of the tourist organisations to which they pay their money, and such comparatively wealthy visitors are constructed as the town's responsibility, benefitting from the informal social connectivity among and between people in the tourist industry and thus having access to privileged information, almost as if they were proxy locals.

5.3 Grey Nomads and Backpackers

The locals' treatment of the cash rich/time poor tourists differs from the ways they respond to time rich/cash poor visitors. Such travellers tend to schedule their own activities and entertainments. These visitors skew towards either end of an aged-based continuum, with the backpackers being the younger twenty-somethings and grey nomads tending towards being active senior citizens (60+). From the perspective of Ursula, who meets a number of these longer-term visitors in her volunteering role, "at this time of year the majority of our walk-through-the-door clients are grey nomads, or backpackers, or travellers". Ursula has worries about these visitors' general knowledge about fire risks in the Kimberley, but She places the locus of responsibility upon the people who provide front line services and stand to gain some financial benefit from the visitors: "I think to raise awareness in that group potentially do some sort of marketing or some sort of a display to the caravan parks and their staff."

While Ursula's view is that the MyFireWatch site offers value to this visitor cohort, if people will take responsibility for telling them about the service, other interviewees disagree as to how useful the website is, particularly for the grey nomads. "I think a bit of that is the age group of the grey nomads […] although they're getting more savvy, more tech savvy, [but] I think they still want to have that interaction with a human being" (Wendy). As Wendy makes clear, her view is that face-to-face advice is preferred by the older traveller, and this is echoed by a resident who believes that this is the role of the Kununurra Visitors' Centre, because backpackers "want to know all the information they can, they can get, for free. Because that's what backpacking is all about". The same interviewee suggests that providing the services of the Visitors' Centre is good for "the grey nomads as well. […] They want to speak to someone. They don't want to do things online. They don't want to look at a tablet".

Janos agrees that the issue around the perceived ignorance of grey nomads might be one of willingness to prioritise access to the relevant technology: "any tool is useful if you're prepared to use it. But, it's back to the end user, and some of the grey nomads that are coming through now won't even have a mobile phone that's fully functional. They won't have internet access". Eric disagrees profoundly with this perception. With a background in local government, he comments that "grey nomads and the backpackers do look at Shire sites as a way of trying to pick up information before they move into an area […] they're travelling around Australia. They're all online […] and looking for things to look up".

Rather than worrying about grey nomads' safety, Gail's concern is that these visitors may actually pose a fire risk to others. Partly because they don't realise that

Kununurra is actually quite a dry environment, her view is that when time rich/cash poor visitors use informal camping grounds their ignorance exposes the wider community to risk:

> There's a lot of illegal camping and stuff that goes on that doesn't get managed that causes fires […] people that camp on the side of the road, and they will camp that way. And people travelling, a lot of backpackers and people camping on the cheap. And I think the risk for us is people go into an area like this to see pristine green, because there's so much water here. And people have the misconception that Kununurra is tropical.

This perception is echoed by Helen, "obviously these people are actually camping, so a lot of them are from not around here. So they're maybe not so aware of the bushfires and bits and pieces"; and by Mark, "the unwashed, unclean, who aren't familiar with this locale and what the fire potential is in this locale, somehow we need to knock on the door and communicate with them, but speak once, speak to many, sort of technology".

Eric's view is that the most important thing is to let people know that information about fire is readily available on the MyFireWatch website: "what is the one, the nomad's magazine they use for travellers? There needs to have an ad in there somewhere so they can get in touch with it too, because everybody needs to know that this [resource] is there".

The implications of these views about the time rich/cash poor tourists is that the people of the town are not directly responsible for ensuring that these travellers have access to appropriate fire information. Instead, these visitors are constructed as people who might prefer face to face information that is in the form of some kind of drop-in service. The views about caravan park-based displays, and the advertisements in appropriate publications, imply that 'someone else' needs to take the responsibility. The comfortable view of most Kununurra commentators is that backpackers and grey nomads will look up information on shire websites; while a few see these "unwashed, unclean" as part of the fire-risk problem since they do not understand the complexities of fire in the area, believing erroneously that the Kimberley is a tropical wetland instead of being, in fact, dry savanna lands.

In contrast to the town's proactive management of the daily experiences of the cash rich/time poor tourists, accessing MyFireWatch is seen as something that falls within the 'locus of responsibility' of the backpackers and grey nomads; even as opinions differ as to how these visitors should learn of the site's existence. At the same time, some commentators fear that not only do these tourists not know enough to realise the importance of MyFireWatch, they may also pose a fire risk to themselves and others through not understanding how to relate to the environment.

5.4 Contributors' Thoughts About Local Aboriginal Practices

Whereas a number of Kununurra residents are concerned about the fire practices of people who may not know the area well, others have concerns about the Aboriginal population whose cultural roots stretch back for hundreds of generations. For example, Ursula comments:

> a lot of people don't like walking through grass when they're walking back tracks to communities and things like that. And I've seen that in Wyndham in the past where they'll just light it up and get rid of the long grass because then they can walk through without having to worry about snakes or whatever.

Gail has a particular term for this kind of fire raising: "the big issue for us is this black fire. The Aboriginal lit fires. Sort of this perception, particularly among a lot of the young people that 'it's cultural for us to light fires'". Even so, Gail's view is that this reflects youthful error rather than traditional Aboriginal culture: "and they'll [the elders] go, 'Well, no, they're just not using it correctly. That's not how we would do it. We won't use fire in that way.' But there's this misconception among the younger generations that it's cultural'".

As far as Helen is concerned, having had a number of fires close to where she lives beyond the main town site, a direct approach is one that works best:

> You could see the different spots where, the ignition points where they'd started to burn them, they'd gone out and he [the manager of her workplace] counted 17 just over that night. And there were ones that started the big fire […] the police have been to see a couple of the communities along the way and just told them, you know, that they're going to do their best to prosecute anyone. And it's been all quiet on that front since. We haven't had any fires since that week, which is good.

It would appear from the interviews cited that many of the businesses and organisations in Kununurra may not construct the local Aboriginal population as a target user group for MyFireWatch. Instead, local Aboriginal communities are perceived as people who may have a different relationship with both fire and the environment. The implication is that fire is seen as a tool, rather than a risk: practices such as using fire to address areas of long grass so that it cannot hide snakes, provide examples of this perspective. Further, some residents believe that the fire practices of (particularly) young Aboriginal people in the local area may be part of the reason why services such as MyFireWatch are required.

5.5 Feedback on the Website

Kate, who works in a front-line customer service role, is particularly positive about the MyFireWatch website:

> I think it's just a unique service, I suppose, and it's something that is a really good service for the community, for people to understand where the fires are up to, both in our area and Australia wide. You're not relying just on the news or on hearsay. You've got some actual, real time proof that you can look at. So I think that's a really good service.

Grahame feels that other jurisdictions have access to greater publicly-available information about fires than has generally been the case in Western Australia. He argues that there is "an open system in other states where they can go on and view that there's something there, and then it's up to them to go and seek further information in regards to that incident". Mark would like additional information regarding the length of time since the most recent satellite update. His concern is that if information is "four hours old, and you're taking it as gospel now […] I need to inform you that that's four

hours old. If it's 15 min old, it's live time, I don't need to interpret it, there it is, it's raw, it's now, it's current, you figure it out".

Helen is more of an everyday user: "I think that the MyFireWatch is [has] really got everything that you need to know", and Denise explains its particular relevance in the northwest of Western Australia: "It's difficult to get a concept of where something is in the Kimberley, because it is so big. You can say there's a fire along the Gibb River Road but that stretches for hundreds and hundreds of kilometres. So it's nice to be able to see a map that can actually pinpoint exactly where something's burning".

Participants in this study had also used the site for a variety of other localised functions. These included event planning; route planning for independent tourists; information for tourism operators to avoid taking visitors to already-burnt-out country; for environmental advocacy; and, as an early warning system for the protection of remotely based assets. Ursula particularly likes "the fact that you can go back by seasons to see what's been burnt, and it is quite dramatic when you see exactly how much gets burnt every season". She offers a specific context when this function is helpful: "when you're going camping it's a useful tool to see what's been burnt last year and going out and making sure that if you're going somewhere it's not going to be totally black from this year, and there's a bit of re-vegetation happened".

This increased range of uses means that the MyFireWatch site engages the community more widely than solely in risk-management contexts, but it also raises awareness about the usefulness of the site for managing risk in emergency situations, and planning fire response strategies [32].

6 Discussion and Conclusion

The aim of this most recent research trip to Kununurra was to interview a cross-section of residents about their experiences with the MyFireWatch site. This data was collected to help answer the research question "What cultural factors are influencing the take up and use of a participatory-designed fire information site". The interviews reveal general acceptance and a positive response to the MyFireWatch site from the Kununurra residents interviewed. What was interesting, however, is that residents took this repeat visit (the fourth in the research project) to continue discussions with the research team around issues of difference and the uniqueness of life in the northwest of Western Australia; the complexity of the local communications and technology ecologies compared with the environment familiar to town dwellers; the comparatively straightforward relationship that locals have with 'monied' tourists (cash rich/time poor), who pay to have their visit managed by people with local knowledge; concern and a general lack of confidence in backpackers and grey nomads who are more autonomous, with fewer financial resources, and constructed as often ignorant of the local fire conditions; and, the even more complex negotiations that characterise relationships between local Aboriginal communities and settler-background Australians.

The cultural factors influencing the take up of MyFireWatch include its use by Kununurra residents in their constructions of 'us' and 'them' in terms of the multiple purposes to which MyFireWatch is put. The local population positions the service as

another link in the net of interdependent and overlapping resources that constitute the bushfire communication ecology used by local community members to respond to fire-based threats and challenges. At the same time, this community differentiates their own experience of fire as being very different from the experiences of communities in the south. The more southern fire zones burn differently, and run the risk of greater financial damage, since property and population are more concentrated. At the same time, professionals are likely to be on hand to help mitigate the danger which means that the "locus of responsibility" [9] is more professional-linked than community-based. The implication here is that technologies such as MyFireWatch are more relevant in less populated areas without professionals on hand to mediate between local communities and externals threats and risks.

By integrating MyFireWatch seamlessly into the set of resources that constitute the local communications ecology, and by exploring the site's additional functions, residents of Kununurra help reduce the fragility and patchiness of the emergency communications options available to them. These actions affirm their cultural identity as people who are competent with technology and used to exercising a locus of responsibility and collaborating with others to make community-based decisions. Kununurra residents position their own identity as responsible, creative users of information and technology in the context of a fast-changing and complex environment. They contrast this self-perception with constructions of the "unwashed, unclean, who aren't familiar with this locale and what the fire potential is in this locale"; the time rich/cash poor backpackers and grey nomads who choose not to, or cannot afford to, pay local tourist professionals to look after them.

The consensus is that the MyFireWatch site is of value across the board for all people living in and passing through the Kimberley area, but that the Indigenous population may not see it as relevant for them since it is less likely to inform their behaviour than their existing cultural practices. Kununurra residents acknowledge a significant challenge in communicating with transient visitors around the importance of fire-based information and the technological avenues through which it can be accessed. This communication challenge was generally constructed as a locus of 'someone else's' responsibility, however. Thus Ursula recommended that MyFireWatch needed to "do some sort of marketing or some sort of a display to the caravan parks and their staff", and Eric's view was that a "nomad's magazine" be used: "There needs to have an ad in there somewhere so they can get in touch with it [MyFireWatch] too, because everybody needs to know that this is there". There is a diversity of opinion around whether or not nomads are tech savvy, and whether or not they take risks with fire in the environment through carelessness or a misunderstanding about risk in natural contexts. Even so, Eric conceded that "grey nomads and the backpackers do look at Shire sites as a way of trying to pick up information before they move into an area."

Finally, it is interesting to note that, despite the research team using Kununurra as an investigative site over a three year period, and notwithstanding the RacingThePlanet tragedy, and given that people agree that MyFireWatch serves a useful purpose for locals and for travellers, and even in the face of findings that demonstrate tourists use tourism sites to look for safety information [16], neither the Kununurra Community Resource Centre, nor Shire of Wyndham East Kimberley, nor Kununurra Country Club Resort, nor the Kununurra Lakeside Resort, nor the Kimberley Grande Resort, nor the

nearby Lake Argyle Resort includes a link to the MyFireWatch site, or any other overt fire-risk information. Visitors need such links to access community-focused information as part of Kununurra's network of bushfire-risk resources; as part of the communication ecology of bushfire information. Perhaps the greatest cultural impediment to communicating the existence of community-accessible fire-related technological resources to people who choose to visit remote Australia is that the organisations which serve tourists prefer not to remind potential visitors that life can often get uncomfortable with smoke and haze; and sometimes becomes actively dangerous.

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Ludic Re-enchantment and the Power of Locative Games: A Case Study of the Game Ingress

Suely Fragoso(✉) and Breno Maciel Souza Reis

Federal University of Rio Grande do Sul (UFRGS), Porto Alegre, Brazil
{suelyfragoso,brenoreis}@ufrgs.br

Abstract. Games can promote a powerful form of reversal of the Weberian disenchantment of the modern world, which we refer to as "ludic re-enchantment". In this article, we present the notion of ludic re-enchantment and situate it in relation to other forms of re-enchantment, proposed by previous authors. Ludic re-enchantment is particularly powerful in locative games, which affect the experience of urban life both with respect to the associations between the inhabitants of the city and with respect to their relationship with urban materialities. These claims are exemplified with an ethnographically inspired study of the game Ingress in the city of Porto Alegre, Brazil. The double composition of gameplay and narrative of Ingress is shown to interlace with urban life in a variety of ways. The strength of ludic re-enchantment by locative games is confirmed and demonstrated to be modified according to the characteristics of Ingress narrative and gameplay. Although play always results in some degree of ludic re-enchantment, the meanings deriving from that re-enchantment vary depending on the attributes of the game.

Keywords: Re-enchantment · Ludic · Locative games · Ingress

1 Introduction

Locative Games are games in which the physical world is used as a "tabletop" and Alternate Reality Games are games which deliberately integrate fictional narratives with real world experiences. Locative ARGs (LARGs) are a subgenre of both, in which fiction is integrated to physical space, usually public urban spaces. Digital mobile technologies and wireless networks were decisive for the increase of popularity of Locative Games over the last decade and some authors prefer to include technology in their definition of Locative Games and even of ARGs. This is the case of Kiefer et al. [20], for example, differentiate Locative Games from other types of games in which the position of the players is an important element of gameplay. The authors, who prefer the designation "Location-Based Game", differentiate between Mixed-Reality and Augmented Reality Games. The former are defined as those which "add a virtual game layer to the real world, which is embedded through cognitive reasoning" and therefore comply with our understanding of LARG [20] (p. 4). The latter are experienced in first-person and therefore required the mediation of virtual reality technologies [20] (p. 4).

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Montola et al. [26] think of Locative Games in terms of three types of "expansion": spatial, temporal and social. The spatial expansion promoted by Locative Games is due to the change of the grounds of play: from a virtual environment, a board or a tabletop to the city. The temporal expansion refers to the fact that these games are played in mobile devices which are constantly with the player, allowing for more playing time. Social expansion refers to the eventual inclusion of passers-by into the game, with or without their acknowledgment. Thus, Locative Games can change the experience of the places in which they are played for those present at those place, be them playing or not.

LARGs players describe changes in their relation with the city, as space and as place. When a game is multiplayer, those who play refer to peculiar social interactions: friends who are rivals due to their relation to enemies from other dimensions, gatherings that cannot be missed but the need for which the non-initiated will not understand.

We take these to be signs of a new form of experience of urban life, both with respect to the associations between the inhabitants of the city and with respect to the relationship with urban elements and city structure. This understanding directed our interpretation toward a Weberian perspective of the disenchantment of the modern world. More specifically, it led us to perceive the existence of a specific type of re-enchantment of urban life promoted by locative games. We refer to re-enchantment by games in general as 'ludic re-enchantment', a denomination that encompasses the special case of locative games.

In this paper, we present the idea of ludic re-enchantment and search for evidence of it with an ethnographically inspired study of the LARG *Ingress* in Porto Alegre, Brazil. Launched in 2012 by *Google* and *Niantic Labs, Ingress* is played *in situ*, using mobile devices for in-game interaction. Context is provided by a cross-platform narrative which invites players to join one of two factions.

The article is organized as follows: in the next section, we introduce the notions of disenchantment and re-enchantment of the world and of the city, as proposed by Weber and contemporary authors. This is followed by the presentation of our idea of ludic re-enchantment by games in general and considerations about the particularities of ludic re-enchantment by locative games. The second part of the article is dedicated to the case study. It starts with brief descriptions of the game *Ingress* and of the methods and techniques used for data collection. After which there is the presentation and discussion of the results and final considerations.

2 Disenchantment and Re-enchantment

Max Weber attributed the disenchantment of the world to the convergence of several forces at the intersection of the Protestant Reform and the Scientific Revolution. As secularization and the modern scientific paradigm advanced, traditional political and religious forms of authority became increasingly meaningless. This process weakened understandings of the world based on religious or traditional meta-narratives, leading to

the subjugation of "legitimate forms of domination"[1] by bureaucratic arrangements. Commitment and passion declined in favour of instrumentality and objectivity.

Before modernity, the world was understood in metaphorical ways and ruled by multiple supernatural forces. Invisible beings and spirits were tightly interwoven with natural phenomena, causing awe and admiration. As modernity advanced, a new world was created: a rational world, in which everything can be calculated and controlled. Enchantment was thus expelled from the world and the only means to explain and even question reality are instrumental.

However, as previous authors have already noted, modernity was never fully realised and, given its internal contradictions, could not have been (Latour [22]). Consequently, the world has never been completely disenchanted.

Assunção (2010) studied the works of several authors who have discussed the possibility of re-enchantment of the world and identified interesting patterns. A few commentators, he says, restrict their search for opportunities of re-enchantment to Weber's own work. The majority, however, compare and contrast Weber's ideas with those of his contemporaries and/or current scholarship. In both cases, the discussion oscillates between science and religion as the most promising fields for re-enchantment. A large degree of variation is found with regard to religion: some authors restrict their considerations to institutionalized religion and others consider broader notions of mystical experience, including the wonder and fascination of arts, sports, or even tourism. These broader approaches treat new forms of "*latu sensu* religion", an intensity, a "diffuse energy", an impulse, that pertains to certain behaviours and could be qualified as religious" [4] (p. 176).

Science, in its turn, is mostly discussed in terms of the differences between the modern and contemporary scientific paradigms, generally translated as views of man as master or as part of the natural world, between the marvels of science, on the one hand, and towards ecological notions of reunification on the other.

Assunção's generalizations certainly discard many details from each author. This does not diminish the merit of the broad picture he managed to draw, which is particularly useful as a synthesis of the many ways in which the current configurations of the two main axes of Weber's notion of disenchantment, science and religion, can be leading to a re-enchantment of the world.

Different understandings of disenchantment lead to different views about the possibilities for re-enchantment. This article is concerned with a specific possibility of re-enchantment, based on ludic appropriations of urban spaces. Before presenting and discussing this possibility, it is necessary to understand some specific aspects of the disenchantment of urban life.

[1] The notions of legitimate and non-legitimate forms of domination are at the basis of Weber's considerations about the modern city. He defines domination as "the probability that a command with a given specific content will be obeyed by a given group of persons" (1978, p. 53). Domination "may be based on the most diverse motives (...) from simple habituation to the most purely rational calculation of advantage" (1978, p. 212).

2.1 Disenchantment and Urban Experience

Weber's considerations about the city are concentrated on a long chapter of *Economy and Society*, a book which is not primarily about the disenchantment of the world [33] (p. LXIV)[2]. The text occupies an important place in the history of urban studies, as Weber's emphasis on the need to "explain inter-human actions in terms of the meanings they have to the parties involved as well as in terms of the specific changes they entail" [25] (p. 51) represented a turning point in urban theories at the time.

In its early years, urban theory concentrated on the physical elements and structure of urban spaces. Authors who included city dwellers in the equation focused on their relation to the material settings. Weber's view of the city as a system of social relations and focus on the rationalization of human associations and power structures provided a new perspective. As described by Weber, the Modern city supplied the princely and Episcopal authorities with revenue, but did not count on their administrative resources, which were insufficient to meet urban economic needs. The gap was filled by what Weber called "non-legitimate forms of domination", that is, by multiple and circumstantial local authorities, who subsumed legal and charismatic powers to their instrumental and unstable agendas. As the locus *per excellence* of "non-legitimate forms of domination", modern Western cities are also the perfect stage for the disenchantment of the world.

We contend that a proper understanding of the city and urban life requires the integration of those three approaches. The material aspects of urban spaces, the ways city dwellers relate to that materiality and their congregations and hierarchies must be taken into account simultaneously, and considered in relation to each other. This threefold approach will be followed in the discussion of the case study presented in this paper.

3 Ludic Re-enchantment

Ludic re-enchantment is a particular form of re-enchantment that derives from the experience of games and play.

There are some intriguing parallels between the literature on play and games and Weber's considerations about the imperative of rationalization in the modern world. In *Homo Ludens* [17], which is probably the best-known text about play and games, Huizinga affirms the importance of play in all matters related to people and their relations to each other, as well as to the natural world. Huizinga makes clear separations between play and seriousness and places himself decisively within the modern scientific paradigm in the Foreword, when he stresses his choice to approach the question of play "historically, not scientifically" assuring his readers that they would "find no mention of *mana* and the like, and hardly any of magic" [17] (p. x).

However, magic is the word Huizinga chooses to name one of his main concepts: the "magic circle". He arrives at the notion of magic circle by his considerations about

[2] The chapter, "The City (Non-Legitimate Domination)" was also published as a book entitled "The City" (1958).

the differences between play and "ordinary life". These same differences direct him to the conclusion that play "always belongs to the sphere of festival and ritual - the sacred sphere" and, "as there is no formal difference between play and ritual, so the "consecrated spot" cannot be formally distinguished from the play-ground" [17] (p. 9–10). This would authorize the use of the expression "magic circle" to talk about the borders that separate different types of "temporary worlds within the ordinary world" [17] (p. 10). This supposedly well-defined separation has been challenged by contemporary views of the magic circle as, at best, a permeable boundary repeatedly traversed during gameplay [1, 26, 31].

It is also worth considering that the relation between play and seriousness is also not clear-cut as posited by Huizinga. In "The Play of Art", for example, Gadamer [13] discusses play in a different, more general note, which can be informative to consider. As often quoted, he understands play as something that "contains its own, even sacred, seriousness" [13] (p. 102). By denying Cartesian dualities, he is led to an understanding of play neither on the side of the player nor of the game, but "in-between the player and the game". This is the basis of his idea of the medial character of play [13][3].

For Fragoso [12], the differential character of playing games is agency, which she defines as "the dynamic and continuous process of symbolic exchanges between players and game systems". Its spatiality is not that of one "magic circle", but of many, ontologically different, tightly interwoven circles. In this scenario, play consists of continually traversing different instances of materiality and representation. As players experience fictional and physical spaces separately and integrally at the same time [12], play (re)unifies the real and the magic, the secular and the sacred, the modern disenchanted world and other, enchanted, worlds. No wonder modern rationality had banned it from adult life.

3.1 Ludic Re-enchantment and the City: Locative Games

In the case of LARGs, game experience is enriched by the fact that materialities of ordinary life are also part of the game world, anchoring the magic circle from within as well as from without. All gameplay is a simultaneous experience of fictional and real spaces, but in LARGs, the elements of the game world and the real world are one and the same. As a result, the magic, the mystery and the challenges of the game interlace with ordinary life more closely and easily. This is why LARGs promote a particularly powerful form of ludic re-enchantment.

Most of the literature on LARGs has focused on players' social interactions and ties [7], predominantly emphasizing game aspects over urban aspects [6]. Fewer authors have studied how players relate to the city as a game space and even fewer focused on the urban elements incorporated to the game worlds [34]. There are still those who focus on technological issues [29], the educational potential of LARGs [9] and their use

[3] In parallel to the recognition of the importance of Gadamer's perceptions to the present discussion, it should not be forgotten that the context of his discussion of play is rather different from ours. Gadamer approaches play in relation to the realm of art and is interested in its medial character as a way to understanding central binding elements in his hermeneutics.

for surveillance or counter surveillance [11]. Works about the LARG chosen for our study, *Ingress*, follow the same lines. For example, Li et al. [23] focused on social interactions at the local community level and Chess [8] on how *Ingress* narrative can promote alternatives to globalism and regionalism. Morgado [27] notices the importance of the reinterpretation of reality by the addition of alternative layers of information, but emphasizes *Ingress* promotion of social interactions as the main point of its education possibilities. The use of *Ingress* for data collection has been discussed from the point of view of surveillance [18] and as an incentive for participation in collaborative mapping projects [3].

Nearest to our proposal in this paper is the work of Andrade [2]. The author's study of the IFSs in two Brazilian cities exemplifies how the urban structure interferes in *Ingress* gameplay. The author describes how the labyrinthic experience of attacking and defending portals in the narrow winding streets of Juazeiro differed from the larger scale run between distant portals in Petrolina's wider streets. He also noticed the influence of non-players present in the game areas, who interfered in the dispute blocking the movement of players, screaming, cheering and providing information to help or hinder. Andrade also mentions that "the movement of players in the city interferes in an important way in the in-game movements, connecting in a peculiar way the game space, [as] seen on the screen of the smartphone, and the physical space" [2] (p. 19). Unfortunately, there are no further details about this point.

The first and foremost difference between our work and Andrade's is that he was concerned with how "the function of space and place in game culture is reconfigured by the ludic use of locative media"; that is, how ordinary space and place are reconfigured during gameplay. Our focus is on how the ludic re-enchants the ordinary experience of space and place, that is, how the out-of-game experience of the city is reconfigured by the game. We searched for evidences of this with an empirical case study of the LARG *Ingress* in Porto Alegre, Brazil. The next section consists of a brief description of the game.

4 *Ingress* Is [Not] a Game

Ingress catch phrase "The World around you is not what it seems" introduces the story of the recent discovery of a strange energy (Exotic Matter, or XM) which flows from portals distributed around the world. Ingress promotional images are self-explanatory (Fig. 1).

Little is known about XM beyond that it alters human cognition and it is controlled by a mysterious group, which has been given the nickname 'Shapers'. Players must join one of two factions, known as the Enlightened and the Resistance. The Enlightened believe that XM is beneficial and will lead humanity to a higher stage of evolution. For the Resistance, XM is a way to control human minds that will ultimately lead to enslavement by the Shapers. Thus, both factions play to control XM: the Enlightened, to help the "mental evolution" of those under its influence; the Resistance to protect humanity against that influence. Developments in the narrative of the game do not clarify whether the XM influence is good or bad, or who or what the Shapers are; therefore, there is no right or good faction, nor a wrong or bad faction.

Fig. 1. Ingress promotional video: XM (in blue) flows from the portal (the fountain) (Color figure online)

The effect of XM on humans explains the location of *Ingress* portals in "monuments, memorials, historic buildings and sites, exterior works of art, significant structures and unique businesses" [15], that is, materializations of high levels of human intelligence and inspiration. Players can propose new portals, which become active after approval by the game managers. In reference to the expected impact of Ingress on ordinary experience, portals are said to "help Agents discover and enjoy their community" [30].

Ingress' mechanics and gameplay are relatively simple: players can hack any portal which is less than 40 m distant from them. If the portal belongs to their faction, hacking allows them to place or upgrade a "resonator". If the portal is under the control of the rival faction, they can attack their resonators[4]. Contiguous portals of the same faction can be linked, forming control fields which capture new mind units, strengthening the faction which controls the field (Fig. 2).

Ingress players coordinate attacks on portals under control of the opposite faction, and join forces to protect their own. They form teams in which special attention is given to beginners, who are helped with hints and explanations for the good of the whole faction. Thus, *Ingress* gameplay enhances collaboration. The narrative, on the other hand, is based on conquest, rivalry and suspicion.

Two years after the release of the beta version of *Ingress*, *Google* and *Niantic* assumed the general coordination of large scale meetings between factions. There are different types of *Ingress* events, for example, *XM Anomaly*, *Mission Day*, *Ingress First Saturday* (IFS) and *#NL-1331* [19].

[4] A resonator is a virtual element which contains XM energy. There are 8 slots for resonators in each portal. For a more detailed description of resonators, portals, and other elements of Ingress, see for example http://decodeingress.me/ingress-manual/. Access date: 10 Feb. 2016.

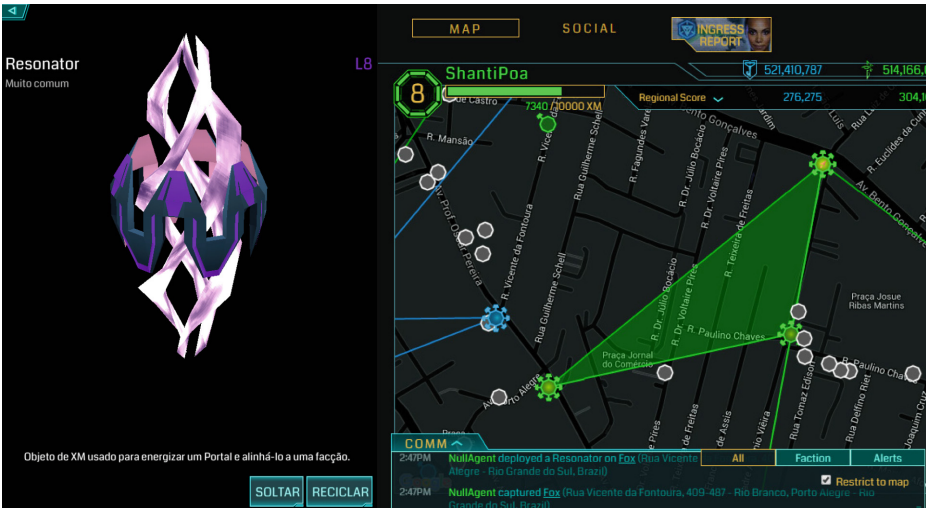

Fig. 2. Left: *Ingress* resonator. Right: field composed of 3 portals in a neighbourhood of Porto Alegre

5 Methods

The study we present in this paper was performed with the intention of grounding our hypothesis about ludic re-enchantment and locative games. Data collection included participation, survey and interviews. One of the authors, an *Ingress* player, was in charge of participation[5], which took place over a period of months. Observation was directed towards the IFSs in Porto Alegre. This choice was guided by many facts, amongst which is that IFSs are held in a large number of cities throughout the globe, their date and time are known in advance and the specific location of the meetings is widely informed. A decisive factor was that an IFS starts with the resetting of all portals in the area[6], which intensifies the need of orchestrated action and movement around the play area. Thus, during an IFS, the key elements of locative games in general, and Ingress in particular, are amplified: levelling the portals increases the attention to the material elements of the city that also pertain to the gameworld and the need to build new fields requires thinking about their distribution on the urban tissue. As a result, during IFSs the interactions with portals, with the city and between players is intensified.

The survey was divided in 3 sections: player profile, game experience and final considerations. It was distributed to groups of both factions in online platforms and

[5] We avoid the use of "participant observation" as, despite compatible with the *latu sensu* understanding of the expression, it was not planned, performed or documented in strict accordance to ethnographic methods.

[6] More information about Ingress events can be found at https://www.ingress.com/events.

applications (*Whatsapp, Telegram* and *Google+*) and responded by 28 players[7]. Three players agreed to participate in face-to-face interviews, with sound recording. Questions were directed to the player's relation to other players and non-players during gameplay, to the city and the play areas in general and to the elements of the city which are portals in *Ingress*. Possible signs of re-enchantment were investigated with questions about *Ingress* narrative, integration of gameplay to ordinary life and eventual alterations of urban sociability by playing *Ingress*.

6 Playing *Ingress*

Ingress' narrative adds a fictional layer to ordinary cities, that of the existence of a strange energy which affects human cognition and is controlled by a mysterious group. This energy, XM, flows through some material elements of the city, called portals, which are *Ingress'* most prominent anchors in the real world. To conquer a portal, players have to remain physically near to it for a couple of minutes, while the "hacking" takes place. This increases the attention to the elements chosen as portals.

Links between portals establish fields that amplify the interference of XM, which reach a larger number of human minds. Creating fields require knowledge of portals location, their relative positions and their accessibility. As a result, Ingress players are particularly aware of the relative position of portals and the urban structure.

In the city narrated by *Ingress*, portals and non-portals, agents and non-agents, XM and daily life are tightly connected. The gameplay, however, appears to take place in a different city, composed solely of portals, the streets around them and the flows of XM. This city is represented to the player as seen in Fig. 3; it is a magic, ethereal place and, also, an empty space. The emptiness of this representation makes it easier to understand the independence between *Ingress* narrative and gameplay. In the words of one player:

> *I don't follow [the narrative]. At times I watch the videos [...] I know of novelties, but more the technical aspects of the game. I always know when new objects are launched, but of the story [I know] little. At times people talk of anomalies and I become aware of them, but I don't know much about them.*

Another interviewee is of the opinion that even though the narrative can be complex and at times confusing and hard to follow, the gameplay itself and the actions required to hack, attack or defend one portal are very simple. Even when only the basic facts of the narrative are taken into account, everything that is, or can be, a portal, is resignified in ordinary life.

Those who are in the area, but not playing, are also erased from the empty Porto Alegre of *Ingress*. The mechanical voice reporting the situation of the portals nearby in the players' earphones help reduce the awareness of the surroundings. Interviewees

[7] Questions (in Portuguese) can be seen at https://professor.ufrgs.br/suelyfragoso/files/IngressSurvey2016.pdf.

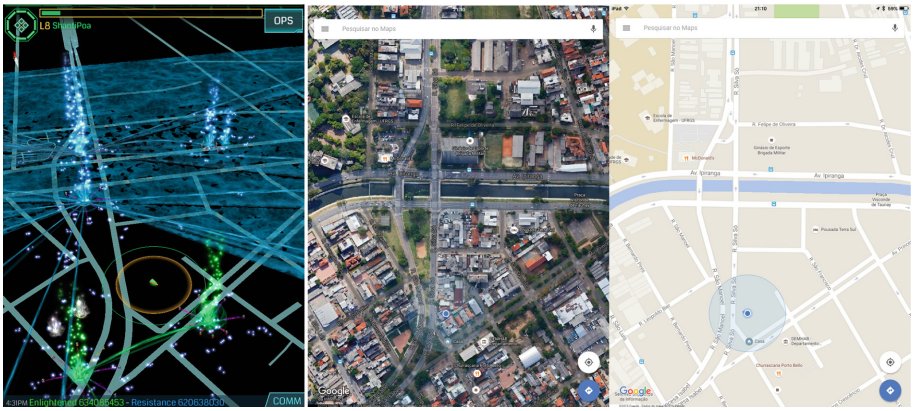

Fig. 3. Left: in-game representation of the player's surroundings. Middle: satellite image of the same area. Right: map of the same area

mentioned being sufficiently engrossed in play to risk their physical integrity in falls or by entering violent districts of Porto Alegre's metropolitan area to create or expand fields.

> when we play, all that interests is playing, is getting AP[8], *then we stay in that bubble. You don't notice the world*

When not playing, players are aware of the correspondences between the fictional city and the ordinary city. Some mentioned using *Ingress* map (the "Intel") to encounter places in their ordinary life, in preference to other tools equally at hand. The Intel map is also used to verify the availability of portals and adapt daily routes accordingly.

> *at times, before leaving for work, I set up a little 'scheme' with a print of the screen on the mobile and […] plan. But I also keep an eye on things, checking how my house is, the size of my field in relation to the city, etc.*

Our interviewees have become more aware of the physical elements of the city, always considering whether they are or could be a portal. This changes their perception of the city, as "*even when not playing (…) we see things with other eyes*". Elements that were previously unnoticed, or even seen negatively, acquire a new meaning and greater importance. Local history emerges through the characteristics of portals, particularly as a result of the need to approach and stay near the portal for long enough to read signs and other indications, for example, in monuments.

> *[The IFS Porto Alegre location] is the historical city centre. There is the Cathedral Square, which is pretty cool, there is the Piratini [Government Palace], which is where we should –*

[8] APs, or Action Points, can be gained by hacking or updating portals, for example. They are cumulative and it is through them that a player can reach higher levels, what grants access to more powerful items.

theoretically - praise our history, there is this guy who always has a pigeon on his head, General Osorio[9]*…*

The same applies to personal histories, as in the case of the player who discovered the identity of the person in the monument she passed by everyday:

when I started to play, I noticed there is a bust on the square that I had never seen. I didn't know who [a historical figure her school was named after] it was. There is an obelisk in honour of [other historical figure] which is the name of the street. It was something I changed my way to avoid when going to the bus stop. This was the greatest shock [I passed by those] for nearly 14 years and had never seen [them]. It is a great square […] and I had never sat there before playing [Ingress]

Some players report having developed strong affection to portals they have guarded for a long period. Referred to as guardians, these are as valuable as those which are difficult to conquer. These portals are not special in *Ingress* narrative, they become special by features exclusively related to gameplay. Beyond personal satisfaction, conquering and maintaining portals are important for players' reputation and for the hierarchy of the local Ingress community. Ingress players level up by accumulating points earned with the control of portals and creation of fields. At level 8, players cross an important threshold in the game's hierarchy. In Porto Alegre, there is a special discussion group for players above this level.

There are signs of other layers of meaning in the investment to control of portals and create fields, which are noticeable, for example, when players refer to their habitual playing areas as "workplaces". It is also worth noticing that players refer to each other by their in-game names (agent names) in out-of-game situations.

All interviewees identify sociability as their main motivation to play Ingress. However, it must be taken into account that all are known to participate in Ingress First Saturday events which, despite centred on gameplay, involve a great amount of social interaction and are usually followed by social gatherings. On the other hand, a sense of community can also emerge from individual play, due to the knowledge that others are also playing in other physical locations.

The game helped me to work better in teams […] be part of a faction. Even if you are not participating in a specific operation, you know what is happening […] In game, you appear alone, so you can do things independently from other players, who don't need to be playing at the same time as you, but they can help you anyway […] even if I don't contribute much, I know it helps a little and I am always connected to my people. If I close a field, it is for my faction. I am not closing a field and that is it. It is a field for my team.

As important as in-game social ties, in-game rivalries also impregnate the social relation of players beyond the gameplay. The profiles of Enlightened and Resistance players are undistinguishable from one another, but those in the other faction,

[9] Niantic's specification that portals must be expressions of human intelligence and artistic skills leads to a concentration of portals in specific areas of the cities. In Porto Alegre, one of these areas is the historical centre, which contains several recently restored buildings, squares and monuments. The IFSs Porto Alegre takes place between two squares that date back to the foundation of the city: and Praça da Alfândega (Customs Square) by the lake, is the site of the original settlement, and Praça da Matriz (Cathedral Square), on higher terrain, is the site of the official foundation.

Enlightened or Resistance, are seen respectively as alienated and gullible or conservative and fearful. Even in social situations that do not involve gameplay, players aggregate by faction. One of our interviewees mentioned that an *Ingress First Saturday* had been suspended due to the hostilities between two players. Their disagreements started with the dispute of a guardian portal and have degenerated to material grounds such as the ownership of *Ingress* memorabilia imported to Brazil by one or the other.

Diffuse as they are, the boundaries of the magic circle interfere with social associations which are not related to the game. Playing or not playing *Ingress* is more important than the choice of faction and affects the relevance of others in ordinary life. Everyone who is seen using a mobile phone is a potential player and, as such, a fellow member of the *Ingress* community: "for me, anyone with the mobile phone on the street is an Ingress player". The sympathy towards those who play is instantaneous:

> *I have many times passed by players, first time was "wow, there is someone else playing here" Some other times I hid, when it was a player of the other faction. I [hid and] watched that other person playing*

Non-players who acknowledge the fiction can be respected, as in the case of the daughter who proudly described how her mother points out buildings which she thinks are or could be portals.

Andrade [2] mentioned non-players interfering with the gameplay in Juazeiro and Petrolina. In Porto Alegre, however, non-players disappear and, as everything else that is not represented in the Intel map, become irrelevant. When questioned about the presence of others in the areas of Ingress events, one of the interviewees was emphatic:

> *I enter the game [...] and don't pay attention to anything [else]. Not [even] the people, but yes, [I pay attention] to places, what are the portals around, [I pay attention to the architecture and the like. Human beings that are not playing don't matter at all.*

Curiously, this attitude is in direct contradiction to how *Ingress* narrative justifies the need to conquer portals and create fields, which is to alter the flow of XM and, therefore, its influence on the minds of those in their surroundings: the non-players. When reminded of this, our interviewees were surprised of having forgotten the narrative to the point of not taking it into account.

7 Ludic Re-enchantment in Ingress

Ingress is a fortunate example of LARGs power of re-enchantment. Its rich narrative and gameplay are relatively independent from each other, making it easier to identify the different forces of re-enchantment set in motion by the game. *Ingress'* narrative dialogues directly with the two axes of disenchantment and re-enchantment, science and religion. It also appeals simultaneously to the modern imaginary and to the contemporary desire of re-enchantment. *Ingress'* gameplay is less specific: most aspects of *Ingress'* mechanics and dynamics can be encountered in other LARGs[10].

[10] Ingress' gameplay consists basically of a dispute of tokens and territories between two factions. As such, it can be thought of as a variation of the traditional children's game "capture the flag".

Therefore, considerations about ludic re-enchantment emerging from *Ingress'* gameplay are more suitable for generalization than those deriving from the narrative.

Regardless of how independent gameplay and narrative appear to be in the description of a game, in the experience of play they are inseparable. In this section, narrative, gameplay and their intersection are discussed separately exclusively for clarity. The same is true for the organization of the discussion of gameplay according to the three major approaches previously identified in urban theories, which are the focus on city materialities, on how city inhabitants relate to the materialities and on the human associations which comprise the social hierarchies and urban power relations.

7.1 Ingress' Narrative: Religious and Scientific Re-enchantment

Ingress overarching meta-narrative reestablishes the role of the supernatural in ordinary life. In *Ingress*, humanity is subject to forces that have resisted every wave of modernization.

XM interferes with a foundational aspect of Modernity: human cognition. Its mere existence challenges modern rationality. An even greater challenge comes from the existence of those who control it, the Shapers. They are "endowed with supernatural, superhuman, or at least specifically exceptional powers" [35] (p. 241) and, therefore, a typically charismatic source of authority. Knowingly or not, humanity has always been subject to some degree of legitimate domination. This sets the scenario for the mystical qualities world of *Ingress*.

In parallel to a plot centered on scientific re-enchantment, *Ingress* world is closer to *strictu sensu* religion than some of the forces of re-enchantment by epiphany given as examples by Assunção [4]. *Ingress'* world is marvelous in several ways, starting from the beauty of its visual representation. The transparent shades of green and blue, the sparkle of XM and, perhaps above all, the emptiness, combine to suggest a space suspended from reality by incantation. Besides its visual atmosphere, the mechanical sounds that come from this world are trance-inducing and continuously repeated in a ritualistic fashion.

7.2 The Intersection of Ingress' Gameplay and Narrative: Battle for Disenchantment

In contrast to the re-enchanting ingredients of its narrative, Ingress gameplay is a call to arms in defense of Modern values. It starts with a practical choice between the Enlightened and the Resistance both of which, contrarily to what the denominations suggest, appeal to a predominantly modern set of beliefs likely to be attuned to the profile of *Ingress* players. This is more obvious for the Enlightened, whose attempts to maneuver the flows of XM are based on confidence that science will be able to understand and control that mysterious force, elevating humanity to a demiurgic level. The Resistance is fighting for the Modern paradigm in a less obvious, but perhaps more effective, way. They attempt to overcome the charismatic domination of the Shapers and reestablish a social organization based on "non-legitimate domination".

Regardless of which faction they choose, *Ingress* players always side with Modernity. The Enlightened defend Modernity because of their trust in science. The Resistance, because of their lack of trust in charismatic authority.

These battles for disenchantment are not clear when just *Ingress'* plot is considered, or when just the gameplay is taken into account. They only become apparent at the intersection of *Ingress'* narrative and gameplay.

7.3 Ingress' Gameplay: Re-enchantment of the City

The discussion of Ingress gameplay in relation to disenchantment and re-enchantment is organized according to the threefold approach to the city and urban experienced previously proposed. Transposed to LARGs, its three axes correspond to the integration of the game to the physical elements and the structure of the city; the impact of the game on the relation players establish with that materiality and the effect of playing on social associations, with players and non-players.

7.3.1 Re-enchanted Urban Materialities

The elements chosen to be *Ingress* portals are already enchanted by being incorporated into the fiction; that is, by being transposed from ordinary life to the experience of the game. More important for our search for signs of ludic re-enchantment in Ingress, however, is that they are also re-enchanted as part of ordinary life. An element identified as portal, or potential portal, is immediately sparked with the magic of XM. On the other hand, looking at the city under the new light and with the care required by Ingress reveals new facets which are independent of the game. The first reason to pay attention to a monument can be the fact that it is a portal, but the discovery that it is also part of the local history, or of the players' personal history, is a re-enchantment of them *in* real life and *by* real life. Ingress gameplay is only the trigger of that process of re-enchantment.

7.3.2 Re-enchanted Urban Experience

Ingress players describe a highly immersive experience, in which they would be transported from the ordinary world to a different sphere, a space which can be identified with the maps on their Intel screens. In this sense, the mystical qualities of that empty and ethereal space qualify gameplay as an experience of religious re-enchantment. However, there is evidence that players forget or disconsider most elements of *Ingress'* narrative during gameplay. This is hardly surprising given that very few narrative elements are important for the game mechanics and dynamics: at the limit, only the existence of the two factions and of in-game objects like resonators and portals.

Ingress players need to move from one portal to the next and to identify contiguous portals to created fields. As a consequence, they develop awareness of the distribution of the portals in the city and learn to see the *Ingress* city in the real city, and vice-versa. The use of interactive maps to play and the Intel map in ordinary life increases and mixes the layers of meanings attributed to the areas around portals, expanding to embrace larger parts of the city as the player proceeds. Urban experience is

re-enchanted by the non-instrumental relations to the urban tissue set in motion by *Ingress*.

Within the context of the game, the initial motivation to invest time and resources to conquer and maintain portals can be instrumental (leveling up), but the type of attachment that results from the investments of time and resources to maintain them is not. This is evident in the choice of words used by *Ingress* players to refer to portals they have controlled for some time: players care for portals, guard them, protect them. The hacking of a portal which has been guarded for some time is reason for grief and can be understood as a personal attack. These portals are re-enchanted by affection, and remain enchanted when the player is not in-game.

7.3.3 Re-enchanted Urban Associations

Social interaction is at the core of *Ingress'* gameplay. Even individual actions such as conquering and maintaining portals are meaningful only in the context of the competition between the two factions. As typical in team games, *Ingress* players develop a sense of community which tends to cross the fuzzy boundaries of the "magic circle". In *Ingress*, this is amplified by fact that one of the few points in which the narrative fully impregnates the gameplay is the choice between the Enlightened and the Resistance. Joining one or the other influence in-game and out-of-game relations. Even the most rational players will at times be impregnated by beliefs such as those who joined the Enlightened are foolish or that those of the Resistance are fearful.

It is important to consider that the choice between the factions is typically a rational decision. The Enlightened and the Resistance are typical modern aggregations: their members are bound by instrumental, temporary and unstable links. This is not contradicted by the sense of belonging which tends to emerge within either faction. One of the internal contradictions of Modernity is that even the most disenchanted human relations never ceased to include enchantments such as love, hatred or camaraderie.

Ingress' gameplay does not erase only the materialities of town, but also others who happen to be in the play area, but are not participating in the game. Materialities which are not useful for the game, that is, that are not relevant for the instrumental logic of gameplay, have been erased, including all living beings. Even the mechanical sounds contribute to the perception that the esoteric city in the Intel map is inhuman and still.

However, the community of *Ingress* players is lively. The sense of belonging that binds all players is more important than the internal links of each faction, or the rivalry between them. Players become part of this community for non-instrumental reasons; they want to enjoy the game. This would be, in principle, a re-enchanted form of human association. However, *Ingress'* gameplay establishes hierarchies through conditional achievements. Added to gamification strategies such as token distribution, these give rise to power relations which are essentially disenchanted. When *Niantic* and *Google* took charge of the *Ingress* events, they chose to establish fixed rules and start the distribution of material goods and mementos for a few elite players. Despite their express intention of motivating participation, these inherently disenchanting strategies are bound to have weakened the magic of *Ingress* social gatherings and run the risk of compromising the sense of belonging that has, so far, been an important aspect of playing Ingress.

8 Final Considerations

When defined in opposition to rationality, play is a form of re-enchantment; that which we chose to call ludic re-enchantment. Play is not restricted to games, but, in games, the intersection between fiction and reality is more evident. This is even clearer in ARGs, which enhance the effect by explicitly entangling the fantasy world with ordinary life. LARGs go one step further in their incorporation of spaces of the material world in the fictional universe. For this reason, one of the hypotheses of this paper was that ludic re-enchantment is particularly powerful in LARGs.

We searched for evidence of ludic re-enchantment with a study of the LARG Ingress. It confirmed the existence of ludic re-enchantment and made it possible to identify some of its characteristics. First and foremost, the study indicated that the peculiarities of a game interfere with the processes of re-enchantment it sets in motion. Ingress' narrative brings to the fore aspects of religious and the scientific re-enchantment which characterize it as a tale about an ongoing re-enchantment of the world. Ingress gameplay promotes three lines of reenchantment. The first derives from the incorporation of urban elements from ordinary life into the gameworld. Players interact with these elements as part of Ingress fiction, resignifying them in a variety of ways. These elements are also reenchanted in their role in ordinary life as, by looking at the city in a new light, players discover new aspects which are not related to the game and change their relation to the city to a less instrumental one. Finally, Ingress' gameplay requires joining one of two factions which are typical modern aggregations. On the other hand, these are essentially human associations and, as for Modernity in general, a contradiction always emerge from them. However rational at the start, even the most disenchanted human relations lead to enchantments such as love, hatred or camaraderie.

The dynamics and narrative of a game can be described and discussed in parallel, but they are never experienced separately. At the intersection between its gameplay and narrative, players of *Ingress* become champions of Modernity. Disenchantment is at the core of the instrumentality of the dispute of territory between two factions. Within each group, the defense of Modern values is clearer in the case of the Enlightened, but stronger and more effective in the Resistance. Moreover, when the narrative and gameplay are taken into account, playing *Ingress* revealed to be a complex convergence of processes of re-enchantment, disenchantment and even disenchantment of the re-enchanted.

Play does not always involve games. Ludic re-enchantment is not a privilege of LARGs, or even of games, it is part of the experience of play. Further studies are necessary to understand ludic re-enchantment not only in games, but also in other forms of play.

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