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David Kreps
Gordon Fletcher
Marie Griffiths
(Eds.)

Technology and Intimacy: Choice or Coercion

12th IFIP TC 9 International Conference
on Human Choice and Computers, HCC12 2016
Salford, UK, September 7–9, 2016, Proceedings

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Preface

This book contains the proceedings of the 12th International Human Choice and Computers (HCC12) Conference, held at MediaCityUK, Salford, Greater Manchester, UK, on September 7–9, 2016. The conference was held by the International Federation of Information Processing (IFIP) Technical Committee 9 (TC9): Information and Communication Technology (ICT) and Society.

The conference Chairs, David Kreps (Chair of TC9 Working Group 9.5: Virtuality and Society), Gordon Fletcher, Marie Griffiths (Vice-chair WG9.5), and Diane Whitehouse (TC9 Chair), chose the theme for this year's conference: Technology and Intimacy: Choice or Coercion. Whilst encouraging contributions from across the subject fields of the working groups of TC9, this theme has coalesced into three principle strands of focus: ethics, communication, and futures.

The papers selected for this book are based on both academic research and the professional experience of information systems practitioners working in the field. It is the continued intention of the TC9 that academics, practitioners, governments, and international organizations alike will benefit from the contribution of these proceedings.

The volume editors have, in addition, contributed an introductory paper "Human Choice and Computers: An Ever More Intimate Relationship," which is divided into two principle parts: the first looking back at the history of the conference series, and the second, subdivided into the three sections, ethics, communication, and futures, introducing each individual paper in the volume.

July 2016 David Kreps

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Introduction

Human Choice and Computers: An Ever More Intimate Relationship

1 The Context for HCC12

Since 1974, the Human Choice and Computers (HCC) conference series has firmly remained at the cutting edge of innovative thinking about the interface between the social and technology (Fig. 1). This observation should not be a surprising statement given that the central remit of IFIP's Technical Committee 9 (TC9) is the relationship between computers and society. As Jacques Berleur, Magda Herschui and Lorenz Hilty related in their Introduction to the Proceedings of HCC9, "The success of HCC1 was such that IFIP-TC9 henceforth considered it the TC's founding event, if not birthplace. TC9 was conceived in 1976, two years after HCC1." [4]

This founding focus has been repeatedly explored throughout the forty-two year journey of HCC even surviving the difficult period documented by the third HCC conference proceedings [14]. The emerging distinctiveness of HCC conferences is highlighted by the fact that in 1986 it was the very nature, scope and purpose of the relationship between technology and people that was at the heart of an intensely critical and heated debate. In his introduction to HCC3, Sackman[1] chooses to remind an increasingly diverse readership of the ranked list of objectives for TC9 as:

1. Protection of Individual Rights
2. Employment and the Quality of Life
3. International Problem Solving
4. International Studies on Social Impacts
5. Professional Social Accountability
6. Universal Social Benefits
7. Protection of Group and Collective Rights
8. International Planning and Cooperation
9. International Education

Clearly, what has set HCC conferences apart is the critical perspective that is its hallmark. HCC12 continues this tradition. Cecez-Kecmanovic [7] identifies critical

[1] [14, p. 11].

information systems research as being defined by a socially critical point of view, or, as Myers and Klein put it, IS research "can be classified as critical if the main task is seen as being one of social critique, whereby the restrictive and alienating conditions of the status quo are brought to light"[2] This view is revealed in Sackman's 1986 list which places the objective most likely to initiate "transformative social change" [7] at the head of the list.

To explore this history the editors of these proceedings used a contemporary textual analysis tool to examine the existing corpus of HCC texts: the prologue, introductions or key introductory chapters were analysed for identifiable trends. HCC6 was not included as it could not be located through the UK's interlibrary loan system and HCC11 was not included due to its relatively brief prologue. Using optical character recognition to include the earlier conference introductions, the corpus was then processed through the voyant-tools website[3] to visualise the resulting trends. Figures 1–6 were produced in this way.

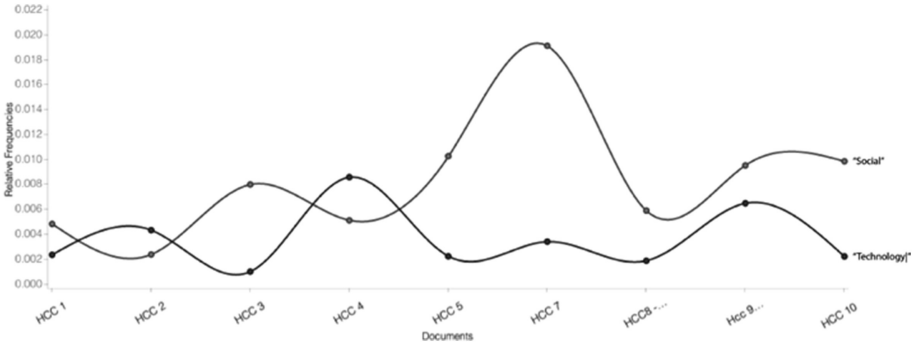

Fig. 1. The intertwined focus of technology and the social in HCC.

McGrath [10] confirmed the distinctiveness of HCC when she cited the proceedings of the first conference in 1974 as a watershed moment in the development of critical information systems thinking. The proceedings, she said, included an encouragement by editors Mumford and Sackman "to engage with the way that computer applications were being developed and deployed, and to make the human choices necessary to ensure that democratic values and ideals were preserved for the benefit of everyone".[4] While Mumford and Sackman probably did not set out consciously to create this theoretical position, the critical focus and variety of challenges presented in the first conference were certainly a product of their time. An almost continuous concern with the position of labour, pressing union issues and the prevailing social theories of the time are peppered throughout the early proceedings of HCC.

[2] [9, p. 69].

[3] http://www.voyant-tools.org/.

[4] [10, p. 87].

> Worker orientation is also possible, and a lot should and will be done. From a certain point on, however, too much adaptation will result in overspecialization and this will rebound back onto the worker in the form of career and position difficulties. Flexibility is a human virtue and should be cultivated.[5]

> Our subject, therefore, is a matter far beyond computer sciences. It has to do with sociology, psychology, physiology, with the art of management and government, with democratic decision making as well as legal decision making and even creation of law. It must deal with the large field of problems with which the trade unions are faced. And it extends even into philosophy and religion - if Europe and America do not teach this, Islam certainly does these days.[6]

The various threads of what are now recognisable critical thinking in IS are developed more fully in later conference proceedings. In many cases, it is the small and offhand points made by earlier authors that became the pressing focus for later discussions. For example, Zemanek in 1979 [15] observed, "today we begin to realize how inseparable scientific and human development are." and Margulies' final footnote in 1979[7] struggled with, "whether we could leave out home computers from our discussions or not - they will probably affect our attitudes towards computers and thereby affect our professional life." Margulies [16] started the first formalising of the critical thinking perspective of HCC by provocatively entitling his contribution - in a rare moment of editorial reflexivity for any conference - as "Why 'HCC' again?" and by then stating:

> ...technology must not become an end in itself, but has to be seen in the context of man. Throughout history man has developed new means of production in his unceasing endeavour to make work easier and life better, thus at the same time creating new ways of human cooperation and societal organisation. The technology of today also can only be justified by its service to man, by its contribution in improving the quality of life, in providing the chance of self-realisation.

In all of these early statements, with the benefit of hindsight, it is apparent that, with rapid evolution, adoption and popularisation, information technology was pressing nearer and nearer and becoming ever more intimately tied with the human condition. In 1986 Sackman working amidst the disruption of a fundamental ontological debate, identified major new forthcoming areas of concern for research that included - somewhat prophetically - "home information systems and social networking" and "robotics and artificial intelligence"[8]. While Barnes [2] is regarded as the originator of the term 'social network' this must be one of the first published instances of the term in relation to computers and information technology. This is an even more extraordinary statement when it is placed in the historical context of Dell Computers, the NSFNET (the first major TCP/IP network) and the WELL (the first digital community) all being only one year old in 1986.

With the increasing ubiquity and everyday presence of information technology, more recent HCC conferences have become less focused on work and more concerned

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[5] [15, pp. 16–17].

[6] [16, p. 6].

[7] [16, p. 16].

[8] [14, p. 16].

with the general human situation including aspects of the personal and of the home (Fig. 2). This does not mean the original concerns of HCC have now somehow disappeared but rather that they have now become supplemented and richer, to incorporate the fuller interplay of public and private (Fig. 3) in ways that were not imagined or possible in the 1970s or 1980s.

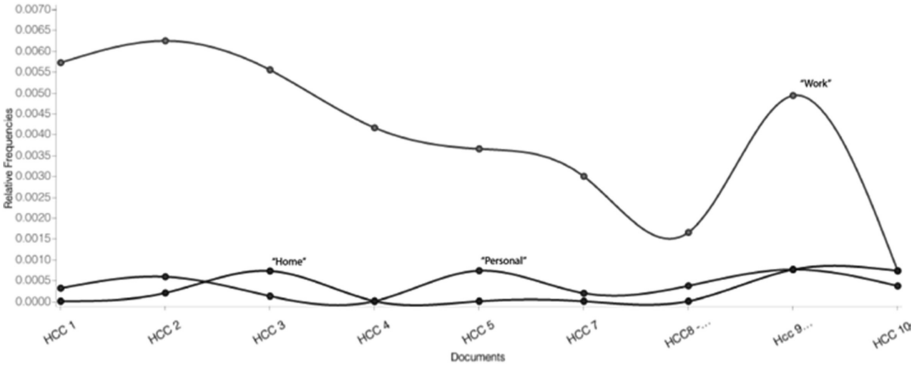

Fig. 2. Home and Personal vs Work through the HCC series.

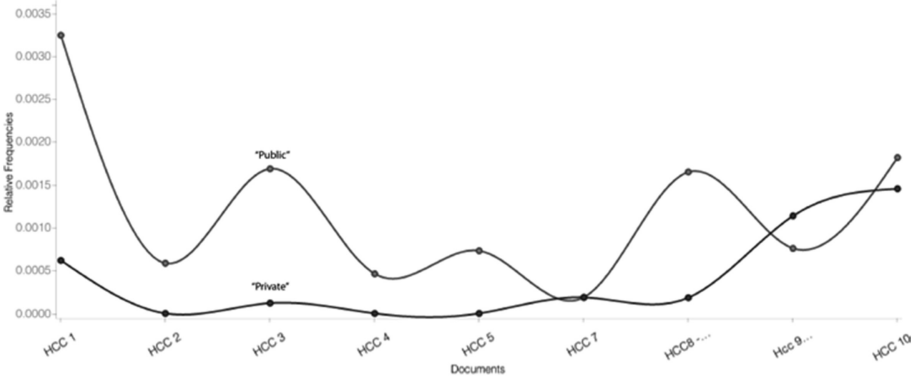

Fig. 3. Public vs Private through the HCC series.

The spirit of HCC is consequently evident in the link tree of connected terms from the first HCC through to HCC10 held in 2012 (Fig. 4). The juxtaposition and mediating terms are themselves revealing of the intimate relationships between technology and people. “Information”, “Human” and “Social” sit at the centre of the diagram interlinking all the other concepts. Both “human systems” and “computer systems” are represented as is the classic “man machine” combination. “Human” and “Technology” are only sometimes mediated by the use of “policy” while “society”, “technology” and “people” sit in a triangular relationship revealing an interdependence that is acknowledged by many HCC papers through the years.

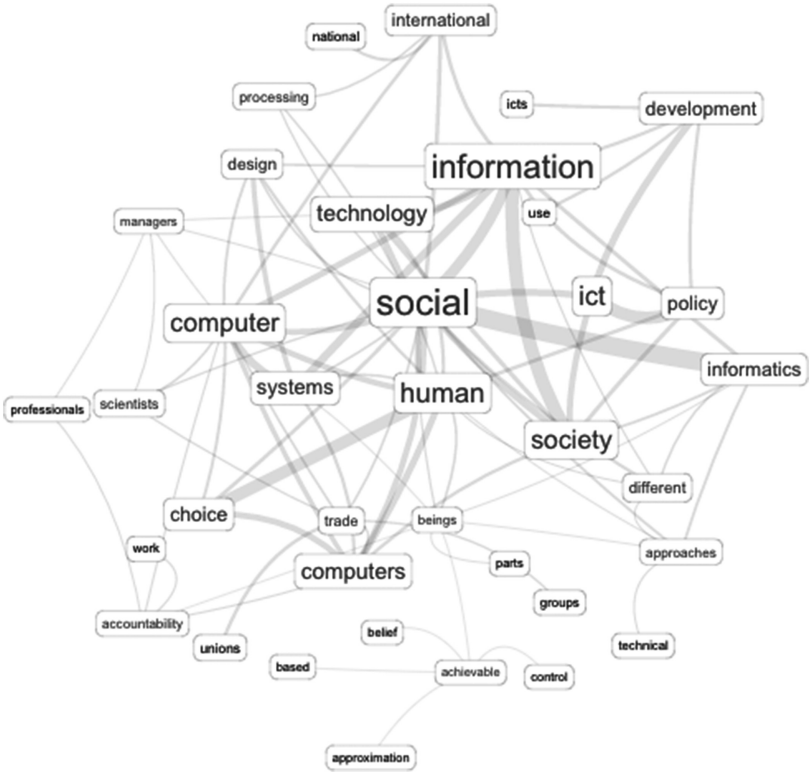

Fig. 4. Link tree of related terms generated from the entire HCC 1 to 10 corpus.

The ever closer intimacy of technology has generated a shift in attention from the rare and expensive hardware of processing in the form of "computers" to the more central object of the relationship between technology and people in the form of "information" (Fig. 5). With multiple devices constantly "near us" and "on us" (and soon "in us") the question of what any single computer is doing or how it will be deployed becomes less significant than what "we" will do with the consequent information that is being generated by the many devices now available for us to access, interpret and use.

The rise of the importance of information at HCC also parallels an 'ethical' turn to the proceedings with rising attention commencing from HCC5. What Constantinides et al. [8] might describe as progress towards the "ends" of Information Systems research. The patterns of critical research, as Richardson and Robertson point out, seem broadly to have settled into a three part format: insight, critique and transformative redefinition. Insight, "helps to highlight hidden or less obvious aspects of social reality;" critique, "challenges many of the taken-for-granted assumptions, beliefs, ideologies, discourses;" and transformative redefinition, "is the development of critical, relevant knowledge and practical understanding to facilitate emancipatory change"[9].

[9] [13, p. 255].

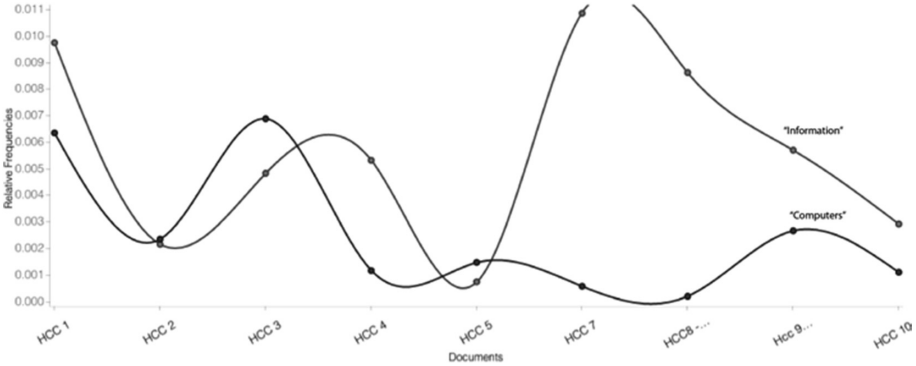

Fig. 5. Timeline of HCC1 to HCC10 proceedings with computers declining over time and information rising in significance (HCC 7 was dedicated to Rob Kling and this introduction is particularly rich in the use of the terms 'information' and 'informatics').

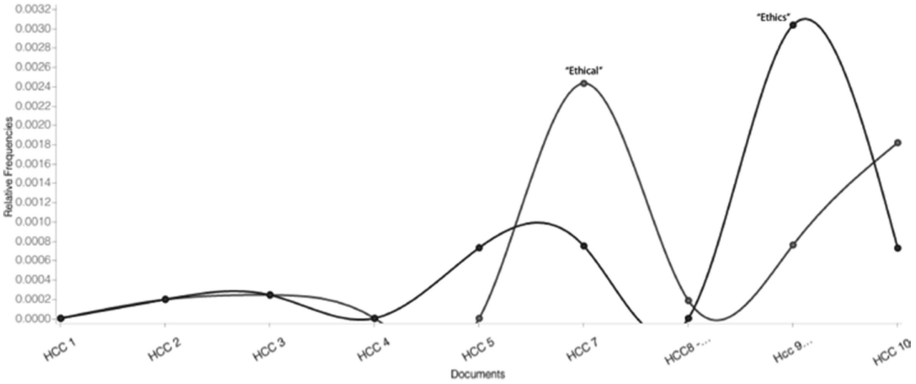

Fig. 6. The rise of ethical and ethics consideration in HCC.

This ethical turn over the course of the HCC series, then, is in keeping with the transformative redefinition such critical research engenders. As people are brought into closer constant communication with technology the issues of ethics and the ethical boundaries between "what can be done" and "what should be done" becomes a more pressing and more evident challenge to researchers. As the number of interfaces increases so too do the ethical challenges. As a long-standing conference series dedicated to critical information systems research, HCC is rightly staying true to its heritage by charting this increasing tension between the many possibilities that technology now enables, in contrast to what "we" as a society should be doing with these capabilities.

The final chapter of the first HCC proceedings, "reviews basic agreements, disagreements and recommendations generated by the papers"[10]. We now continue in the spirit of this tradition by taking a look towards the imminent future.

[10] [11, p. vi].

In the tradition of the previous HCC conferences, there is, in HCC12, an international spread of attendees, with authors representing South Africa, Germany, Slovenia, Australia, Norway, Britain, Japan, Canada, Italy, Denmark, Malaysia, Greece, Sweden, Ireland, and, interestingly, a large Finnish contingent.

2 HCC12: Technology and Intimacy

The theme for HCC12 is "Technology and Intimacy: Choice or coercion?". A theme that came about when the editors recognised how often, during discussions about the conference, that each was using some form of mobile device to check a point of fact, ask questions of colleagues who were not in the room, to format a document or look up the details of a previous HCC conference. The immediacy and intimacy of this relationship with technology provided all the inspiration that was required.

> Intimate technologies are now manifest in so many ways in the workplace, domestic environments, in transport, in defence, and through entertainment opportunities, with both similar and distinct impacts in the developed and in the developing world. (HCC12 Call For Papers)

From this statement came the inspiration for a series of prospective themes to prompt prospective authors. These were developed by the editors based on existing discussions found in a range of disciplines around technology and intimacy.

- Intimacy – Location – Personal/Social – Wearables – Implantables – Data Manipulation
- Personalisation – Identity – Digital Footprint – Gender
- Marketing – User Experience – Human Computer Interaction & Design – Search and Social Media
- Customisation – Material Culture – Innovation – Kit – Microchipping
- Generations – Histories – Enabling Technologies
- Geographies – Urban Technologies – Wayfaring
- ICT for Development – Global Mobility – Developing Economies – Sustainability

Of course, while editors might speculate on what "their" conference will look like it is ultimately the authors who structure and shape the final experience and who now lay down the next layer in the historical record of HCC. The HCC12 papers present a number of common themes that all sit comfortably within the HCC tradition while also reflecting the impact of a changing digital landscape. A quick glance around any bus or train offers a fair indication of the extent to which society has overwhelmingly embraced an increasing myriad of devices for their information and entertainment consumption. The increasing range of venues and purposes for juxtaposing technology and people will continue to pose new dilemmas that require further theorised investigation.

The structure of the HCC12 proceedings endeavours to capture the essence of the themes that have been raised. Three broad themes emerged. Two of these themes reflect the current priorities of human computer interaction in the form of ethics and

communications. The ethical questions being raised reflect the human aspects of human computer interaction while the communications discussions focus more heavily upon the technology side of the relationship.

The tradition of HCC is also preserved in the third theme of the conference in the form of consideration for the future and the recognition of emerging technologies that will present further new challenges to the intimacy of the human computer relationship.

As with any conference these themes are not mutually exclusive, or the sole set of concerns being expressed. There is, for example, a strong presence of theory with many authors explicitly positioning their work within the context of a recognisable intellectual tradition. Authors in this spirit include Koskinen and Kimppa (2016), Pan and Finken (2016), Padua (2016) and McKenna (2016). Many others also continue the HCC tradition of critical thinking with their strongly theorised work.

3 Ethics

The particularly sensitive area of healthcare information systems is examined by Koskinen and Kimppa (2016) in relation to the ownership of the voluminous and intimate information that these systems contain. Their theorised approach to the ethical issues raised by healthcare system enables them to provocatively propose an alternative solution that is labelled as Datenherrschaft.

Heimo et al. (2016) continue this ethical attention to healthcare by considering the relatively new coupling of the potentially vulnerable and elderly with healthcare technologies and the gaming sector. The paper takes up the challenge of understanding the ethical issues of using a device - the Jumppatikku - that encourages activity in the elderly while also potentially exposing personally identifiable data to third parties. The nexus of data privacy and ensuring the security of the senior citizens provides a broad platform from which to interrogate the main ethical implications that are drawn out with new technologies.

Harvie et al. (2016) continue this focus upon the elderly by looking at the use of assistive technology devices more broadly. Their discussion is positioned within the context of a generally aging population but is humanised through the use of a vignette of 85 year old Rose and her personal experiences with technology. Age, or rather generational difference, in the experience of technology is another recognisable theme through many of the conference's papers.

The use of potentially beneficial technologies by the elderly is continued with Kwee-Meier et al. (2016) who consider the very specific use-case of tracking wearables on a cruise ship. Their survey shows that the concerns for data privacy associated with the use of wearables is weighed against their perceived safety benefits by many users of these devices. Kwee-Meier et al. (2016) also point to age as an important variable in determining these attitudes.

The importance of addressing the social isolation amongst the elderly is taken up by Hessey et al. (2016) who discuss a specific assistive technology for the elderly that was trialled in Cornwall. The project brought Skype to the elderly through their existing televisions and endeavoured to alleviate some of the issues associated with being older.

The project reveals the importance of user-informed design and the need for consideration of the many intersecting attitudinal issues associated with the use of technology.

The issues associated with the elderly and people with dementia are also taken up by Kreps et al. (2016) with a more conscious design perspective. The paper utilises the concept of skeuomorphic reassurance to present necessary design principles to inform the creation of technological artefacts for older users and for those with cognitive decline. The key principle employed in this paper is the need to reference antecedent designs in the creation of new and innovative technology products. Without this consideration the intended users are potentially left unable to access the benefits of technologies intended for them.

Botha et al. (2016) also offer a solution in their paper to deal with the problem of leaking personal data. Drawing upon a South African legal situation to set their context they examine the issue of unintentionally revealing personally identifiable information. The work moves towards the development of a preventative solution that endeavours to prevent leakages of this type before they occur. A technological solution is required in order to manage the volume of information that must be filtered and for its accuracy in determining the leakage of "small" bits of data that are meaningful to a hacker but can be regularly missed with human filtering.

Ishii and Komukai (2016) also take the up ethical considerations for data through a legal perspective by comparing the situation in the US, UK and Japan regarding data breaches. Although framed within the legal context for dealing with these breaches the paper also reveals the extent to which social values, norms and perspectives are reflected in the experience and responses.

Iredale and Heinze (2016) examine the issues surrounding the professionalisation of Search Engine Optimisation. They consider how - or when - a move to professionalisation will occur. The paper takes the position that ethical consideration must be at the core of SEO work and that without this self-awareness and guiding set of principles associated with ethical behaviour the industry itself cannot become professional.

Vartiainen et al. (2016) also look at the ethical issues in the professional world when they consider the sometimes fraught client-vendor relationship. Their survey identifies the competing series of variables that traditionally shape this type of relationship and they argue for the need to deploy new approaches. As with many of the papers that take up this ethical consideration for people and computers, Vartiainen et al. (2016) advocate participatory design as a key ingredient in shaping an ethical and productive relationship.

Reijers et al. (2016) round out the ethical theme by making the case for personalisation. Utilising the work of Ricoeur they argue to what extent the act of personalisation is itself an act of personhood and that in this act is an aggregation and shaping of the personal itself.

4 Communications

Kljun and Pucihar (2016) complement the paper offered by Hessey et al. (2016) to take on the criticisms that technology can be a socially isolating experience to examine the prospects for using mobile technologies to initiate communications in public settings.

As with so many of these conference papers, Kljun and Pucihar's (2016) discussion also raises many ethical questions and points towards the clear value of participatory design.

Phahlamohlaka et al. (2016) explore the value of secure ICT in the context of marginalised and developing economies. Particular attention is given to the role of ICTs as a mechanism for enabling economic activities. This is a complex problem within economies where many individuals do not have access to conventional banking mechanisms. However, success with this form of communications has the prospect of empowering individuals and entire communities.

Aligning with Phahlamohlaka et al's (2016) argument and building a more specific focus, Pathirana and Khin (2016) also explore the relationship of communications in the form of the value of social media within the banking sector. The context for this work is the Sri Lankan situation. This paper also reflects the underlying theorised positioning of many papers by drawing on both the work of classic economists and the Technology Acceptance Model. This work also tackles the equally contested area of generational difference and the varying engagement between age groups of technology and financial services.

Pan and Finken (2016) offer a unique insight into the specialist area of marine technology by drawing upon Actor Network Theory and Computer Support Cooperative Work. Not only is a heavily theorised perspective again evident but so too does the argument for the use of participatory design emerge that can be found in the work of Kreps et al. (2016) and Hessey et al. (2016).

Haugsbakken (2016) looks at the role of "betas" in extending and legitimating the use of social media within organisation and professional life. The work is based around a theorised approach towards reflection and reflective practice that assists in shaping the framework that is outlined in this paper. Shaping the discussion around the role of "betas" also hints at the changing roles that people have within their professional life and offers a counterbalance to the discussion of professionalisation offered by Iredale and Heinze (2016).

The social networking and social media focus is narrowed down to Facebook by Pirli et al. (2016) in a phenomenological study of the individual user's connections. Their examination of this particular social network also takes up the issue of generational differences in the use of technology by focusing on 'adult Facebookers' and their consociate connections.

The issues associated with privacy and ethical practices are reintroduced by Tarkkanen and Harkke (2016) in their examination of social networking sites. In contrast to the legal starting point of Ishii and Komukai (2016) and Botha et al. (2016), the positioning for this paper is very much based around the traditions and practices of usability testing and human-computer interaction design.

The link with the ethical questions raised by personally identifying information is further addressed by Chutikulrungsee et al. (2016). The focus in this work is upon "other-generated content" and the issues of disclosure that become possible through this use of social media. The work presents the challenges that are raised by using the concept of interdependent privacy and takes the position that this situation is inevitable. In engaging this challenge, Chutikulrungsee et al. (2016) present the need for reconsidering how we perceive privacy through social networking sites.

Padua (2016) adheres closely to the overall theme for the conference by examining intimacy and the nearness of technology. In a wide arc that encompasses augmented reality, economics, recent political history and situational context theory the paper looks at the ever more intimate relationship that humans have with technology. This then opens up the opportunity to articulate a call for digital corporate social responsibility.

Augmented reality is then also the focus for Seppälä et al. (2016) which they position within the context of cultural heritage and serious gaming. This development around a specific context draws upon the themes found in many of the conference papers. The design and user experience of the application is examined in a range of ways including the reception by different age groups and the opportunities for further participatory development.

Moving from cultural heritage to the fine arts, Pucihar et al. (2016) take a different tack in their examination of communications technology by exploring the potential and prospects for virtual tracing using mobile devices. Their primary research shows the value and benefits to this specific task and points to a range of potential use-cases and applications.

5 Futures

Perhaps somewhat perversely we incorporate Tatnall's (2016) historical examination of the State Computer Education Centre of Victoria within the Futures theme. The paper acts as a cautious tale for attempting to predict the future. The history related by Tatnall (2016) echoes the trajectory of development that can also be discerned within the context and history of the HCC conferences, and reinforces the need for recent technological development to not be regarded ahistorically. Equally significant is the reminder built into the paper that attempts to foster a digitally literate society are by no means a new phenomenon.

Grbac et al. (2016), in contrast, document a potential system for bringing together the virtual and the digital worlds into an intimate combination. Complementing the discussion offered by Pucihar et al. (2016), a specific process for combining physical and digital annotations is proposed and unpicked to document and explain a very specific use-case for augmented reality.

Feiten et al. (2016) also propose a system that complements the discussions of Heimo et al. (2016), Botha et al. (2016) and Reijers et al. (2016). The outlined revocable anonymity approach rethinks much of the current views on online security and "other-generated content" (Chutikulrungsee et al. 2016). The system proposed by Feiten et al. (2016) is scrutinised from a range of perspectives including ethical, economic and legal points of view.

McKenna (2016) rounds out the collection with a rich description of a near present / near future city that is rich in human computer interfaces and "edges". As Phahlamohlaka et al. (2016) also point out, the interaction of technology and people is primarily an urban one and all current indications are that new developments in this area will continue to emerge from these spaces.

Of course, this is the editorial post hoc rationalisation of these many diverse papers. We encourage readers to explore alternative routes through these proceedings and to discover other new themes that are also contained inside.

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Contents

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An Unclear Question: Who Owns Patient Information?

A Kantian Take on the Concept of Datenherrschaft

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Abstract. Patient information systems are critical instruments in modern healthcare; thus, modern healthcare systems cannot function properly without them. While there are countless varieties of information systems used in healthcare, there is one overarching commonality among them – they all contain information about patients. Different groups involved in healthcare have an interest in patients' information for different reasons. However, in many countries, it remains unclear who exactly owns the data. This issue thus needs to be resolved. As ethics is critical in determining the justifiable owner of patient information, any legislative solution to competing interests ought to be ethically well justified. In this paper, we argue that an ethically acceptable formulation of the ownership of patient data has already been suggested and that it can be further justified also through the Kantian tradition.

Keywords: Patient information · Datenherrschaft · Kant · Ownership · Regulation

1 Introduction

Who owns patient information, and perhaps more importantly, who should own it? This is a question that the research literature has so far failed to conclusively answer. Furthermore, the potential answers offered have mainly been derived from the field of jurisprudence (although authors tackling the issue are typically also knowledgeable about ethics and healthcare) and from the United States [1–4]. The paucity of academic discourse is interesting because of the topicality of the issue, and there is a strong global drive towards developing healthcare information systems. Cognisant of the differences between the legal tradition of the US and that of (particularly continental) Europe,[1] we need to engage in further discourse from academics with different backgrounds in terms of traditions and fields.

[1] There are of course other traditions, but the authors want to underline the differences between the United States and (particularly continental) Europe, which have been the main traditions of relevance to this topic.

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It appears that the ownership of patient information[2] is a target of regulation that seems to have either failed or has not been accurately or explicitly defined in many countries [2, 3, 5]. Existing arguments or viewpoints arguably diverge in relation to how the issue of ownership should be solved or approached. The first view is that patient information should be publicly owned and regulated [3]. The second view is that the patient should have mastery over his/her information [5]. The third view holds that the propertisation of information is not a solution and actually leaves the problem unsolved [4, 6]. Common among all these views is the recognition that ownership or property rights is not easily implemented when it comes to patient information.

There seems to exist contradictory scenarios when it comes to patient information. The (lack of) regulation of ownership mentioned above, when viewed against the protection of personal information found in European Union directives, seems to be inconsistent [7, 8]. Koskinen et al. [5] show that by approaching the issue from the perspective of ethics, rather than from that of jurisprudence, the problems of unclear regulation become visible.

Koskinen et al. [5] propose a different approach to how the ownership of patient information is viewed. They note that the traditional view of property, or current immaterial property rights, is not a plausible solution because of the nature of patient information. The solution they propose is the use of a different definition of ownership, namely Datenherrschaft [9] – mastery over data – granted to patients to overcome the problem [5]. This definition seems more appropriate in serving the aim of controlling patient information because it takes greater account of the problems of property and ownership in this context.

This paper starts by analysing patient information from the viewpoint of ownership because there is an established practise as well as trends to propertise different kinds of information with immaterial property legislations. The academic discourse on what constitutes ownership has considered information about people in internet and company databases. This suggests that we are in an era in which the boundaries of our privacy and protection of personhood have been re-drawn. Patient information is at the core of this issue, or at least it should be – which is not currently the case. The legislative approach is essential because our societies are controlled through the use of legislation; thus, without clear legislation, rights become non-appealable, i.e. such rights can and will be ignored or deprecated. Of course, the approach could be other than ownership-based, for example, in Finnish legislation,[3,4,5] the aim has been to control and restrict the use of patient information with laws and regulations, not through ownership. However, with the ownership approach in focus, the issue can be clarified by analysing and stating who in the end should control and by ascertaining how patient information is used and by whom. Property rights do have a strong and

[2] We use the term patient information (system) to avoid the problem of different terms being used, for example, electronic health record (ERH) or electronic medical record (EMR) etc. What is important is that the patient information system, or whichever term is used, stores information about the patient.

[3] Laki potilaan asemasta ja oikeuksista 785/1992.

[4] Laki sosiaali- ja terveydenhuollon asiakastietojen sähköisestä käsittelystä 2007/159.

[5] Sosiaali- ja terveysministeriön asetus potilasasiakirjoista 298/2009.

fundamental position in Western countries, and this approach suggests that it is fruitful to have a strong offset for clarifying the patient's position as well as rights that protect the patient's information.

It is notable that in different countries there can be numerous ways of controlling patient information. However, it seems that a look at the Finnish legislation on the proper use and storage of patient information can lead to complex and case-specific legislation, which could be avoided with a focus on legislation based on ownership. In this way, the detailed practices – which must respect Datenherrschaft – could be regulated with soft law and could thus cope more easily with technological developments (see also Kainu and Koskinen [10]). With this, patients can thus control how their information is used (with some limitations, which are shown later on).

It seems that Datenherrschaft is an ethically justified way to regulate patient information, at least according to the Lockean [5] position. Nonetheless, we want to strengthen the ethical justification for Datenherrschaft with Kant's categorical imperative(s). The Kantian view is relevant here because, as Wiesing [11] states, "In a time of rapid change, the concept of human dignity and human rights from the Kantian tradition serves at a certain level as a stabilizing anchor"[6]. The Kantian tradition respects the value of humans differently than, for example, the utilitarian position. Utilitarianism seeks the most efficient outcome of good and can thus lose sight of humanity, an aspect of critical importance in the field of healthcare.

2 Datenherrschaft – Mastery Over Data and Information

This paper uses the concept of Datenherssaft in the same way that Kainu and Koskinen [9] defined it:

> [Datenherrschaft is] the legal right to decide the uses of, in a database or another compilation, collection or other container or form of data, over a entry, data point or points or any other expression or form of information that an entity has, regardless of whether they possess said information, with the assumption that sufficient access to justice is implemented for a citizen to have this power upheld in a court of law.[7]

Datenherrschaft differs substantially from property rights in four specific ways. First, when ownership of property can be moved from one party to another, it is not a case of Datenherrschaft. Datenherrschaft is irremovable from the individual who has it. This is similar to the aforementioned by Kainu and Koskinen [9]: an individual's choice to participate, or not, in a criminal act is not removable from the actor – even though the driving forces behind the act can be interpreted and argued. Datenherrschaft can only be given to the person about whom the information is. It is notable that someone cannot give up his/her Datenherrschaft, even though he/she may wish to do so, as it is an integral part of who and what he/she is. This is what makes Datenherrschaft so unique. Even if there is a contract that limits one's Datenherrschaft, it cannot be upheld in a court of law.

[6] [11 p. 229].

[7] [9 p. 54].

Second, the work done is seen as a justification for individuals to gain immaterial property rights. However, the context of healthcare differs substantially from the common creation of immaterial work. Immaterial property rights are seen as compensation to individuals for work done. However, in healthcare, income is salary based, and thus, there is no need for compensation [5].

Third, immaterial property rights are commonly passed on to other parties who have not done the actual intellectual work. This in itself is very problematic because, in many cases, there is no real possibility of possessing a right when another individual produces the intellectual work. This is so because of a weak negotiating position when rights are negotiated between parties. Instead, Datenherrschaft is non-transferable; it is a part of the patient in a similar sense as the criminal deed is bound to the person who commits the crime, as Kainu and Koskinen [9] show.

The last and arguably most fundamental difference is that whilst immaterial property rights are based on creative or artistic processes, work done by an individual in a healthcare situation differs substantially. Healthcare is based on evidence-based medicine – or at least it should be, or we are talking about snake oil or the art of performance. Healthcare professionals rely on science and knowledge of medicine and not on their artistic or creative ideas; therefore, property rights cannot be justified here.

The consent approach is arguably more plausible than Datenherrschaft as it has one major advantage – it is part of the prevailing legislation in many countries. However, Datenherrschaft reaches further than the consent approach. It changes the paradigm between the patient and healthcare – the patient is no longer the object of healthcare;[8] rather, he/she has control over his/her information, and he/she interacts with healthcare for some purpose. The consent regime aims to provide sufficient information to patients to make decisions regarding the medical issue at hand. The Datenherrschaft approach focuses on serving the need of the patient when he/she observes him/herself in a medical sense and, more broadly, in his/her life as a whole. Only patients can judge what are the relevant issues for them even if they may – and most probably do – need medical professionals to help them to gain an understanding of their patient information. Deber et al. [12] suggest that autonomous patients could be seen to mean people who wish to understand their disease and their possibilities even though they usually do not want to play the self-provider role in healthcare. The self-judging approach and the patient view of one's own life plan is critical when we think of the problem of controlling patient information. Lee and Lin [13] show that the impact of patient centeredness – which should include respect for the patient's goals and desires – in health outcomes is elusive. However, even if we find no indisputable evidence for health outcomes for patients from patient centeredness, it is not a sufficient reason to disclaim it. The health outcome is not only a relevant issue for the patient and perhaps not even the most important. Knowledge of one's own situation is a core factor in gaining an understanding not only of the situation but also of the possibilities for one's life. If we must rely on the judgement of healthcare professionals regarding what

[8] The author notes that in healthcare, patients are not treated as objects in the sense that they do not have rights; they are 'objects' for healthcare in the sense that healthcare contains information designed for healthcare professionals about patients, and by mixing this information and professional work, healthcare executes the medical tasks appointed to it.

information is needed by us, it is not clear that we would necessarily be treated as ends in ourselves; rather, we could end up as mere means in the system. After all, we would be expected to accept doctors' viewpoint like everyone should. This cannot be accepted if we wanted to be ends in ourselves and not reducible to mere means. To have a proper understanding of patient information for patients, there is a need for new patient information systems that would serve primarily the layman's needs and not only those of professionals. Here, the aim of Datenherrschaft would be misplaced because the information may not be understandable or even accessible to patients.

The main practical contribution of Datenherrschaft is this paradigm shift – which it also supports from a legislative standpoint – and its strong support for patients' sense-making of their health and life [14]. This is crucial in healthcare where healthcare professionals and especially doctors, rather than patients, have maintained control of the medical path and information [15].

Datenherrschaft would thus seem to be an appropriate solution by which to overcome the baggage associated with the term 'property' in general and especially with its economically weighted use in intellectual property rights. Datenherrschaft emphasises the right of the patient to be free from paternalistic control and speaks for the patient's right to choose how his/her information is used and by whom.

Understandably, this mastery cannot be absolute and can be overridden if it conflicts with the *fundamental* (which are not property rights of any sort) rights of others, such as the right to life or health. Situations in which the patient's rights are justifiably overruled would occur, for example, during lethal epidemics where others are in direct and grave danger [5].

However, the patient's mastery can only be overruled temporarily and only with justifiable reason to protect the idea of Herrschaft. Information about overriding Datenherrschaft must be clearly reported to the patient [5]. Another critical issue to note is the use of patient information for research purposes. There are justified reasons – for example, the duty to preserve all of mankind – for collecting anonymised patient information for research purposes, but only that anonymised data can be accessed and not the original data [5]. However, this data should be collected within some common database(s) to which free access for research purposes would be available. This way, both the rights of individuals and their duty towards mankind would be served.

Health information technology is changing, and there is a need to analyse the idea of informed consent in the healthcare context [16]. Traditionally, paternalism has been justified due to the doctor knowing more than the patient about various medical conditions. This is no longer always the case, and patients are more capable of taking responsibility for their own condition/s. If, in this situation, the patient continues to be treated as a target for paternalistic handling, he/she is not considered an end but rather a means for the healthcare professional. Any use of power over another needs to be justified, and in the current situation, paternalism is no longer typically justifiable as in the traditional sense.

3 Kantian Autonomy and Rational Agents: Prerequisites for Patient Centeredness and Empowerment

Patient centeredness and empowerment are seen as important factors in today's healthcare systems and thus need to be taken into account [17–20]. Empowerment is a multilevel construct whereby people, organisations and communities gain mastery in matters that concern them by having rights and needed resources [21, 22]. To be empowered, citizens require information while patient centeredness supports respect for patients and ensures that citizens' needs are fulfilled. Without information, one obviously cannot have credible mastery or gain an understanding of one's own health or treatment. This is where Datenherrschaft makes a difference in healthcare practice as it respects the autonomy of the patient and enforces the patient's right to decide how his/her information is used by granting him/her mastery (compare this to empowerment as defined above) over his/her own information, thus reducing the possibility of healthcare professionals exercising paternalism over him/her.

Nevertheless, Sjöstrand et al. [23] show that there can be an acceptable level of paternalism if it enhances patient autonomy. Autonomy is constructed from at least three parts. First, there must be competence held by the individual who is exercising autonomy. Second, there should be the ability to make decisions aimed at realising desires, goals etc. Third, desires should be authentic, meaning that they should not be based on, for example, self-deception or coercion. The level of authenticity in desires varies; some desires are more authentic than others [23]. However, there can be situations in which paternalism is acceptable – for example, in cases of nervous breakdown and shock – but paternalism itself cannot be held as a universal law.

Although Kant did not take a stand on medicine, his influence has been strong in the medical field, especially in relation to autonomy and human rights [11]. Autonomy and the free will of actors are preconditions for duty, which is an essential part of Kant's moral philosophy. Duty is something that can only be performed by rational agents, and actions can only be moral when conducted by rational agents on the basis of free will [23]. Forced 'good' actions cannot be moral because morality comes from people's will, and the actions they undertake are just consequences of that will. The outcome is secondary or even irrelevant to the will and its goodness. Nevertheless, the will is a necessary but not sufficient condition. If the actor has not understood his/her duty, he/she can still act wilfully, but that action can be a bad action. Therefore, the universality of moral acts and taking each person into account as an end are also preconditions for moral action and essential parts of Kant's moral philosophy, which becomes concrete in the three categorical imperatives that are, according to Kant, all modifications of the same moral law, just presented differently [24].

4 Datenherrschaft in Light of the Categorical Imperative(S)

There are three different forms of categorical imperatives identified in Kant's Grounding for the Metaphysics of Morals, and there are also different translations from German to English, not forgetting other languages. Nevertheless Kant's three categorical imperatives can be translated into English as [25]:

CI1: Act as if the maxim of your action were to become through your will a universal law of nature.
CI2: Act in such a way that you always treat humanity, whether in your own person or in the person of any other, never simply as a means, but always at the same time as an end.
CI3: An act is morally right if and only if the agent, in performing it, follows the law autonomously.

In what follows, the third categorical imperative is examined through the first and second formulations; it is visible throughout the paper and is, as Kant points out, directly connected to the other two.

4.1 Categorical Imperative 1

The first categorical imperative, 'Act as if the maxim of your action were to become through your will a universal law of nature', demands that the Datenherrschaft of patient information be formulated and legislated in such a way that it satisfies the requirements of being a universal law. Taylor [26] has analysed the paternalistic maxim and came to the conclusion that it is not acceptable for people to be treated in a paternalistic way. If a world in which the maxim of paternalism as a universal law is imagined, there would be situations in which people would not be able to truly exhibit self-control. The paternalistic maxim converts rational agents into less autonomous beings and diminishes their capacity for self-control, which is a precondition for the potential to effectively will any action. Thus, by willing the paternalistic maxim as a universal law, one takes away this capacity and leaves that will to face a collision with itself. Therefore, paternalism cannot be held as a universal law [26].

Koskinen et al. [5] argue that the patient should be held as the possessor of Datenherrschaft whereby the solution to the problem of paternalism is reached by giving the patient control over his/her information. However, the patient's Datenherrschaft cannot be absolute without violating the first formulation of the categorical imperatives. There are occasions when healthcare professionals or other authorities must have access to patient information, for example, in situations concerning disease epidemics or when access to patient information is crucial for some other individual. It appears likely that European Union legislation will increase the problem of using information for the purposes of healthcare if amendments to the Data Protection Directive (DPD) are implemented as written whereby privacy will have greater value over health [8]. In some situations, information is a premise for securing the lives of others, and so, withholding that information – as the DPD would – cannot be seen as an act of universal law. Likewise, the aforementioned anonymised patient information

used for research purposes seems fitting as a universal law as it makes possible the curing or saving of people in the future. In addition, the literature (though limited) indicates that patients consider the use of their information for research and public health proposes to be legitimate (see e.g. Spriggs et al. [27]).

Thus, our suggestion for a **universal CI1** is: Patients should have mastery over their information, thus granting them as widely inalienable a mastery of their patient information as possible, but not exclusive control of use, thus granting the possibility of using the data in exceptional situations, such as in cases of pandemic or when information is crucial to save the lives of others or to secure their health from serious danger. Likewise, access is permitted for research purposes when properly anonymised.

The first categorical imperative clearly brings out the advantages of Datenherrschaft because it avoids the flaws inherent in paternalism compared to a situation in which citizens are without mastery of their own patient information. However, the limitations and use of anonymised information for research purposes seem to be exceptions that should be catered for. Thus, Datenherrschaft fulfils the first formulation of the categorical imperatives if those restrictions are added, as proposed by Koskinen et al. [5].

4.2 Categorical Imperative 2

The second formulation of Kant's categorical imperative states: 'Act in such a way that you always treat humanity, whether in your own person or in the person of any other, never simply as a means, but always at the same time as an end'. Thus, people should always be treated with respect by virtue of their humanity and not in an arbitrary manner. Each person should be honoured because he/she is a human being and not only because he/she is something that serves some personal end or goal [24]. Therefore, citizens cannot be bypassed in deliberations on patient information. The contrary suggests that people are treated only as means.

Kant places greater emphasis on the motivation – good will – behind actions than on the outcome. Thus, following Kant's deontological approach, a situation in which the outcome would be good is unacceptable if the moral codes are neglected or given less weight on utilitarian grounds. This makes a position in which people's liberty or other personal rights are limited by others very problematic. Thus, through the paternalistic actions of some other party, we can lose the autonomy of patients, which is seen as one of the core values of medical ethics [28, 29]. Hence, paternalism violates the second categorical imperative. It is obvious that solely restoring a citizen's health or curing his/her disease does not sufficiently fulfil the second Kantian formulation, thus nullifying it as a basis of how people are treated in a healthcare system. In that case, people would be treated merely as objects by the healthcare system as well as by healthcare professionals carrying out their care or medical treatments, and that would be unacceptable.

This point of objectification needs to be noted in situations where a holder of Datenherrschaft over patient information is proposed to be some party other than the patient. If some party other than the citizen is granted Datenherrschaft, the patient, as a human being, is not honoured as an end in him/herself. Accordingly, if the patient is set aside from other Datenherrschaft candidates – who have their own goals (even though

these goals *can* be similar to those of citizens) – we do not respect people's autonomy and liberty when we choose how their information (which is an extension of themselves) is used or not used. Even though the goals might be similar to those of citizens, the outcome is not the point; the main point is the moral motive which satisfies respect for the patient as an end in him/herself.

Even though many (probably most) healthcare professionals *do* consider the patient as an end, not all of them necessarily do. Thus, as we cannot be sure of this, we must design systems that at least ensure that the *system* supports treating the patient as an end. Manson [30] shows that even though patients seem in many cases to be unwilling to participate in decision-making, they can have different requirements for information. By according mastery to patients, we ensure that they have all the necessary information when they want or need it, and we do not rely on the hope that healthcare professionals will treat patients as ends in and of themselves.

For example, people are not necessarily treated as ends if healthcare professionals have mastery over their patient information and thus have a paternalistic hold over them. In a paternalistic relationship, healthcare professionals can decide how information is used and what is best for the citizen without knowing the personal needs of the patient [30]. The problem is that the biomedical worldview focuses on medical *consequences*; this collision of worldviews (deontological vs. consequentialist) is problematic and can generate conflicts if not taken into account. Thus, the citizen's humanity as a person with his/her own will and opinions about his/her life can be lost through someone else's power over this citizen. Even though the intentions are good, the paternalistic approach itself can easily lead to loss of a person's control over his/her own life. If the possessor of information is an institution (such as the state, a healthcare organisation or a company), the problem is actually worse since institutions can and usually do treat citizens as only part of a bureaucratic process, without a trace of humanity (see, e.g. Wiesing [11] for the view that the Kantian tradition functions as a stable anchor for humanity).

5 Conclusions

The clear regulation of patient information seems to be missing in several legal systems or traditions of jurisprudence. While patient information obviously plays an essential part in modern healthcare, there must be a wider discourse on the issue than there is at present. The proposal that patient information should be regulated in such a way that it gives patients the strongest possible rights over their information is ethically justified from a Kantian perspective. Other viewpoints from different perspectives and traditions are needed to elaborate Datenherrschaft in such a way that it fulfils the ensuing transdisciplinary demands.

This proposal also has the advantage of being free from the baggage of previous legal solutions. It responds to the problems of current views on property and respects the privacy and autonomy of patients. Likewise, the proposals note the right of public healthcare authorities to access and use patient information in situations deemed necessary to protect the life and health of others, for example, in the case of epidemics.

Future research should evaluate what kinds of changes are needed in information systems and healthcare practices if Datenherrschaft is implemented.

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Ethical Gathering of Exercise Metrics from Elderly: Case Jumppatikku

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Abstract. Health gaming for elderly, alongside with other game types, have become an emerging trend amongst video game industry. As all emerging technologies, it brings some ethical questions which – as usual – are better solved before implementation, for the values these choices reflect to be embedded into the design. In this paper we introduce a case example of the elderly activation system Jumppatikku ('Exercise stick') and analyse the main ethical questions of the specific case example, as well as take into consideration other similar systems from the viewpoint of ethical design and responsible research and innovation.

Keywords: Responsible research and innovation · Elderly · eHealth · Mobile · Ethical design

1 Introduction

In this paper we introduce an ethical dilemma on elderly healthcare. During the 2000s and 2010s many different digital aids for activating and caring of elderly has been developed. These activation aids and methods rise several challenges which may, in the worst case endanger the privacy and security of these senior citizens.

The dilemmas are analysed through a variety of ethical theories. Both consequences [1] and intentions (see e.g. [2]) of any system we build should be considered when thinking of whether the system is morally good, or at least acceptable (See e.g. [3]). In this paper the case of the *Jumppatikku* ("Exercise stick") is analysed from both of these perspectives. It is clear that the intention of the group developing the device and the related systems is good – the aim of the system is, after all, the wellbeing of the elderly for whom it is being designed – on top of which it is hoped to take into account and solve any various unintended consequences on a satisfactory level. Since considerations typically raised in IT and ethics field cover such as professional virtue (on virtue ethics, see e.g. [4]), ethical discourse [5], and considerations for those in the weakest positions [6], this paper is focused on (unintended) consequences of actions. The selection is intended to act as an opening of discussion on the topic, and consider a field not already

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covered by the design of the project activities. In the Jumppatikku project those who are in the weakest position are taken into account in designing a device and a system that will be available to all elderly irrespective of their financial or social status in Finland, this paper itself is part of the ethical discourse (albeit not purely in the sense Habermas intended), and we have no reason to suspect the professional integrity of the designers of the system.

In the 2nd and the 3rd sections the field of elderly health gaming, the Jumppatikku project and related, possible metrics that can be derived with these kinds of systems are introduced. This research is a theoretical ethical study from the Jumppatikku research project to ensure the ethical validity of the Jumppatikku exercise system. Thus in 4th section the ethical dilemmas are introduced and discussed.

2 Background

2.1 Games for Elderly

Primary interests for the usage of games with elderly are related to the training of memory, cognitive skills, and physical training. With the cognitive skills and memory the main aim is the prevention and slowing down the decline of memory. Muscle and balance training games are targeting fall prevention as falling related injuries (e.g. hip and wrist fractures) are one of the leading causes affecting the quality of life of elderly population. Some of the commercial off the shelf (COTS) training games are created and marketed for the elderly, but mostly they are created for wider audience.

The general (non-sedentary) games aiming at increased activity levels (e.g. dancing games based on body movements) have several differing limitations with elderly players. Such games use different techniques on detecting player's body movements, and depending on the method, players with physical limitations might have problems on using them. In general movement based games the target audience is relatively younger and the gameplay requires movements and/or positions that are not possible for some or most of the elderly players. Some of these games use physical devices (e.g. WiiMote) that contain buttons or require constant force for holding the device in hand for prolonged time, causing discomfort for elderly players.

In the more specialized use cases, meaning research and therapy sessions, the main reason for the usage of such games are the same as with the COTS games. Games for therapy sessions are specially made for therapies and even targeting the elderly only, but in many cases the games used are regular COTS games. The same principle applies to the research settings. As an example of COTS games used, the Super Mario game has been used to study the effects of gaming on the brain structure of the elderly subjects [7] with promising preliminary results. As a custom counterpart for this game similar trend in results has been found with the Neuroracer [8].

2.2 Advertising and Data Mining

Advertising and data mining has been an upward trend in games for at least the past decade. For example, in-game advertising has grown from generating around $34

million in 2004 to an estimated $7 billion by 2016 [9, 10]. The rise of social online games can be identified as one of the major explanations for the observation. Especially Free-to-Play (F2P) games rely heavily on income from advertisers. Data mining in games, particularly that of player behaviour has been an important source of information especially in games that generally have long persisted online worlds. Game developers of these games have a constant need to add new content to keep the players engaged and for that they need data on preferred solutions and settings of the game, directly from the users. Free-to-Play games and Massive Multiplayer Online Games (MMOGs) are the most common games for data mining, and as such those games have been pushing data mining in games to new heights [11].

What is game data mining exactly? Game data mining can be seen as an insight, formed by utilising the collected game metrics and game telemetry. Game telemetry is the raw data collected from a game, such as player location at a given time or play time. Game metrics, on the other hand, are data formed from game telemetry using simple aggregation. Average play time calculated from raw play times could be a game metric, or hotspots of players could be another. Game data mining in this example, could be seen as the process of getting insight on why the spot is a hotspot and what does it mean in terms of gameplay [12].

2.3 Capitalizing on the Game Data

The capitalization of the mined data varies depending on the game needs, but generally the focus is on improving gameplay and monetization. Gameplay can be improved in a number of ways. For instance, IO Interactive used heat maps composed of player character deaths in Kane and Lynch 2: Dog Days, a game developed by them, to get insight on the workings of the gameplay. In this particular case, the data revealed that there was a surprisingly high amount of team kills at a certain map location, but that otherwise the gameplay was as designed [13]. A common way to gain from the game data in the form of monetization is to inspect what kind of downloadable content (DLC) players, and especially players spending the most, are interested in, and focusing on creating content for them.

3 Metrics

3.1 Existing and Theoretical Metrics

The abundance of possible game metrics has led to a number of categorizations for them. Categorization by Mellon [14] divides game metrics to player metrics (also known as user metrics), performance metrics and process metrics (sometimes known as pipeline metrics). Process metrics consist of metrics related to the development process and as such is only of interest for a limited set of people. Performance metrics are metrics on the game performance with frames per second (FPS) being the usual example of a performance metric. This is also a metric that generally only interests certain people, such as developers working on optimizing the game. The third and the most relevant category in considerations of capitalising on the game data, is the category of player

metrics. Player metrics consist of all the metrics related to what the player does, and therefore can give an insight of choices and preferences of the players. It is the category that most of the research and discussion related to game analytics concern. Player metrics can again be divided to either generic, genre specific and game specific categories, or as suggested in Drachen et al. [15] to customer, community and gameplay metrics. Customer metrics cover metrics related to the player as a customer and are mainly of interest for sales and marketing teams, such as customer retention rates. Community metrics tell about the players' involvement in the game community. Such metrics are usually collected from for example game forums explaining the activity levels of the entire community and are mainly for community managers. Gameplay metrics are related to what the player actually does and how he or she behaves in the game and pretty much consist of rest of the metrics. They essentially answer the questions of what the player did, where, at what time and which player(s) were involved. The last sub-categories are of gameplay metrics, which is yet divided to interface, in-game and system metrics. System metrics are collected from actions initiated by the game engine in response to player actions, such as unlocking an achievement. Interface metrics consist of the players' actions in the game menus and other possible interfaces in the game. In-game metrics are the metrics of what the player does in-game. Everything that does not fit the first two sub-categories fall under the in-game metrics [15].

The concrete metrics collected in games depend on the game itself, on it's genre and of course, on which metrics the developers are interested of. Some core metrics, such as length of the gameplay session, can be collected from most if not all games regardless of the game type, but the majority of metrics only make sense in specific games. Most of the games for the elderly promote health in some way, be it physical or mental health, and as such they tend to be either fitness or puzzle games. In a fitness game the important metrics collected could represent such choices as which exercises were chosen, which were performed, how well and often were they performed as well as how many calories was burned in each session and in total. A puzzle game might collect metrics on which puzzles the player has given a go on, which of the puzzles he or she passed and how often, how he or she passed them (order of moves or choices), how long did it take to either complete a specific puzzle or for example, how long did the player try to solve it. These are noticeably more intimate metrics than what can be collected from other games in the sense that they are directly related to the players' physical and mental abilities, even more so when the game especially targets the elderly. For instance the pattern of how the player might try to keep solving a puzzle wrongly might reveal a decline in some cognitive skills or the inability to properly perform a certain exercise could give a strong indication of a physical disability [15, 16].

The possibilities of physically tracking the player with gaming devices, be it a mobile phone or a game console, are becoming more and more plentiful as more sensors are added and their accuracy enhanced. Naturally this leads to game developers being able to create better experiences for the players, but it also means more data and more accurate data for those collecting the metrics. As mentioned above, this data is potentially rather valuable, at least if compared to such other examples of metrics, like how many frags a player gets in a FPS game. The TI SensorTag, which the Jumppatikku ("exercise stick") uses, has six sensors: pressure, humidity, temperature (IR), accelerometer, gyroscope

and a magnometer. The new (2015) version of SensorTag also has a light sensor, making the total amount of different sensors to rise to seven [17]. At the time of writing, Jumppatikku has six moves which it can track and detect: squats, leg lifts, leg swings, leg rotations, hand swings and body twists. Body twists and foot rotations are both tracked using the accelerometer and gyroscope, but the rest of the moves only make use of the accelerometer. In essence just the two of these very basic sensors are enough to determine a variety of moves and possibly get hints of the players' physical condition. Add in a few external sensors, such as a heart rate sensor or a blood pressure sensor, plus some creative thinking and there is a huge amount of information that one could deduce about the player.

3.2 Examining Metrics

Following the previous categorizations we can discuss genre specific metrics that relate to all health games that use imaging or movement sensors. In the case of interface metrics we collect data about subjects' actions with the application itself. This data can be used to measure how fast or how well they can use the interface. If data is collected for longer periods of time, the change in this data can reveal changes in physiological and cognitive performance. In the case of health games aimed for the cognitive effect, the in-game player performance data can directly concern the decline or improvement (or steadiness) of subjects' memory, visual attention or other cognitive skills (see e.g. [18]).

The body movement data and imaging sensors produce vast quantities of data which can be mined with specific algorithms. Modern imaging sensors and their 3D data can be used to measure heart rate from micro-fluctuations in surface veins on the face of the subjects of the study [19]. Facial micro-movements and gaze tracking can be used to reveal signs of depression [20]. Combining different methods, the gaze tracking can potentially be used to track what kind of visual stimuli interests the subject based on their voluntary or involuntary micro-expressions [21].

In the case of Jumppatikku, where the player data is collected from sensors located on the subjects hand or body, we have a variety of possibilities for data mining [22, 23]. With the sensor package and data collecting application we can receive data, including GPS-coordinates, accelerometer data, physical performance from the game's interface and in-game metrics related to the usage of the app and scores from the tasks itself. (See Fig. 1.)

From this data set, the obvious findings are current location and hotspots where the subject tends to be during normal days. By combining these with other data sources we can deduct when and where the subject might be during certain days and times [24]. Further, finer grained accelerometer and gyroscopic data can be used to track the limb movements of the subject. (See Fig. 2.) With data mining algorithms and learning neural networks, we can potentially monitor the development of diseases like Alzheimer and Parkinson's disease, or measure the gait of the user which can be used to predict the subjects' tendency to fall which can be used as a signal to guide them to either do certain exercises or seek related help (e.g. [25–27]).

Fig. 1. Using Jumppatikku.

Fig. 2. Exercising by standing up and sitting down with Jumppatikku.

Accurate and ubiquitous sensors can also be used to track fine-grained hand movements. This, combined with advanced algorithms has led to a situation where data mining of movement data can reveal personal information about the subjects. This includes their physical actions like hobbies, potential physically manifesting illnesses and even PIN-numbers they might punch in daily [28].

4 Gathered Information and Ethics

As mentioned before, the system contains a huge amount of information. That information can, in wrong hands make the subject of the information vulnerable. There are several ways to protect the subject from these vulnerabilities, e.g. by limiting the access to the information, by securing it or by not collecting it in the first place. When the information is not collected one can be sure it cannot be misused. The difficulty with this method is to understand what information is relevant and what is not.

Limiting access brings forth some questions, foremost who should be told and what? From the raw data several things, such as timestamps or the diagnosis for Parkinsons' disease can be derived when the data is pre-analysed and transformed into information the medical personnel can interpret easily without the need to deliver the private information to them. This information is none-the-less sensitive information.

Moreover, the data, such as timestamps and movements, still stay in the servers. Hence, if the main system can be hacked, and if it logs location information (or something that can be interpreted as such) the information can be used to access elderly persons' homes for example for burglary. Thus, it must be taken care of that location info is not saved and that the system might give an impression for a casual hacker that it would be used in multiple locations (whether that is true or not).

This of course holds true for other parties as well – access to the system should be only on need-to-know, and of course, on *informed* consent basis.

Ownership or control of the data: to avoid undue paternalism, the default control of the data must be held by the user (see e.g. [29, 30]). If the users do not want to share their data with any particular parties – even if those parties are health care professionals – they must be able to choose so unless there are special reasons such as far advanced dementia or public health hazard.

Data control video recording is possible with X-Box and similar devices. If these kinds of devices are used, there is a need to be very careful indeed that the video material so collected does not fall into the hands of others than those who need the data for diagnostic purposes.

It must be noted that even though the system can alert the medical personnel if it recognises a risk of e.g. Parkinson's disease the system is not a doctor, and thus there is no doctor-made diagnosis and the alert should only be a guideline for the patient to see a doctor, and for the doctor to see a patient. Systems like this are not decision making systems, but only alert systems. There are two challenges with this: first we need to be aware of the patient's right to privacy and information security (handled below) and secondly, patient's right to a correct diagnosis. Even if the system could deliver 95 % accurate prognosis it still – according to the medical traditions and legislation – is not a diagnosis (nor should it be). That information, therefore, is still a prediction and thus should be handled as such because false positives could affect the patients' behaviour. This can cause unnecessary and unwanted fear and pain for the patient when he or she is both afraid of the sickness and still waiting – in many cases for days, weeks or even months – for guidelines and diagnosis from his or her MD. Thus, there is an ethical dilemma: should the information about e.g. Parkinson's disease be visible to the user or just for the treating medical personnel? We need to note that this is not data from the

system but a mere speculation by the system and it is not under the direct control of the user. The medical professionals can then use the data to deduct a diagnosis of the disease (or lack there-of). The patient typically does not have the necessary skills to do this, and thus should not be put in a position to try and worry about it.

While it is obvious that information security must be high in the server end, it must also be protected in the user's device. While the mobile device contains various kinds of information on the activity of the user, it should never reveal daily activities (at least time stamp and location) because the person using the device might not be the elderly person him- or herself. If the privacy of the user is leaked by the system for example to the person's relatives, it can harm the patient in situations where the relatives are not that trustworthy.

In essence the privacy of the user is in straight contradiction with the patient's right to see his or her own (medical) information when the user of the mobile device is someone else than the patient themselves. Therefore that person's information should be locked so that the users can leave their phone still in *swipe to open* mode (which tends to be a familiar password with elderly persons' mobile devices), or let their relatives call or send a message without fear of them accessing their medical information.

The device should not save the data to the device itself (due to security concerns), but rather the (useful and required) data should be stored on a server to which the user has access via a secured connection not included in the device itself. None-the-less, any speculations by the system always need to go through a medical professional – and the system should have an alert whenever it is deducting a pattern matching a disease – before the patient has access to this deduced information. This is not against the right of the patient to control their information (see e.g. [29, 30]), as the deduced speculation is not yet known about the patient but only *speculation* about the patient's condition, and might prove out to be wrong.

Responsible Research and Innovation [31] can be used as a way to ensure ethics in design (see also [32]). If the designers do not possess the required character, although they should and this should be the aim through professional development, a sub-project in a R&D project that covers ethical and social aspects can be built in the project instead. A part of the sub-project should be research governance as a way to also remain sensitive to broader concerns such as social acceptance. The main point however is that both the societal actors and innovators should be helped to become mutually responsive to ethical issues in any design project. Reflexivity through ethics is paramount to enable this ([31], but see also [33, 34]).

5 Conclusions

The overall intent for the Jumppatikku is obviously good and the desired consequences seem valid. The idea of creating a good life and better health for the elderly seems indeed to be virtuous. Yet there are a few problems with the whole idea of data gathering with sensors that must be kept in mind. In this paper we have looked at these problems, and offered solutions through the use of ethical design methods, taking into account the various different possibilities that could go wrong and how to actually solve them in this

context. Of course, this study is only a case study of the Jumppatikku, so any lessons learned should be understood in this context. However, most if not all of them can be used in similar situations as-is or at least with very little modification. Of course, in any project a reflection of methods used in other projects is always in order.

We hope, that we have shown that even quite simple looking and clearly good intentioned projects need ethical consideration so as to not misuse the collected data or the device itself; to help projects such as Jumppatikku achieve maximum benefits and as few drawbacks as possible.

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Assistive Technology Devices for the Oldest-Old: Maintaining Independence for the Fourth Age

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Abstract. User interface design needs to be revisited for our oldest members of society. The literature has shown that over the age of 70 increasing numbers of older people find it difficult to learn, and the rapid changes in technology and associated interfaces make it particularly difficult for our oldest citizens to participate in the digital age. Focused on aged care residents, this is a perspective paper, outlining the needs and suggesting avenues for research in this under researched population of technology users. Also explored in attempts to overcome digital exclusion are the assistive technologies that aid members of this fourth age, as well as their family and professional carers.

Keywords: Assistive technology devices · Gerontechnology · Elderly · Fourth age · ICT · Digital divide - ageing - peer training - aged care - digital inclusion

1 Introduction

The literature defines the elderly in stages: with the oldest-old being those in the 80+ age group [1–3]. Experiences of technology in this age-group, defined by [4, 5] as the fourth age, are considered in this perspective paper. The global population of elderly people is steadily increasing [6–12]. It is generally accepted that while innovations in technology are advancing rapidly, the elderly are increasingly unable to keep up [6, 13]. In particular, those in the fourth age, many of whom have not been exposed to technology in their home or working lives, are at a disadvantage as more and more daily tasks are performed electronically [14]. Access to information, resources and services is increasingly reliant on technology. Indeed, computer operating systems are frequently being changed and upgraded, ultimately resulting in a quite different computer experience, again leaving the older users at a disadvantage when they are presented with an interface which is quite different to what they have learned and to which they have become accustomed.

Given that relatively little work has been done in relation to technology use by the fourth age, this article's main contribution lies in its exploration of how such citizens can better be included in the digital age. While this fourth age group of people are not averse to learning how to use technology [15], attempts to assist older people with training courses aimed at their level of expertise, have had varying degrees of success. As people age they become less mobile and less able to attend such courses. They also

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experience increasing physical difficulties, including visual and motor coordination challenges. Advances in technology can lead to isolation and ultimately a digital divide [14].

There has been some research which investigates the training courses and online communities which assist the oldest-old, examining whether these are useful for those in the age group and if not, what might be the alternatives. Many of our elderly wish to remain independent and living in their own homes for as long as possible, but while it is acknowledged that they need support to remain there, a large number are restricted in their use of technology in these homes. A certain level of independence can be achieved by the use of assistive technology devices (ATDs), but the elderly need to be persuaded of their benefit and relevance to themselves. The alternative is often that they will need to move from their homes to retirement villages or assisted living environments [16].

As they become less mobile, the ability of the fourth age to take part in social activities is also decreased. Some have been introduced to social networking sites, such as Facebook but many prefer face-to-face communication. Smart phones and tablet devices provide easy access to information and social contact but this also requires knowledge, skill and financial resources. The fourth age, who lived through the years of the 'Great Depression', are averse to spending money on new equipment every few years. Yet, computer operating systems are constantly being upgraded and, over time, the interfaces are changing which leaves older users at the disadvantage of not only cost, but learning, in regards to those changes to technology, applications and interfaces.

1.1 Vignette

Rose, who is 85 years old, phoned in distress when her laptop had failed. Her computer was installed with Windows Vista – a very outdated operating system. The computer would not start up at all. When Rose was told that it might be impossible to recover the computer she was extremely upset and protested that it had not been used very much and indeed, was only bought after her husband had passed away, 6½ years earlier. In her mind, this was not a long time for an expensive possession to continue working; whereas in computer terms it was ancient. There followed some discussion around the possibility of her using an iPad instead, which might be easier to manage, since she only used her computer for email and internet browsing. 'No!' she protested. 'I want MY computer'. It was inconceivable to her that what was to her such an expensive piece of equipment should have such a short lifetime. She also believed that she was approaching the end of her days and that to buy a new computer would be an unacceptable waste of money. But she had grown accustomed to being able to communicate with her family over email, and keep up to date with news stories online. She was delighted when the computer was eventually recovered, but being so outdated it is only a matter of time before it happens again. Rose is not comfortable with change, as is evident by her reluctance to change to a tablet device. She has also not been willing to embrace other assistive technology devices, such as hearing aids, or personal emergency devices when they have been suggested to her as tools to improve her health and well-being. She accepts that these may be helpful to other elderly people but considers that they are not relevant to her, despite her being profoundly hard of hearing and prone to falls.

2 The Digital Divide

As was the case with Rose, many information and communication technologies (ICTs) are perceived by members of the fourth age to be of little or no relevance or use to themselves, even though access to information, resources and services is increasingly reliant on technology. Learning to use technology and adapting to the ever changing interfaces present challenges for the oldest-old. For example, web guidelines for older people learning to access online communities have been shown to require longer learning times [17]. The oldest-old need to learn how to navigate the digital spaces, digital language and interaction styles, and ever changing technology. Literacy and learning are thus challenges that need to be addressed. This is true for all use of technology, by the elderly. Increasingly the elderly encounter tasks that were once familiar to them that are now performed digitally.

The learning divide is a sub-set of a wider digital divide (DD) to do with education. According to [18], the phenomenon could be generalised as addressing either some form of socioeconomic divide or some form of education divide. One can extrapolate that less well-educated seniors are likely to face more of an age-based learning divide than better-educated ones. It is also possible that the kind of work undertaken by seniors during their working lives, will have an influence on their ability to participate online. Three reasons for non-use of ICT by older Portuguese residents were identified by [19] as attitudinal, functional and physical. They define attitudinal as the elderly being willing to try technology but they are either generally indifferent or they lack the self-confidence to persevere. Functional is defined as a lack of access to a computer at home or they do not have the skills necessary to use it; and physical means they have physical or mental limitations preventing them from using technology.

3 Objectives

This paper discusses research that is in its early stages and the focus of which is to explore what factors facilitate or hinder the fourth age from taking advantage of Information Technology and to keep up with advancing technologies and ways to address that, now and in the future. The challenge is how do you bring Information Technology to them, making sure that it is relevant to them and enabling them to continue to access it? To address this dilemma, the following research questions have been identified: What factors influence the successful access to and continued use of Information Technologies for the oldest users? What are the enablers/inhibitors to the oldest-old embracing the use of assistive technologies?

These factors may include, but not be restricted to, the factors identified by [19]: Attitudinal, Functional and Physical. These questions are relevant to current problems faced by the elderly in coming to grips with advances in Technology, hence the research innovation and relevance.

4 Digital Inclusion of the Fourth Age

Although the use of computers and the Internet among older adults is increasing, there is an age-based divide [18, 20, 21] whereby, compared to other age categories, older people are reporting less use of PCs and the Internet. Comparisons of ICT penetration by age for various OECD countries in 2000, including Australia were developed by [18]. These comparisons showed that for people aged 18 to 24, close to 90 % of them accessed the Internet, whilst for people aged 55–64 it was less than 50 % and for people aged 65 and over, it was well under 20 %. A report of ageing in Germany claimed, however, that the situation was changing, and that there were indications that technology could make a significant contribution to ageing successfully [22]. However, [19] calculated that 20 % of 64–74 year-olds were frequent users, while 81 % of 16–24 year olds embraced the technology. Indeed, 65 % of older adults had never used technology. A large study by [23] revealed that those aged over 80 are still left behind in the use of the Internet and technology in the United States. Australian data correlates to these figures with 97 % of 15 to 17 year-olds reporting use of the Internet, while only 46 % of those aged 65 or older are Internet users [24].

An example of the age-based divide is that some seniors experience access limitations due to age-related disabilities [23]. It was reported by [18] that in 2000 people with disabilities only enjoyed half the benefits of Internet access at home, compared to those without a disability. A solution was put forward by [25] that "One way to alleviate this problem may be to provide a publicly accessible infrastructure to the information technologies; for example, a high-tech pavilion in a city park, a computer booth in a shopping mall, or an Internet kiosk in a restaurant, bookstore or library". Given the prevalence of disability with increasing age and consequent geographical and mobility issues, public access through community centres, schools and libraries, alone, does not sufficiently overcome the challenges faced by seniors with age-related disabilities [26]. This can only be of benefit to those elderly who are still mobile. What, though, of the "shut-ins": the elderly who do not venture to such places easily, who are reliant on friends or family to transport them and who spend most of their time inside their own homes? One explanation for the age-based divide is that, with increasing age, there appears to be a diminution of power (purchasing power, political power, and position in society). It seems that the Digital Divide may be closing as more seniors use the Internet, email and other electronic forms of communication. Sociological research has shown that 'experience counts'. That is, the longer people have engaged in online activities, the more use they find for the Internet. There is increasing evidence that amongst younger seniors such online engagement is taking place, as seen for instance with their use of social networks [27], and that they engage with each other online and they participate in online communities [27–30].

5 Assistive Technology Devices

There are a significant number of assistive technology devices, or gerontechnologies, which can be useful in assisting to maintain independence and continued well-being.

Gerontechnology is the combination of gerontology and technology and can be defined as "the study of technology and aging for ensuring good health, full social participation, and independent living through the entire life span" [8, 13]. These gerontechnologies include assistive technology devices marketed to people with hearing loss, memory loss, cognitive and other disabilities. Bookings for buses, taxis, cinemas, and health appointments can all be done online. Health care was identified by [26, 31] as a particular reason for the elderly to take to the Internet for fact-finding related to their medical conditions.

A number of technologies are available to assist with age-related health issues. These include, but are not limited to, vision and hearing aids, mobility aids such as wheelchairs or scooters, communication devices to assist people with speech difficulties, emergency call buttons, and initiatives to provide health care in the home.

One of these initiatives introduced in Europe and America, and in particular, the Netherlands, to counteract problems with nursing shortages, is home telecare [32], which is defined by [12] as "an audio-visual connection between a home-dwelling client and remote healthcare professionals, using communication technologies". The connection with a health professional takes place through a computer or television screen and allows the elderly to maintain their independence in their own homes longer, while providing assurance to those caring for them that their health needs are being met. One of the perceived advantages of this system is its relative ease of use once relevant training has been provided. While these ATDs are helpful for anyone with a disability, regardless of age, they are particularly beneficial for the very old to enable them to remain independent for as long as possible [13, 33, 34].

A number of focus groups were conducted by [13] with older adults living in communities in Europe. While they reported that the participants were aware of the digital divide of technology use between generations and were willing to embrace the use of various ICTs, they nevertheless displayed a lack of interest in assistive technology devices which they perceived as having negative connotations.

So it appears that while it has been shown that elderly people are willing to learn about computers, they are still reluctant to embrace assistive technology devices in their lives [9, 10, 13]. This reluctance of elderly people to acknowledge their need for assistive technology devices was investigated by [9] who introduced them to robot technology. While the participants could see that they might be helpful for others, they were not ready to accept the technologies for themselves. These perceptions would need to be taken into account when configuring artificially intelligent devices for the elderly. Perhaps the use of the term "robot" was a reason for the lack of enthusiasm, as some of the responses from participants related to perceived size of robots along with reduction of jobs for humans and possible safety issues [9].

In contrast, [35] concluded that the elderly are willing to embrace technology if they perceive it has value to their situation. However, they highlight the issues with increasing functionality of devices, much of which is not relevant and not user-friendly to the elderly. Devices targeted to the elderly need to be more closely designed to their requirements and abilities. Perhaps one initiative would be to investigate methods of addressing Rose's protestation earlier in this paper "I want MY computer". The elderly may be better equipped to handle changing technology around them if their personal devices and interfaces remain familiar to them, dissociated from the underlying technology.

Benefits can be obtained from exploring what factors facilitate or hinder people from using technology. A great deal of research has been undertaken using surveys and a number of theoretical models to gain an understanding of the factors which influence the use of technology. While surveys are useful for gathering and evaluating statistical data, they do not shed a lot of light on what influences the elderly to accept or reject technology [10, 36–49]. While design of technology for the elderly needs to take into account their specific requirements, training is of particular importance in assisting with their acquisition of self-confidence and continued use of the technology. Interestingly, the elderly do not like to be taught by younger people or their children and they recommend that these training environments should be led by older adults [50].

Consideration also needs to be given to the future sustainability of assistive technology devices for the elderly. Those who currently are reliant on these technologies for their health and well-being are not always considered with the inevitable upgrades and improvements that are made. For instance, the Royal Automobile Association in Adelaide, South Australia recently warned that the new National Broadband Network roll-out by the Australian Government will put at risk a large number of users of personal alarms which, they assert, are not compatible with the new network. While this is not insurmountable, it will involve changes to current installations, disruption to users, possible failure of devices, and depending on the provider, may also incur a cost [51].

6 Conclusion

Since global populations are ageing, at least in the western world, one implication is that more seniors than ever before will be needing to have access to technology and acquire the skills to use it. This trend is likely to continue as governments and other agencies involved with seniors require more electronic interaction in order to save costs and increase access. Yet, many of the oldest seniors are unprepared for this change and are lacking in the skills and confidence to be able to access the required data. There are efforts taking place to train the elderly to provide them with these tools and skills to attain and maintain access. It would seem that assistive technology devices have the potential to be extremely beneficial to our fourth age population yet many are reluctant to take advantage of these ATDs for various reasons. Clearly, perceptions by the elderly of a need for the technology as well as its ease of use, will dictate whether acceptance is positive or negative. Research needs to be ongoing to determine the factors that encourage or inhibit the elderly to take advantage of these technologies. If they do not, they risk becoming further isolated and further disadvantaged, as services become increasingly tied to technology. Closer attention also must be paid by governments and other authorities when planning infrastructure changes which may impact on technologies used and relied upon by our oldest citizens.

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Safety-Enhancing Locating Wearables on Passenger Ships: Privacy and Security Perceptions by the Elderly

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Abstract. Wearables are intimate solutions for a variety of purposes and could enhance safety on large passenger ships in cases of evacuations. Today's cruise ships offer capacities of up to 8000 passengers. From a technological point of view, wearables offer support for electronic mustering and more efficient possibilities to search for passengers. However, privacy and security perceptions of wearables have so far remained unclear for safety-critical areas. Moreover, the population on large passenger ships is characterized by a relatively high average age. Therefore, we investigated the results of a survey with 2085 passengers for the relationships between demographic data and privacy and security perceptions. Additionally, we explored potential influences of personal attitudes. Evidence was found that privacy concern and perceived security risk are influenced by age but not by gender. Interestingly, the effect of age on both variables is negative and stronger for security than for privacy perceptions. The individual need for safety contributes to explain both variables significantly. In conclusion, privacy concern and perceived security risk decrease with increasing age and need for safety.

Keywords: Wearables · Privacy · Security · Locating · Age · Safety

1 Motivation

1.1 Privacy and Security of Wearables

Wearable technology is an increasing trend. However, privacy and intimacy issues of these intimate devices have not yet been resolved. Wearables appear advantageous and scary at the same time. Support for various areas is available, for instance, for organizing everyday life, navigation, or fitness and health. Nevertheless, these systems need to collect data, such as the user's location, to function as helpful devices. Austen [2] most recently pointed out the challenges of security

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and the related concerns about privacy and security of wearables against the background of their benefits for everyday life, which is in accordance with previous literature, for instance Loebel [20], contrasting the risks of location-based services and applications with their benefits for the user. Hence, wearables need to be viewed in light of their risks for privacy and security and, therefore, investigated for the perceptions by users.

1.2 The Research Gap of Privacy and Security Perceptions for Safety-Enhancing Wearables

Previous research has shown that privacy concerns and perceptions of security risks can hinder the usage of e-commerce systems (e.g. [9,21]), online health information systems (e.g. [3]) and in particular of location-based services (LBS) of wearables (e.g. [37]). Raschke et al. [30] approached lowering of privacy concerns for LBS by a privacy-by-design paradigm, Barkhuus and Dey [4] suggested to let the user permit momentary locating, and Ahmed and Ho [1] proposed notifications for transparency of data collection for the user.

However, privacy perceptions towards wearables for safety-critical areas have not been investigated so far, although high potential can be seen in wearables for safety enhancement, for instance on passenger ships. Technical failures and events of disasters on passenger ships can never be completely excluded. Examples are the Star Princess in 2006, the Costa Concordia in 2012, and the Oriental Star in 2015. Nevertheless, the number of passengers is continuously increasing and modern cruises fit up to 8000 passengers. Hence, this trend invokes the need for new approaches for efficient mustering and passenger search in case of an evacuation. Wearables, such as locating bracelets, could enhance safety without video surveillance, which has become infamous for its exploitation on occasion.

In a large passenger survey, we revealed privacy concern and perceived security risk as predictors for the acceptance of safety-enhancing wearables on passenger ships for cases of evacuations [19]. Hence, we aimed at investigating the predictability of privacy concern and perceived security risk and their sensitivity for population characteristics such as demographics, which are obvious for shipping companies, and personal attitudes, which are indistinguishable for shipping companies. Therefore, we analysed the results of the survey with 2085 passengers from 16 to 81 years for influences of the demographic variables, age and gender, and personal attitudes, such as the individual need for safety, on the dependent variables privacy concern and perceived security risk regarding safety-enhancing wearables for locating.

2 Variables

2.1 Dependent Variables: Privacy and Security Perceptions

With emerging technologies, the term privacy has become fuzzy, with a dissent in science on the inclusion of security issues [35]. For a clear picture of the influences of independent variables on privacy and security perceptions, we separated these issues in the presented work.

Privacy Concern. With regard to Smith's et al. [36] dimension *collection*, privacy concern is therefore narrowly defined as the concern that is directly connected with the disclosure of location information for the intended purposes in an evacuation. This collection concern of privacy was shown to be a predictor of the usage intention for LBS [30]. Thus, two aspects are of interest for privacy concern in our context, i.e. the consent with location identification in an evacuation situation, and continuous, anonymous locating in case there is a sudden emergency, as even anonymous locating is likely to lead to privacy concerns [18].

Perceived Security Risk. The second dependent variable besides privacy concern is seen in the perceived security risk that location data is accessed without authorisation and/or misused, building on the more traditional term privacy risk that was introduced by Featherman and Pavlou [10] and Pavlou [27].

2.2 Demographic Variables

Age. The population on passenger ships and especially on cruise ships needs to be considered comparatively old, with 72 % of the passengers older than 50 years [13]. Furthermore, low fertility rates and, especially, rapidly increasing life expectancies have led to a demographic change in Europe [5], suggesting even older passenger populations in the future. These data and trends raise the question of attitudes towards innovative wearable technology within an elderly population. Moreover, the age distribution is not constant over all travel locations but varies with the ship's route and type of travel, as there are, for example, theme cruises.

Demographic and social data have been collected in privacy research but often only used for the sample description but not investigated for predicting privacy perceptions (e.g. [6,34]). Morris and Venkatesh [23] have found that the salience of technology acceptance factors varies and the initial intention to use technologies decreases with increasing age. These findings have been supported by succeeding research [22,31].

Gender. The gender ratio is to be assumed balanced for passenger ships [13]. However, like the age distribution, it might vary with regard to travel destinations and types. Effects of gender on privacy perceptions were obtained in previous research. Nosko et al. [25], for instance, found that females are more careful about disclosing sensitive information.

2.3 Personal Attitudes

Personal attitudes such as personality traits and general attitudes are investigated for their additional explanatory power on the privacy and security perceptions. Three personal attitudes of interest were identified in the literature review and the prior interviews with passengers.

Technical Enthusiasm. Wearables for safety-enhancement in evacuations are a new technology. Hence, general technological attitudes might influence privacy and security perceptions. Technical enthusiasm was defined by Karrer et al. [16] as one dimension of technical affinity meaning the perceived enthusiasm for new electronic devices. Other measures, such as technology readiness (TRI, [26]) or computer literacy [33], often presuppose direct interaction over an interface.

Neuroticism. Uncertainty is of high relevance in the investigated research topic. The personality trait neuroticism, as one of the five personality traits in the Big Five Inventory [14], was defined as the opposite of emotional stability [15]. Its influence might be ambiguous. On the one hand, there is potential for uncertainty regarding the privacy and security of wearables. On the other hand, this might be outbalanced by the uncertainty and even fear of an emergency.

Need for Safety. Closely related to neuroticism, we suggest a third personal attitude for the investigation for effects on privacy and security perceptions in safety-critical contexts, the need for safety. We defined need for safety as the attitude towards and the weighting of safety. Regarding the safety-critical context of emergencies at sea, need for safety is of particular interest as the investigated wearables aim at enhancing safety at expense of uncertainty for privacy and security risks.

3 Method

3.1 Participants

Passengers of a cruise company were invited to participate in the online survey via mail and a cruise club website. There was no payment or other incentives. 2100 passengers completed the online survey, from which 15 were excluded from this investigation due to obvious misuse of the survey or missing age. The gender ratio was balanced and similar to the recommended IMO [13] population statistics with 49.6 % females and 50.4 % males, i.e. 1035 female and 1050 male participants. The mean age was $M = 49.22$ years ($SD = 12.59$). Even more importantly, the age ranged from 16 to 81 years (see Fig. 1), also representing people with 50 years and older (51.3 %).

3.2 Questionnaire

Each variable, introduced in Sect. 2, was mapped in the survey by several items (see Table 1). The items were based on the discussed research for this variable as far as possible and, if necessary, translated to German for target group adequacy. Participants rated their degree of consent with the items on a 5-point Likert-scale (from 1 = disagree to 5 = agree).

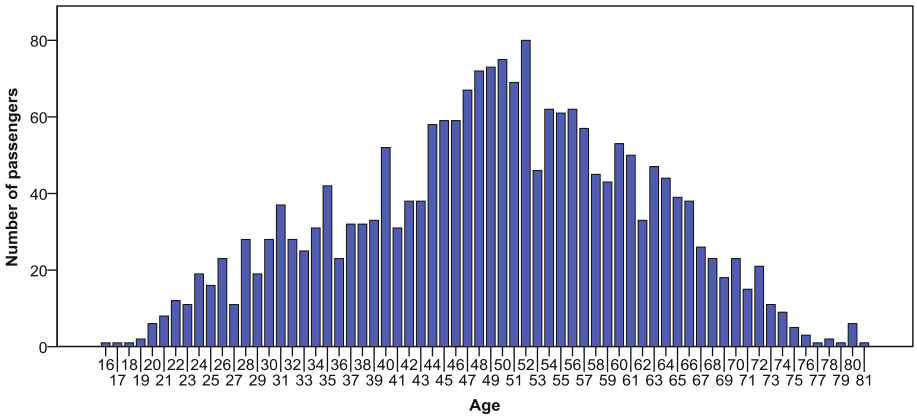

Fig. 1. Age distribution of the participating passengers ranging from 16 to 81 years with a mean age of 49.22 years

Table 1. Items

Variable	Items
Privacy concern	I would not want anyone to be able to locate me, even not for purposes of rescue
	I would not want my bracelet to be tracked, even anonymously
Perceived security risk	I would be worried that someone would track my location for other purposes than rescue
	I think that someone would use my location data without authorization.
Technical enthusiasm	I inform myself about electronic devices, even if I do not have the intention to purchase
	I love owning new electronic devices
	I am enthusiastic when a new electronic device is launched
	I like going to specialized trade stores for electronic devices
	I have fun trying a new electronic device
Neuroticism	I am relaxed, handle stress well (R)
	I get nervous easily
Need for safety	Safety is important to me
	Safety always comes first

3.3 Statistical Analyses

First, multiple regressions and (M)ANOVAS were conducted to identify the relevant predictors for privacy concern and perceived security risk. Analysis of variance was used for independent nominal variables, i.e. only gender in this

case, whereas regression analysis was used for ratio or interval scaled variables, i.e. every other variable in this investigation. The alpha-level was set to $\alpha = .01$. Based on Cohen [7], we defined the effect size regarding measures of association power as small, when explaining 1 % of the variance, as medium, when explaining 6 %, and as large, when explaining 14 %. For inclusion of independent variables in the final model, we therefore further defined the effect size explaining at least 1 % of the variance in at least one of the target variable as prerequisite, i.e. independent variables that explained less than 1 % of the variance in privacy concern and/or perceived security risk were excluded from further investigation. Second, we were interested in the sensitivity of privacy concern and perceived security risk by changes in the population. Hence, in accordance with Schwieger [32], multiple stepwise regressions were conducted with the identified relevant predictors of the target variables, forcing objective factors into the first step to increase the overall model validity.

4 Results

4.1 Descriptive Statistics

Table 2 presents the descriptive statistics of the target variables and the personal attitudes as demographic descriptives were presented in Sect. 3.1. Construct reliability was assessed by Cronbach's alpha α and the item-total correlation r_{it}. Kline [17] and Field [11] recommend thresholds of $\alpha > .70$ and $r_{it} > .30$. While all constructs met the latter requirement, neuroticism's and need for safety's Cronbach's alphas were not excellent but satisfactory for exploratory analyses [8,12]. In addition, the neuroticism scale had been validated in the short version BFI-10 [28,29].

Table 2. Descriptive statistics for dependent variables and personal attitudes

	Mean	SE	Cronbach's α	Item-total correlation r_{it}
Privacy concern	2.24	0.027	.847	.739
Perceived security risk	2.84	0.030	.933	.875
Technical enthusiasm	3.11	0.022	.902	.673 – .828*
Neuroticism	2.28	0.019	.669	.504
Need for safety	4.80	0.009	.586	.447

*Range because of the number of items

4.2 Statistical Selection of Independent Variables for the Final Model

The independent variables were investigated for their explanatory power on privacy concern and perceived security risks. Linear regression results with age as

the only predictor for privacy concern showed a significant effect of age on the target variable, $F(2082) = 37.381$, $p < .001$, $R^2 = .018$, fulfilling both criteria for inclusion in the final model, i.e. significance at $p < .01$ and an explanatory power of more than or equal to 1 %. The impact of age on security risk was higher, $F(2083) = 93.960$, $p < .001$, $R^2 = .043$, again fulfilling both criteria for inclusion in the final model.

Gender had a significant effect on privacy concern, investigated by MANOVA, $F(1, 2084) = 11.381$, $p < .001$. However, the explanatory power was very small, $\eta_p^2 = .005$. No significant effect of gender on perceived security risk was found, $F(1, 2084) = .004$, $p = .951$. Thus, gender was rejected as predictor for both target variables.

The influences of the personal attitudes technical enthusiasm, neuroticism, and need for safety were assessed by regression analyses. There was no significant effects of technical enthusiasm on privacy concern, $F(1, 2083) = .016$, $p = .899$, and on perceived security risk, $F(1, 2083) = 2494$, $p < .114$. Neuroticism had a significant effect on privacy concern, $F(1, 2083) = 12.407$, $p < .001$, but with a very small effect size of $R^2 = 0.6\,\%$, and no significant relation with perceived security risk, $F(1, 2083) = .119$, $p = .730$. Need for safety significantly affected privacy concern, $F(1, 2083) = 222.771$, $p < .001$, $R^2 = .097$, and perceived security risk, $F(1, 2083) = 107.361$, $p < .001$, $R^2 = .049$. Hence, the only personal attitude, included in the final model, is need for safety.

4.3 Final Multiple Regression Models

For the final multiple regression models, age and need for safety were considered as independent variables and privacy concern and perceived security risk as dependent variables. The dependence of need for safety on age was checked by regression analysis, showing a small significant effect of age on need for safety, $F(1, 2083) = 48.427$, $p < .001$, $R^2 = .023$. As our primary focus is the explanatory power of objective factors, such as demographics, we applied multiple stepwise regression analysis, forcing age into the model first and need for safety second, investigating need for safety only for additional explanation of the variance in the target variables that is not explained by age.

Multiple Regression with Privacy Concern as Dependent Variable. The regression model with age and need for safety, stepwise entered into the analysis, can explain 10.5 % of the variance in privacy concern, $F(2, 2082) = 121.538$, $p < .001$ (see Table 3). Age accounts for 1.8 % of the variance, $F(1, 2083) = 37.381$, $p < .001$, but need for safety can explain another 8.7 %, $F(1, 282) = 202.087$, $p < .001$, $\Delta R^2 = 0.087$. The relation between age and privacy concern is negative, i.e. the older people are, the lower their privacy concern is, $\beta = -0.88$, $t(2082) = -4.186$, $p < .001$. Need for safety also negatively relates to privacy concern, $\beta = -.298$, $t(2082) = -14.216$, $p < .001$.

In other words, there is a significant negative effect of age on privacy concern but the negative effect of the individual need for safety, for which age only partly

Table 3. Multiple regression results for privacy concern as dependent variable

	B	$SE\ B$	β
Step 1			
Constant	2.884	0.109	
Age	−0.013	0.002	-0.133^{**}
Step 2			
Constant	7.178	0.320	
Age	−0.009	0.002	-0.088^{**}
Need for Safety	−0.940	0.066	-0.298^{**}

$R^2 = .018$ for Step 1, $\Delta R^2 = .087$ for Step 2, $p < .01^{*}$, $p < .001^{**}$

accounts for, is larger. For a better understanding, we depicted these effects in a diagramm in Fig. 2 by recoding need for safety into only two categories, i.e. highest value in need for safety (high NfS: NfS = 5) and rest of the population (low NfS: NfS $\leq$ 4.5).

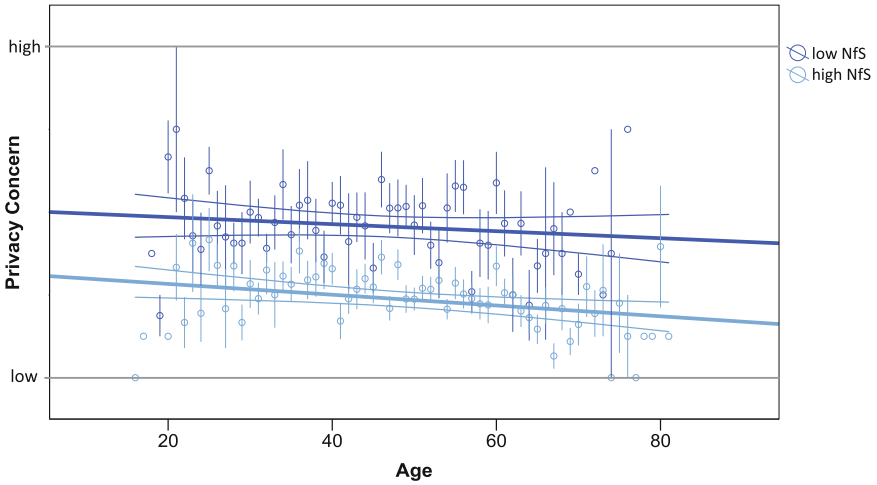

Fig. 2. Means of privacy concern with SEs in dependence on age, with regression lines (=thick lines) with 95 % CI (=thin lines); dark blue depicts the group with a low safety need, light blue depicts the group with a high safety need

Multiple Regression with Perceived Security Risk as Dependent Variable. The regression model for perceived security risk can explain 8.0 % of the variance in this target variable, $F(2, 2082) = 90.840$, $p < .001$ (see Table 4). Age accounts for 4.3 %, $F(1, 2083) = 93.960, p < .001$, and need for safety for another

3.7 %, $F(1, 2082) = 83.978, p > .001$. Both independent variables are again negatively related to the target variable, i.e. perceived security risk decreases with increasing age of passengers, $\beta = -.208$, $t(2082) = -8.390$, $p < .001$, and with increasing need for safety, $\beta = -.195$, $t(2082) = 9.164$, $p < .001$.

Table 4. Multiple regression results for perceived security risk as dependent variable

	B	*SE B*	β
Step 1			
Constant	3.959	0.120	
Age	−0.023	0.002	−0.208**
Step 2			
Constant	7.070	0.359	
Age	−0.020	0.002	−0.178**
Need for safety	−0.681	0.074	−0.195**

$R^2 = .043$ for Step 1, $\Delta R^2 = .037$ for Step 2, $p < .01^*$, $p < .001^{**}$

In contrast to the small explanatory power of age on privacy concern, age as objective demographic factor explains almost as much variance in perceived security risk as need for safety, reflected by the obviously higher gradient in Fig. 3 than in Fig. 2 using the same scaling for the axes.

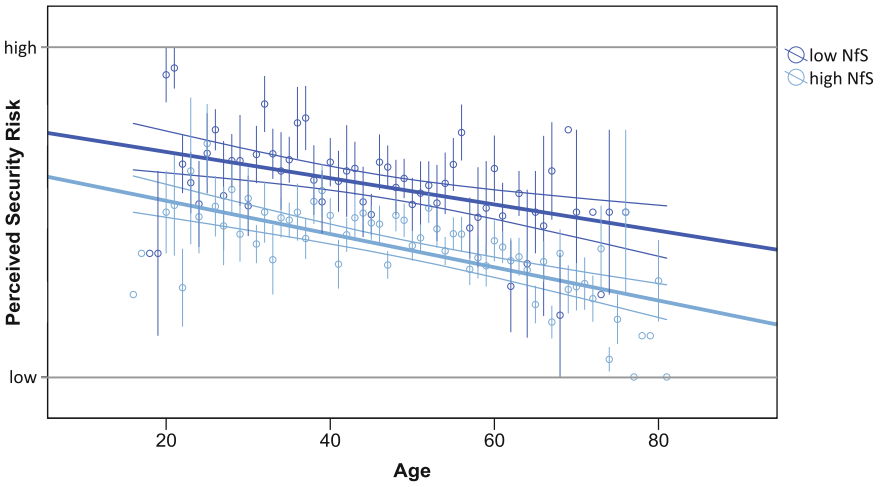

Fig. 3. Means of perceived security risk with SEs in dependence on age, with regression lines (= thick lines) with 95 % CI (= thin lines); dark blue depicts the group with a low safety need, light blue depicts the group with a high safety need

4.4 Summary of Results

The effects of age and need for safety on privacy concern and perceived security are depicted in Fig. 4. The black arrows reflect the explanatory power of the objective demographic variable age on the two target variables. Moreover, we found significant influences of need for safety on privacy concern and perceived security risk, additionally contributing to explain variance in the target variables. Taken together, age and need for safety account for 10.5 % of the variance in privacy concern and 8.0 % in perceived security risk, with a stronger influence of age on the latter variable.

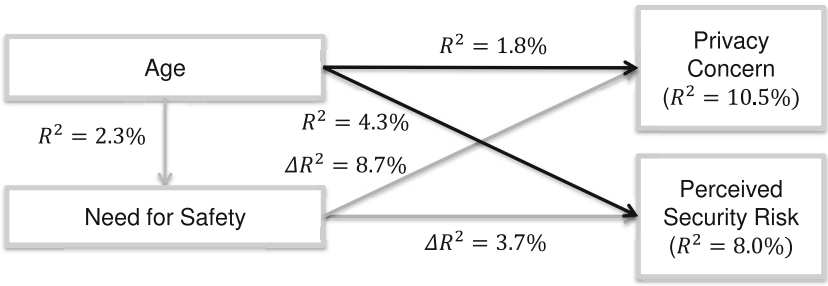

Fig. 4. Model with explanatory powers R^2 of the objective demographic variable age on privacy concern and perceived security risk (black arrows) and the change in the explanatory powers ΔR^2 integrating the need for safety into the model (grey arrows)

4.5 Limitations

The selection of independent variables was based on a comprehensive literature review and interviews with passengers aged between 32 and 70 years old. However, the unexplained variances in the perceptions of privacy and security suggest that there might be more, not yet identified factors of influence. Only as many items as constructs' dimensions were used in order to avoid boredom and fatigue by seemingly redundant questions. To ensure reliability though, the survey was iteratively tested with about twenty persons including passengers and experts from psychology and communication sciences. After each test we enhanced the items for clarification and representativeness of the underlying dimensions. In order to collect data from as many passengers as possible, we decided for an online survey, implying a potential bias by technical affinity. Lastly, a bracelet is obviously not the only possible form for safety-enhancing wearables.

5 Discussion and Future Work

The demographic variable age and the individual need for safety have been revealed to have significantly negative effects on privacy and security perceptions

by a survey with 2085 passengers. A model based on multiple regressions has been developed explaining 10.5 % of the variance in privacy concern and 8.0 % of the variance in perceived security risk. Age was shown to be a stronger predictor for perceived security risk than for privacy concern.

For assessing sensitivity of the privacy and security perceptions due to varying population characteristics, we present the multiple regression results in Figs. 5 and 6.

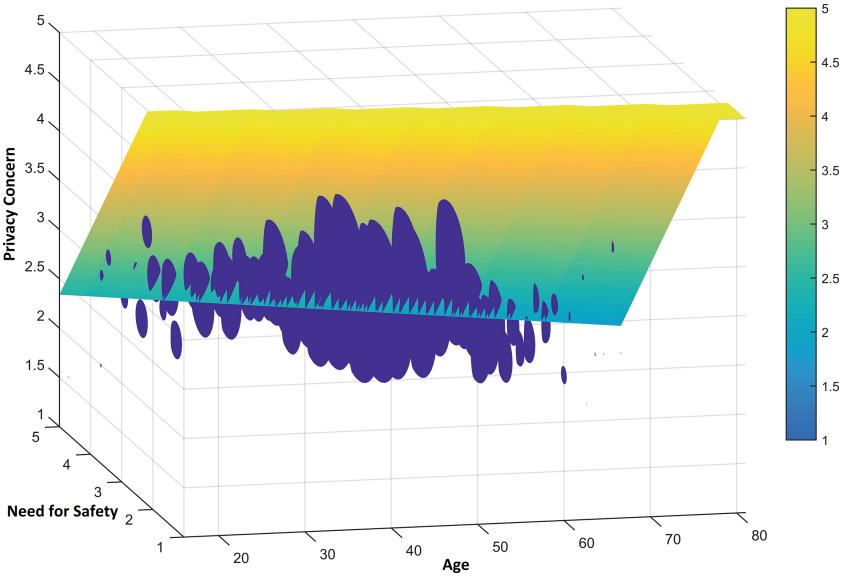

Fig. 5. Privacy concern as dependent variable of age and need for safety according to the multiple regression simulation; ellipses depict the survey data with sizes representing the frequency of answers

Figure 5 shows the simulated ratings for privacy concern in dependence on age and need for safety. The data is derived from the survey and covers an age range from 16 to 81 years. The regression plane shows how privacy concern decreases with increasing age and need for safety. However, need for safety increases with age enhancing the revealed effects on the target variables. Additionally, the actual average values for privacy concern in dependence on age and need for safety are mapped by ellipses, with the ellipse sizes representing the number of answers.

Figure 6 presents the ratings for perceived security risk in dependence on age and need for safety and depicts the multiple regression model as a surface plot. The regression plane shows how perceived security risk decreases with increasing age and need for safety. Again, the actual observations from the survey are mapped by ellipses in the figure.

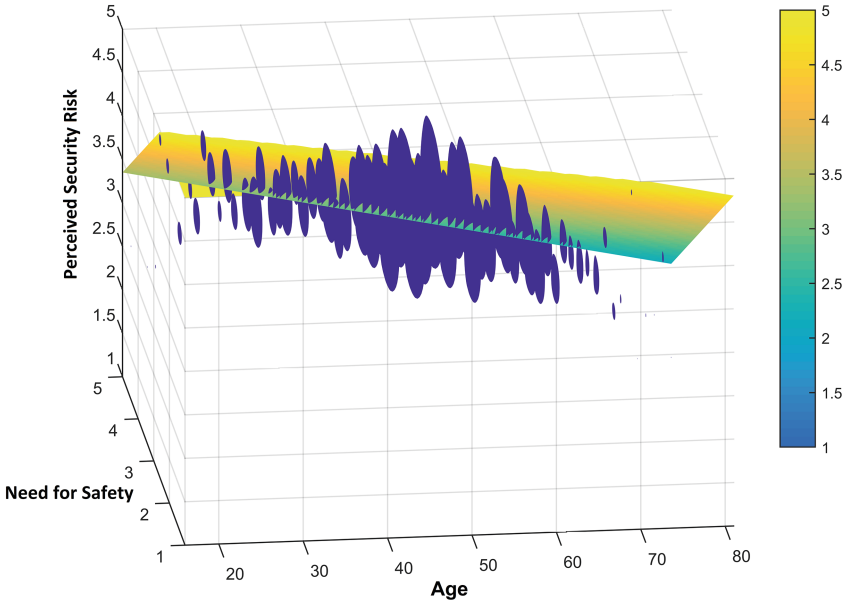

Fig. 6. Perceived security risk as dependent variable of age and need for safety according to the multiple regression simulation; ellipses depict the survey data with sizes representing the frequency of answers

The findings indicate that privacy concern and perceived security risk depend on the population characteristics age and need for safety. While need for safety of passengers is not directly visible to shipping companies, age is easy to retrieve. In general, privacy concern ratings beyond the threshold of 3.5 suggest a negative perception of the presented technology. According to the regression model, persons with a low need for safety are likely to show such a perception. The multiple regression simulation for the variable privacy concern in dependence on age and need for safety shows high values in privacy concern for low values in need for safety over the entire range of age. Thus, for a scale value for need for safety of less than 3.49, the simulated rating for privacy concern is above the threshold value for the entire range of age. This effect becomes even stronger for younger passengers than for older passengers. For passengers younger than 30 years, forming the youngest age group according to the IMO [12] recommendations for population characteristics, privacy concern only exceeds the threshold for the variable need for safety being 3.35 or lower. However, in our tested population we found a large majority of persons that showed a high need for safety, which indicates a correlation with low ratings for privacy concern.

Especially the perceived security risk is sensitive to age, i.e. younger populations, for instance due to theme cruises, perceive higher security risks than older ones. For young passengers (<30 years), the threshold value of perceived security risk is lower than 3.5 only if need for safety is rated at 4.85 or higher

according to our regression model. Especially older passengers (>50 years, oldest age group assumed in IMO [13]), even with a low need for safety, are likely to perceive a low security risk when confronted with the proposed technology (threshold value of 3.5). This means that according to the model, corresponding attitudes can be assumed to prevail among certain groups. The group of elderly people with a positive need for safety and the group of younger people with a very high need for safety are likely to show a rating above the threshold.

There is an implicit contradiction to prior research as we found that elderly are more open to safety-enhancing technologies than younger people, although, for more traditional technologies, Morris and Venkatesh [23], McCloskey [22] and Rogers and Fisk [31] found a decreasing initial intention to use these technologies. Our research findings suggest an opposing relation of age with privacy and security perceptions for wearables to usage intentions for more traditional technologies.

Motti and Caine [24] found that users are unaware of the details of data collection by wearables and our research has shown that elderly people are not as critical about privacy and security of wearables suggesting that privacy and security perceptions would not hinder the deployment of wearables for safety-enhancement in elderly populations that much. In contrast, these findings are alerting for consumer-oriented wearables for the elderly as especially elderly persons have to be informed more about potential privacy and security risks. Hence, future work on privacy and security design including information policy for wearables that support elderly in everyday life is desirable.

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Balancing Act or Compromise? A Case Study Highlighting the Challenges of Trialling IT Services with the Elderly

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Abstract. The world's population is ageing. Older members of society have needs from IT which can be quite specific, reflecting their living arrangements and increased likelihood of suffering from physical and cognitive impairments. So how can businesses offering IT services understand these needs to develop products and services that this demographic group (and their carers) will be willing to adopt? In this paper we outline the process we went through to attempt to answer this question. Because our research involved elderly and (in some cases) disabled trial participants, the process had ethical considerations at the forefront, which on occasion affected the operational processes involved in bringing the trial to life. We describe the various challenges we encountered, where possible how we overcame them (by balancing commercial, stakeholder and participant requirements or by compromising where we could not), and what we learnt for future trials.

Keywords: User trials · IT · Ethics · Trust · Business processes · Organizations · Stakeholders

1 Background – BT

From developing the first amplified telephone handset in the 1920s for the deaf [1], to the highly successful BT Big Button 200 (Fig. 1) with features such as easy-grip handsets for those with dexterity issues and an inductive coupler for use with hearing aids, BT has a long history of offering inclusive communication products. In addition, in collaboration with organizations such as local councils, telecare and telehealth services are offered with the intention of enabling such customers to live independently and securely in their own homes [2] (Fig. 2).

As well as the financial and non-financial benefits these products and services bring to BT and to customers, the public sector is another expected beneficiary of such services, as quoted by Paul Burstow, MP, Department of Health in March 2012:

D. Kreps et al. (Eds.): HCC12 2016, IFIP AICT 474, pp. 49–60, 2016.
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Fig. 1. BT Big Button Phone.

Fig. 2. BT Telehealth Trial, Northern England 2015.

The widespread adoption of telehealth and telecare as part of an integrated care plan will mean better quality of care and greater independence for people with long-term conditions. Delivered from the front line it could save the NHS up to £1.2 billion over five years.[1]

So the rationale for offering these services is clear: for BT, the customer and the public sector. But BT, like other IT companies, constantly evolves its product set to meet the changing needs of its customers, reflecting demographic and societal changes, and to fulfil its business and Corporate Social Responsibility (CSR) ambitions. Successful products continue to be sold, less successful ones are discontinued. In order to maintain the refresh cycle of new products, BT has various foresight and development teams within its organisation. For this case study in particular, the Research and Innovation department, in collaboration with teams in CSR [3] and the Business Development teams in the Health sector-facing part of the organization, developed a specific concept to

[1] https://www.gov.uk/government/news/telehealth-and-telecare-could-save-nhs-1-2-billion.

potentially add to the existing suite of inclusive products. The concept was to be delivered in the form of a trial service, to address a specific and evident issue facing predominantly elderly members of the UK Population – that of social isolation.

2 The Case for Researching Concepts to Address Social Isolation in Elderly User Groups

Social isolation among older people is an increasing problem. A survey conducted by Age UK in 2014 (Fig. 3) revealed that over 1 million people aged 65 and over admit to always or often feeling lonely, 30 % of older people saying they would like to go out more often, while 41 % say their TV or pet is their main form of companion. The charity also found that 12 % feel "cut off" from society. Loneliness can be seriously damaging to health - feeling extreme loneliness can increase an older person's chances of premature death by 14 % [4].

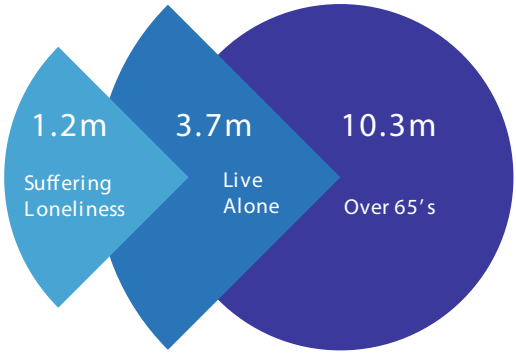

Fig. 3. Proportions of over 65's experiencing a level of loneliness [Age UK 2014].

These statistics become more significant when looking at the projections for the future. In the UK, between 2015 and 2020, during which the general population is expected to rise 3 %, the numbers aged over 65 are expected to increase by 12 %; the numbers aged over 85 by 18 % and the number of centenarians by 40 % [5]. 25 % of the UK population is projected to be aged 65 and over by 2050 [6]. When considering these projections, the incidence of social isolation and its effect on health and social services becomes even more significant.

Because of this evidence, the BT teams collaborated to develop a conceptual service which could potentially reduce social isolation among elderly people. BT is well-positioned to be able to do this having the ability to offer fast Internet access to provide connectivity, to be able to work with consumer device vendors, to work with these vendors to adapt products' user interfaces according to the target user group's needs, and to work with external organisations to explore options for the concept's route to market and ongoing technical support for any prospective service. With these factors in place, a trial plan was created.

3 Trial Objectives

The original intentions of the trial were, over a period of 12 months, to build upon previous research on the role of technology in addressing loneliness, and to inform the strategic direction for the implementation of these technologies. The technology for the trial was deliberately simple – a system using Skype over the participants' existing TV.

The county of Cornwall was chosen as the geographical location for the trial as:

1. Its population's age is higher than the national average (1:4 is over 65 years old) and is expected to increase [7],
2. There was an established collaboration between some of the stakeholder groups to deliver the trial, and
3. Infrastructure was already in place to deal with technical and participant support during the trial.

The original objectives of the trial, from a commercial point of view, were to:

- Measure the benefits of TV video chat in reducing social isolation.
- Evaluate performance, experiences of the user and their families/carers and feature sets to identify improvements and future service enhancements.
- Understand usage models and frequency of use to support proposition insight.
- Understand geographic and demographic elements to support any proposed business model.

Another objective was to be able to use research findings for publication due to its relevance in the field of Human Computer Interaction (HCI) which includes 'Inclusion and Accessibility', 'Designing for the Elderly' and 'User Interface Experience Design'. To enable us to do this, ethical approval was needed; this was provided by a university partner whose faculties specialise in researching technology use in elderly populations. Having ethical approval to ensure participants are protected is vital and an activity all stakeholders supported. However, it was the negotiation of the detailed recruitment and participant engagement processes for this ethical approval procedure with the multiple stakeholders which created the first of the trial's many challenges.

4 Challenges

4.1 Challenge 1 – Balancing the Needs of Multiple Stakeholders for Ethical Approval

The stakeholders were those involved in bringing the trial to launch who also had an interest in the trial's output. The number and diversity of these stakeholders is demonstrated in the list below:

- Local delivery and support team (part of BT).
- Local development council who ran outreach programmes to educate elderly IT users.
- Local housing associations for referral of potential participants.
- Local charities for the referral of potential participants.

- A non-BT Internet Service Provider to provide the high-speed Internet connections for the service.
- Device vendor (supplier of the hardware to be installed on participants' TVs).
- CSR and regional Broadband roll-out programme managers within BT.
- Public sector-facing marketing teams of BT.
- University partner advising and supporting the BT research team through the ethical approval process.

All stakeholders had a common desire for the highest levels of participant safety and protection. However, the production of the detailed processes and documentation which the ethics approval committee required, needed to take into account a variety of logistical requirements from different stakeholders. For example, one of the charities was already running a similar exercise in trialling non-technical means of reducing social isolation and were some way ahead of BT's research team in developing their own ethically approved participant referral and engagement processes. While honouring their wish to keep our processes aligned with theirs for the recruitment programme they were running, it did not fully match the resourcing capabilities of (for example) the housing associations who needed separate, parallel participant referral processes. The nature of the work of both organisations was in itself different – one being a charity supporting the elderly, the other organisations dealing with aspects of social housing tenancies). This in itself doubled the already significant quantity of process documentation required by the ethics approval committee.

Letters of communication to participants similarly required agreement from all parties to ensure consistency in the tone, content and intent of the documentation, from the original flyer advertising the trial, to welcome letters, to letters advising of the end of the trial and letters outlining what participants needed to expect in terms of providing feedback to the researchers. Legal documentation was thoroughly reviewed (i.e. terms and conditions plus two sets of participant consent forms). Finally, technical criteria checklists, for the use by the referrer (outreach worker, charity or housing association representative) needed to be produced such that the referrer themselves – usually an individual from a non-technical background – was confident that they could record that such criteria could be met for the trial service to be delivered in the participant's home. Another requirement upon this referrer was that they recommend the participant on a subjective assessment of whether or not the individual would benefit from such a service, taking into account what they knew of the participant's health, social network and living arrangements. As this was a responsibility upon the referrer (BT did not engage the participant directly until all consents had been given), this too needed special consideration. Again, these processes did not extend to all referral parties because some wished to retain their own processes, and this too had to be taken into consideration.

When all agreements were met and documentation produced, the ethical approval board itself caused another impact on the roll-out of the trial, because our application was submitted during summer recess and the board did not meet until some weeks after. Although this was a known factor, it had an impact on the ability to start recruiting participants, and in turn this affected the timescales for launch of the trial service.

As a result, the trial start date was pushed back, leading to a loss of momentum, especially with the internal commercial partners. However the need for ethical approval was paramount, so the trial launch continued and approval was eventually gained to start recruitment.

4.2 Challenge 2 – Issues with Trust

Popular and widespread adoption of new technology is less straightforward than it might initially appear; given that technology is always imperfect there are initially more barriers to take-up than drivers that will push adoption – this was especially true of our group of participants. Central to the adoption process is the need to consider the question of whether the technology itself can be trusted as well as the necessary trust in those who deploy, control and deliver such technology. In this trial, this task was made more complex because we needed to access and engage with a potentially vulnerable population of elderly people. To do this we needed to build a trusted relationship with those stakeholders through whom we wished to access the participant population, as well as the participants themselves, and also to address any trust issues around the technology we proposed to deliver.

Trust Issues in Participant Engagement. Rigorous research requires participant engagement with the research process and in this instance recruitment and engagement posed a challenge. From a recruitment perspective trust issues were more complex because we did not have an existing relationship or direct access to a sample with the required characteristics, hence this gave rise to the necessity to leverage relationships with stakeholders who did. This placed an extra burden on the trust/risk relationship in two ways; stakeholders were being asked to trust both our technology and our ethical rigour in sharing their personal contacts whilst participants were being asked to trust the judgement of stakeholders in recommending referral and participation in the trial. Without a direct trust relationship with those delivering the trial, participants were required to rely 'second hand' on their trusted stakeholder relationship and in turn this introduces a potential risk to disrupt or redefine the confidence they have in that relationship – a relationship risk that applies to both participants and stakeholders, albeit for different reasons.

Any asymmetry of relationships between individuals and institutions is also important in understanding the issues of risk and trust and this presents a further complication here between the parties concerned: participants (who are in receipt of services from stakeholders), stakeholder institutions (supplying services to potential participants) and those organising and running the trial (supplying a service to stakeholders' participant referrals). Each party concerned is required to address and assess the level of trust required and risk involved but each will perceive both the risk and degree of trust differently. From a business perspective we could not measure, with any certainty, the impact these relationships may have had on perception of risk, trust, and willingness to participate or engage with the technology offered, as a result it was difficult to pre-empt, react to or manage these varied perceptions.

Trust in Technology. The unfamiliar nature of cutting edge technologies can be intimidating, particularly for a potentially non-technical, elderly population, but since we proposed to utilise the television as our medium of delivery, trust issues around technology were minimised because the television is a technology that has gained long-standing trust and acceptance in most homes, amongst most users. This was a challenge which we considered but believe we overcame because from the users' perspective what we were offering was a different way of using that tried, tested and trusted technology, combined with an enhanced service proposition that aimed to improve and extend opportunities for communication with friends and family. This gave us confidence that any issues concerning the device and its usage were not due to trust (or lack of) in the technology itself.

4.3 Challenge 3 – Technical and Organisational Issues

The delivery of service into participants' homes depended on a co-ordination of tasks led by BT's Research Project team, with Internet connections (where required) delivered by a 3rd party supplier, and a separate local delivery team installing the devices on participants' TV sets. Co-ordination of the two parts of the delivery process was problematic because there was no direct link between the two – all interactions were mediated by the Research Project team. There was a dependency between Internet connections being delivered before the local delivery team could install devices. At the outset of the trial, we had agreement from these two teams that co-ordination of these parts of the delivery process would be seamless, although as we will discuss later, such attempts were thwarted by various different issues.

The trial service required a high speed Internet connection, with uplink speeds higher than standard ADSL. Despite investment in infrastructure in the region [8], high-speed connectivity was not ubiquitous and take-up was inconsistent within the participant group for the trial. Some participants had pre-existing high-speed services so could go straight to the device-installation phase; others did not, either having no Internet connection at all, or using ADSL, which in addition to insufficient uplink speeds is prone to lower speeds in rural areas due to the distance from the exchange. Because of this, according to the trial terms and conditions, BT offered to provide high-speed Internet connections to participants who did not have them already. Although being an existing BT customer was a condition for trial referral, some non-BT customers were referred and in order for the team to arrange upgrades to participants' existing connections, we needed to ask for MAC addresses (a condition of the ISP industry at the time). This was a concept beyond the understanding of many participants, but only they, as the account holder, could obtain it from their ISP, adding further complications to the task of getting participants connected and placing an added level of responsibility upon them, which we had intended to avoid. Additionally, delivery of some of the fast Internet connections was delayed due to delivery timescales in the third party organisation, due in turn to challenges presented by the Cornish environment and delays from *their* supplier of infrastructure and engineering teams. Some of the fibre-to-the-premises connections - although offering the highest speed Internet connectivity and theoretically the best user experience when using the device - were the most problematic due to these issues.

These delays became compounded by issues with the local device installation team, who were managed by yet another stakeholder group. However problems encountered here, which could not be foreseen, were associated with organisational and resourcing problems rather than technical issues. The delivery of devices and their support was intended to be an "add-on" to existing services the organisation already offered. Installation engineers to install and support the trial service were agreed upon at an early stage, but in due course the teams involved shrank in size, with redundancy and sick leave affecting resourcing profiles, and our trial service deliveries were de-prioritised as a result. Engineers left, taking skills with them, and their replacements were not sufficiently skilled or available to complete the tasks. The knock-on effect was that participant deliveries were delayed, and ongoing support was not available, necessitating the research project manager to become involved directly in technical support issues. This was challenging due to his location being over 350 miles from the trial location but essential due to the level of technical support needed by participants. Whilst this was provided as an act of good will, the lack of ongoing local support resulted in a loss of momentum and interest amongst participants.

4.4 Challenge 4 – Technology Engagement

The final challenge presented itself during and after the trial. In our attempts to provide a trial technology to those who were socially isolated (to meet the original objective of the study) our referral partners suggested participants they knew whose relatives lived far way away, or who did not have a local social network. For some, this worked well, or rather it augmented existing relationships, for others, it did not help, as in the case of those who had relatives in the US or Australia where significant time differences meant the service was not useful, because when they were awake and ready to use the service, their relatives were asleep, or at work. Participants observed and accepted that their younger relatives often have dependent children to attend to, were likely to be working full time and have busy social lives, and therefore it was hard to find a mutually convenient time to call. Although the intention was for this trial technology to enhance social interaction (as geographic barriers are eliminated by the technology), the complex context of people's lives meant that quite often, even the convenience of a Skype over TV service was not enough to increase interaction and as a result, some participants found this a barrier to use.

In addition, within this cohort, there was an observed deterioration of existing social networks, such that those who did not have many living relatives did not have anyone else they wanted to connect with and hence did not find a use for the technology – it seemed they needed a *pre-existing* social network for it to work beneficially. Additionally one participant mentioned that, as she is disabled, she had the device set up with her bedroom TV as she goes to bed early, but this too was a barrier as she was uncomfortable being able to be seen in bed by even her own relatives, inferring a concern this participant had regarding her privacy. Finally, usability issues such as the usage of the device's remote control (Fig. 4), switching between input channels on the TV and intermittent technical problems presented barriers to use. Without local technical support, it was also challenging to make changes to installed devices, provide additional training

or add new connections to participants' devices remotely, which had knock-on effects to the devices' usage, and therefore our ability to collect participants' experiences of the device's usage as initially planned.

Fig. 4. Remote control used to operate the trial device.

5 What Did We Learn?

Despite the challenges of the trial, a significant amount was learnt, some of which was unexpected, but all of which was valuable. Our attempt to prove that social isolation could be alleviated by Skype over TV could not be delivered by this trial alone, but our understanding of the barriers to use (as described above), and the requirement for local, accessible support delivered by trusted individuals and organisations is vital for the success of a service such as this. As a result, one of our main conclusions was that customers need a *service* more than just a *device*. And that service includes one that a customer can trust and that will be delivered responsibly and supported fully, with seamless single point-of-contact customer experience (regardless of the number of suppliers actually involved).

5.1 The Importance of User Engagement in Service Design

A key lesson learnt is in the value of engaging with a population of potential real end users; as service developers and technologists we may believe that our product or service is new, exciting and innovative but we have to accept that this view may not be upheld by non-technical potential users who may tell us some uncomfortable truths. By listening to users' experience and understanding how engaging with a technology relates to their own desires and experience we can gain valuable insights that would not otherwise be accessible. In undertaking such an endeavour we are likely to encounter views that run counter to our own but it is not until we engage with consumers of that product or service that we can create the opportunity to understand why it might, for example, appear to be a technologically elegant solution from a developer's perspective but a clumsy one from a user's perspective. In a business context it is the opinion of the consumer that is most important and if we confine ourselves to a focus on technological solutions in isolation we may well end up 'fixing' the wrong things. This is particularly important in the public sector where funds are at stake that are needed to provide services that will ultimately be used by the people who are paying for them such as health care programmes [9].

Some might argue that the process of soliciting opinion from potential end users is not objective because they are not well-informed enough to judge the value of a product or service as mere 'members of the public.' Technologists and service designers are also members of the public of course and we would argue that there is value in the very process of uncovering knowledge gaps or misunderstanding because it allows us to address the 'right' aspects of a product or service to enable development and better understanding. As Bruni et al. [10] (2008, p. 16) describe, our potential end users may not be technological experts, but they are experts in 'lived experience.' In listening to and taking account of what participants tell us we can create the opportunity for the co-creation of trust to create better, appropriate and more user-centric products and services that have wider market appeal. If we design services around the end users and involve them and engage with them from the outset, trust and confidence are more likely to follow as a natural consequence and by listening to and responding to end users we can start to develop an empathy with the user perspective that addresses any issues that impact on trust, acceptability and take-up.

5.2 Understanding Technology Adoption

Classic adoption theories such as Rogers' (1995) 'diffusion of innovations' [11] and the Davis' (1989) 'technology acceptance model' [12] both address the importance of social structures and personal beliefs in the acceptance of any new technology. In order to achieve public buy-in with technological developments, we need to understand the issues from a number of perspectives. Acceptance of, and trust in the technology to be offered is of central importance to the adoption of new solutions, but trust of those people involved in the introduction and delivery of technology is also central and this relationship is often ignored or overlooked. Decisions regarding whether or not to engage are not necessarily based on technical novelty alone, but on the analysis of attendant risks and benefits. This risk-based approach repositions the question of trust and places it at the baseline of every discussion whilst simultaneously expanding its importance [9]. We need to consider these discussions in the light of this.

An additional learning point is that technology adoption may be enabled by re-focussing marketing efforts *away* from the target demographic. It can be a hard thing to admit that one needs help – that one is struggling to cope with living alone for example. Often this is instead recognised by other family members. Additional user research conducted by BT among a sample of adults with elderly relatives suggested the main instigator for adoption of these services may actually be *this population* and not their elderly relatives. Not only did they perceive value in being able to physically see their relatives using the technology, they could see the value of integrating such a service with other telecare or smart home services to remotely monitor their relatives in the case of falls etc. They are also likely to be willing to support their relatives in the setting up and maintenance of such a service, and deal with suppliers if things go wrong.

5.3 Understanding Issues of Trust

In the course of working with multiple stakeholders supporting a vulnerable population we have learned that trusted relationships are a necessary and key component for success. Those relationships can be enhanced by explicit, clearly defined and appropriate benefits to all concerned and voluntary, mutually understood and agreed boundaries. When balanced with respect for the value of the opinions of end users we can increase opportunities for reciprocity in the consumer/developer relationship that can be translated into robust product and service offerings that can benefit consumers, business and wider society. We need to enter into these relationships with as much knowledge as possible about the potential impacts, particularly when dealing with a vulnerable population and this highlights the importance of the quality of trusted relationships between stakeholders and potential participants and between both stakeholders and participants and those delivering the trial.

These aspects of risk and trust are particularly apparent when comparing the challenges of recruitment and engagement for this trial with a previous trial led by a charity, with BT providing technical support, to a similar participant group. Participants were originally signed up to the trial by a community GP, and thereafter engagement was managed by a charity, of which one individual grew relationships and trust with participants and was a single point of contact for them throughout the trial period. The success of this recruitment strategy was in contrast to that experienced on this trial, inferring that existing levels of trust between the GP and charity representative were more fully formed than those encountered on our trial. To summarise, it is clear therefore that success of technology introduction needs to consider and build these important trust relationships, potentially over a longer period than we had initially assumed.

6 Conclusions

In having completed the trial, we are now able to summarise the findings and translate them into new service ideas to the business and stakeholders. Our findings go beyond the user experience aspects we originally envisaged – our learnings apply to the entire service launch, delivery and support aspects, so were greater than we first envisaged. For us this was an unexpected but worthy result.

As of 2016, the participants of our trial probably represent the last generation willing to use a single-function service like this however, so in the future this service may be embedded within a wider suite of inclusive and smart home products, delivered responsibly and supported through established networks of family members, social services and/or the NHS, to meet changing needs.

Additionally, there are customers with different needs who may benefit from simple video communication services – the autistic population, for example, may find interaction easier when mediated via a screen. Wider understanding of their needs would be required in developing these communications services.

The challenge is now to develop products and services which meet evolving consumer, stakeholder and supplier needs. We hope our trial learning enables our organisation – and others – to design new products effectively with these considerations in mind.

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Skeuomorphic Reassurance: Personhood and Dementia

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Abstract. User interface design needs to be revisited for people with dementia. This paper introduces 'skeuomorphic reassurance' as a guiding principle for human interfaces in technological design, particularly for older people and people with dementia (PwD). Skeuomorphs exhibit decorative design elements reminiscent of 'parent' objects that incorporated such design elements because they were structurally integral.

The philosophy of personhood is discussed in the context of dementia, concluding that the subjective character of conscious mental processes is an irreducible feature of reality, and the persistence of personhood in PwD supports this assertion.

Assistive technologies that aid carers, as well as PwD, need to ensure that skeuomorphic reassurance is incorporated in their design, not least because older people and PwD need recognisable interfaces today, but because the problems today's over-65s have with digital technologies may not go away, but re-present themselves generation after generation, unless skeuomorphic reassurance is built into their design.

Keywords: Person centred care · Family centred care · Applied ethics · Personhood · Dementia · Digital inclusion

1 Introduction

As the literature grows concerning older people with neuro-cognitive declines, user interface design needs to be revisited. This paper aims to promote the concept of 'skeuomorphic reassurance' as a guiding principle for human interfaces in technological development and design, seen most recently in Apple's smart watch design [10]. It does so set in the context of a number of developments in the contemporary social landscape: (i) an ageing world population, (ii) the persistence of personhood amidst the occurrence of dementia in otherwise physically healthy older people, (iii) the accelerating rapidity of technological development, (iv) the importance of combating digital exclusion of the elderly as an on-going, and not merely a one-off imperative. We shall address each of these issues in turn. This constitutes, of necessity, a position paper, rather than one presenting results of research, laying out the conceptual background behind a planned

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research programme aimed at discovering what the guiding principles - and associated techniques - of skeuomorphic reassurance might be.

A skeuomorph is any object that exhibits decorative design elements reminiscent of 'parent' or antecedent objects that incorporated such design elements because they were structurally integral [67]. The moulded stitching on a plastic jacket recalling the actual stitching on a leather one is a good example, because it also includes both the implied technological advance - from traditional materials to modern materials - and the implied 'retro' chic that makes the old materials, and the old ways of making jackets, seem somehow more attractive than the new, which need no stitching at all. Increasingly, the old materials alluded to in skeuomorphs, are simply no longer in use - or only in expensive artisan shops -but the aesthetic nonetheless remains. In the context of digital interfaces, such skeuomorphs are everywhere, from the floppy disk icon one clicks upon to 'save,' to the Super-8 film reel icon one clicks upon to shoot digital video.

The key concept of this paper - skeuomorphic reassurance - is built upon the knowledge already embedded in much technological design that the human interface adopted by new technologies needs to be carefully balanced between novelty and recognisability.

For older people with neurocognitive disorders, for whom long term memory often remains intact significantly longer than short term memory, the use of skeuomorphs promises a more meaningful and memorable means of engaging with, in particular, innovative technologies which aim to augment disease-related declines in cognition. What we bring to this is the assertion that this balance is inevitably a moving target: the digital exclusion of the elderly is not a one-off problem that will be overcome once those currently over 65 have all died. As has been shown in other work, given the frequency of technology changes, it is important to re-examine design principles [3, 12, 15, 60]. Those who are today's tech-savvy twenty-something digital natives - who may have never seen a floppy disk let alone a Super-8 camera - will in forty years' time be faced with the self-same problems as today's elderly population, unless inclusive design principles are embedded into the education of technologists and interface developers by the educators of today.

2 Contemporary Ageing, Cognitive Decline, and Dementia

According to the UN's 2013 report on World Population Ageing, "The global share of older people (aged 60 years or over) increased from 9.2 % in 1990 to 11.7 % in 2013 and will continue to grow as a proportion of the world population, reaching 21.1 % by 2050" [61]. These are big numbers, and the coming 'second machine age' of automation and robotics promises a host of technological solutions for the care and social engagement of the elderly [6, 11, 51, 62, 63].

Health and welfare are an extremely important part of the wider economy, and many technologists will make their living from providing technologies specifically to meet the needs of older people. Being economically productive is not restricted to being part of the working population. Whole new markets are already opening up catering for the interests and activities of the growing population of economically active individuals who are no longer in work, but whose (pension and asset-based) incomes are still being

spent. The focus for the authors of this paper is one very special feature of ageing: the phenomenon of neurocognitive disorders, particularly dementia.

Defined loosely as a disorder of the mental processes marked by problems with memory, personality changes, and impaired reasoning, dementia is a spectrum, described as "a set of symptoms that may include memory loss and difficulties with thinking, problem-solving or language" [2].

A common misconception of dementia - that as the mental processes gradually collapse an individual's 'personhood' also vanishes - has long been challenged in the medical literature [20, 22, 23, 25, 29, 37, 40, 44, 57]. Others challenge the stigma against older people even more broadly, at the same time welcoming the deconstruction of 'senility', in the 1970s and 80s, as a treatable disease (Alzheimer's as the most common among many) and yet pointing out how the public information campaigns concerning Alzheimer's have heightened, not lessened, the stigma, through generating even more fear than the less-well defined condition of senility ever did [4].

The stigma translates all too often, moreover, into poor care. There are numerous examples in the literature of unsafe, dehumanizing and disrespectful behaviour toward PwD, which deny personhood [8, 44]. For instance,

> They had a habit for a while of taking off her diaper and pulling down her pants and leaving them around her ankles [at nap time] and it bothered me. One time when I happened to be there when she was waking up from her nap, she was just squirming and moving all over that bed and frowning. I kept saying, "Mom, what's wrong?" "Nothing". "Does something hurt?" "No". I finally figured out that she's trying to move her legs and can't. Who of us would lay down for a nap and pull our pants down around our ankles and leave them there? None of us.[1]

We would argue that the view that personhood vanishes as dementia increases relies upon a philosophical definition of personhood that has itself been robustly challenged. The challenge is taking place on several fronts, but of most interest to this discussion are the arguments in political philosophy, in the biological and mechanical understanding of life, and in the philosophy of personhood.

3 'Rational Man' and the Philosophy of Personhood

Much political philosophy rests upon a renaissance understanding of the 'rational man' of Descartes [18], who with Locke's [32] rights of accumulation of unowned resources, Rousseau's social contract [50], and Kant's morals [24], establishes himself in the liberal world. Even Rawls' more contemporary notions of social justice rest upon this same foundation [49]. This definition of the human has come in for a good deal of criticism in recent years - not least from feminists (e.g. [39, 41, 42, 48]) - for its depiction of personhood in terms suited to a (male) capitalist political settlement concerned with protecting itself from royal and aristocratic appropriation [19, 33, 34]. It may have been useful in the 17th and 18th centuries, it is argued, but is today responsible for creating its own new aristocracies of billionaires at the top of a very unequal society [30].

[1] [44 p. 226].

Similarly, there is renewed distrust in the 'rational' man's more contemporary depiction of the human as biological automaton. Wiener's cybernetic understanding of life in terms of feedback processes [66], was challenged by the second-order cyberneticists of the decades following his work [5, 36, 46, 47] for whom the observer became integral, and has been largely debunked by the complexity theorists in contemporary evolutionary biology [9, 21, 26, 31], for whom life is a spontaneous self-organised order at the edge of chaotic network dynamics.

Thought experiments in the philosophy of personhood, meanwhile, such as Parfit's [45], have suggested that 'persons' might be surgically transferable in half-brain portions between different bodies, if only we were to understand such personhood as mere eliminable epiphenomena, dancing flame-like upon the 'real' activity of synaptic electrochemical pulsations. All that makes us human, for such 'eliminativists', is mere illusion, an insubstantial froth upon the reality of biochemical predetermination. To Churchland and his followers, "our common-sense conceptual framework for mental phenomena"[2] should be seen as a tacit theory that we absorb in childhood and make use of every day. This is to suggest that mental-state terms, ('I feel happy', 'I want to dance' etc.) in short, are theoretical terms. This folk psychology 'theory,' for Churchland, - known as FP - is both tacit and empirical - we don't think about it, and it is neurological in origin. In its harshest form - 'eliminative materialism' - FP is, however, regarded as a seriously mistaken theory - a "degenerating research programme" in Lakatos' terms[3]. We have rested upon its tacit use for millennia without it seeming to progress. Churchland argues, moreover, that the posits of seriously mistaken theories - such as Stahl's phlogiston[4] for example - do not exist. His conclusion, therefore, is that mental-state terms refer to things that do not exist, or in other words, that mental-states do not exist. Folk psychology, for Churchland, will eventually be "displaced, rather than smoothly reduced, by completed neuroscience"[5].

Here we are at the fulcrum of the debate between compatibilists and incompatibilists - the stand-off between free will, for which read mental-states that have meaning in the world, and determinism, for which read scientific materialism. Free will may be compatible with determinism, in which case all is determined only up to a point, or incompatible with it, in which case either nothing is determined, or there is no free will. Without going too far into the debate, the authors suggest that the evidence of personhood amongst dementia sufferers may have an important impact upon its outcome, and that skeuomorphs are a key aspect of that evidence.

For Parfit, and, by extension, for some of the eliminativists, 'memories,' once reimagined as 'q-memories' - simple neural firings and synaptic chemical exchanges - could be transferable, and thus personhood transplantable, and if these neurobiological processes deteriorate, personhood vanishes. This acknowledges what is known as the 'supervenience' of physical science, from the dynamic forces of mechanistic physical properties all the way up. In contrast to this supervenience stand three other possibilities:

[2] [16 p. 68].
[3] [16 p. 75].
[4] [16 p. 81].
[5] [16 p. 67].

(i) that of emergent properties, faculties that come about where the whole is greater than the sum of (in this case neurochemical) component parts; (ii) panpsychism, wherein such faculties as subjective consciousness are apparent everywhere, in everything, only to varying degrees [35]; and (iii) the possibility that the 'supervenience' of physical science is a veil covering science's ignorance of the processes of subjectivity, which are - must be - as real as any others, but for which the sciences of our day are as yet inadequate to the task of understanding. For all these views opposed to supervenience, memories could never be ever anything other than 'my' memories, and the memory triggers encoded in skeuomorphs powerful handles for those struggling to retain personhood in the face of neuro-cognitive decline.

Nagel [38], and other philosophers, have supported the subjective character of conscious mental processes; as he says: "The subjectivity of consciousness is an irreducible feature of reality - without which we couldn't do physics or anything else - and it must occupy as fundamental a place in any credible world view as matter, energy, space, time and numbers."[6]. This view, the authors argue, is compatible with the notion of the emergence of such a faculty, and could equally well be situated within what Skrbina [52] would describe as a 'panpsychist' understanding of consciousness, but is perhaps closest to the processual view of Whitehead [65], for whom our concept of nature - originating in Descartes' division of mind and body - is what needs to be healed. Bergson [7], whom Whitehead acknowledged as a major influence, was perhaps a supporter of both emergence and panpsychism, and seemed to suggest our intellectual faculties could not - by definition - appreciate the nature of the subjective, which is more properly the domain of our intuition [31]. The fundamental reality of the subjective, which biological science and a 20th century philosophical tradition wedded to physics seem intent on denying has any existence, nonetheless, as well as finding support in the philosophical approaches of emergence, panpsychism, and process studies, perhaps also finds support in the real-life experiences of those suffering from dementia, and their carers.

For example, in dementia studies, Kitwood [28] and those that followed him have seen personhood in relational terms. That is, there is not only the individualistic view of personhood prevalent in western philosophy, outlined above, but an understanding that for millennia has been evident in other cultures of the value of community (e.g. [59]). The interpersonal, relational, social aspects of personhood are seen to continue, even as the neurological disorder worsens. This is why with 'person centred' care, nursing staff are encouraged to relate to the person with dementia as they are now, whilst using photos and objects of that person's past to make relational connections between that nurse and the older person [22, 23, 25, 37, 58]. Such physical props as are in current use by professional caregivers of PwD can be adapted into forms of skeuomorophic reassurance, for new assistive technology devices (ATD) that augment rationality.

The philosophy of personhood, in sum, is a debate, and not a consensus. For all the importance and usefulness of the biological and medical sciences in maintaining our physical health, our mental health and the subjective reality of our selfhoods remain beyond the understanding - because it is outside the constraints that define what they

[6] [38 pp. 7–8].

mean by 'understanding' [56] - of even the most accomplished of neuroscientists. Our detailed knowledge of the behaviour of synapses, and, indeed, of the deterioration of the brain in diseases such as Alzheimer's, still does not even begin to approach an understanding of who we are, or how it is we come to be who we are, because our sciences persist in a "bifurcation of nature into two systems of reality"[7]. Nor do we know how it is, even when the biological functioning of the brain is coming to a close, that we still are who we are - even if only in flashes through the clouds of confusion that gather in our minds. Such episodes of lucidity - even in quite late stage dementia - and the evidence within the relationships between those with dementia and their carers, strongly suggest that "in dementia personhood can be understood as increasingly concealed rather than lost." [53]. One may, indeed, conclude that the 'individual rational man' approach to understanding personhood, with its unpalatable political ramifications and the resulting rather nonsensical arguments of the eliminativists, is being superseded by the evidence supporting Nagel's assertion of the irreducibly subjective character of personhood, and that a 'general' (in Whitehead's sense of the word) understanding of the nature of Nature - our perception of it combined with, rather than merely added to the constituents of it - may finally be approaching fruition. Skeuomorphic reassurance, in this context, becomes a key handle upon reality.

4 Towards a Principle of Built-In Skeuomorphic Reassurance

Although in recent years Kitwood's [27] attempts at defining personhood for dementia have received attention [22, 25], little has so far been developed that examines the connection of personhood to the role of assistive technology [1]. ATD have been used extensively for PwD, from home sensors, to lifting devices [1], to telehealth [43] and much more. Increasingly artificial intelligence (AI) ATD are augmenting memory, spatial and temporal orientation, and providing other forms of cognitive assistance [60]. Thus the concealment of personhood for PwD is being increasingly overcome.

The rapidity of such technological advance since the 1970s has not only been striking, but continues to accelerate. The so-called Great Acceleration [54, 55] of the Anthropocene has produced effects such as Moore's Law that have helped to radically transform our societies and our expectations. However, most older - and many younger - people have problems working with and accessing digital technologies, due to issues of accessibility, pricing, and the ever changing functionality of the devices available, and the software that runs on them [13, 14]. Although it was thought that more serious health conditions would impact these difficulties more negatively, the reality is proving far more nuanced. As the costs of catering to an ageing population escalate, governments around the world are looking to technology to reduce the costs of institutionalisation. Frequently such technologies also serve, moreover, to enhance quality of life, by enabling people to live independently in their homes and communities for longer.

[7] [64 p. 30].

Mobile technologies, and the connectivity they provide for all manner of devices, alongside GPS functionality for location-awareness, have encouraged a shift from the pathology of illness toward support for continued wellness in healthcare systems, using technology to help care workers provide their services to people in their own homes, when needed [60]. One of the most relevant of these developments, with respect to PwD, is a new field of technologies clustered around the notion of 'augmented rationality,' including reminiscence games, reminders to take medicine, geofencing, smart homes, and so forth. In its simplest form, in an age where augmented reality permits people passing by a historic building to see it as it was in, say, the 1920s on their mobile device (e.g. Museum of London smatphone app, 'Streetmuseum'), 'my' memories - at least in photographic facsimile - can be stored and retrieved, such that it becomes possible to augment memories, and by extension, the rationality of PwD.

One issue with all these new technologies that this paper wishes to highlight, is of the usability - the 'user experience' - of these new devices, the interfaces they offer, and the functionality of their software. Issues of designing for the whole population have begun to rise to the forefront of people's minds [17], and it is to this debate that we wish to add the notion of skeuomorphic reassurance. The problems today's over-65s have with digital technologies may quite likely not go away. The nature of those problems will change as technologies change, but those of us familiar with today's technologies, as we grow older and join the over 65s, may likely find the new technologies coming onto the market difficult to engage with - let alone the likely impact of on-going convergence whereby technologies we are familiar with today become replaced by new functionalities of other technologies. The assumption that because current generations will be familiar with technology, they will cope better when older is thus flawed - not only because technology is itself constantly changing - but because as Burmeister [13] points out, it fails to account for an understanding of ageing, and the cognitive limitations that the ageing process brings to usability of technology. To avoid this problem, we believe, technology developers need to embed into their design processes a principle of skeuomorphic reassurance. This principle moreover, needs to be a 'rolling' one, that keeps skeuomorphs (like the film reel and floppy disk icons) for roughly 30–40 years, and drops them gradually as time goes by, and piecemeal rather than wholesale.

Skeuomorph design needs to consider the particular needs of the user population. Not only does it need to be person focused, respecting their autonomy, recognising the limits imposed on such autonomy by their debilitating disease, but for PwD there are also further interfacing considerations. Research in socially assistive robots has revealed that the most effective technology for PwD has proven to be natural speech [6]. However, that does not apply to all PwD because of four frequently occurring problems: long pauses or no response to questions, problems with word finding, confusion, and confabulation (the user provides non-factual information). As suggested above, in relation to adapting the skeuomorph design to the personal history of the PwD, so too the skeuomorph design needs to be adaptive. Flexibility in the mode of input may be required, given that the intentionality of some user behaviour will need to be selected based on the user's remaining abilities. Skeuomorphs, moreover, should not only be dynamically adaptive to the user, but should lend themselves to interaction that does not require manual dexterity. That is, although the display might be visual, user interaction might

involve speech or gestures. Apple's smart watch, again, with its range of options for interface, is a good example.

5 Conclusion

In this article user interface design has been revisited with a particular focus on PwD. We have considered (i) the ageing world population, (ii) the persistence of personhood amidst the occurrence of dementia in otherwise physically healthy older people, (iii) the accelerating rapidity of technological development, and (iv) the importance of combating digital exclusion of the elderly as an on-going, and not merely a one-off imperative.

We have seen that "The subjectivity of consciousness is an irreducible feature of reality"[8] and that personhood is concealed rather than reduced in the context of dementia, often at its most visible through the relationships with family and carers that persist even in later stages. We have found, in particular, that the person-centred care model, which arose from consideration of the philosophy of personhood [27], arguably takes its place among other robust challenges to the more traditional Western philosophical definitions of personhood discussed in this paper. It has been applied in many areas, including that of dementia. Similarly, a special form of person centred care has been that of family centred care, which has focused on the care of young children who in many cases, due to their age related cognitive limitations, need family carers to make decisions for them. Arguably family centred care, with its roots in the philosophical consideration of personhood, could also be applied to the care of older people with neurocognitive disorders, such as dementia. This suggests new areas of exploration that have not previously been considered in the literature on personhood. Crucially, the memory triggers incorporated into skeuomorphs, are a key assistive technology in their own right, helping to ensure that personhood is less concealed than it might otherwise be.

The implications for design of ATD, and for policy makers, suggest much more collaborative approaches: right from the inclusion of subjectivity in the understanding of the nature of Nature, up through the applied sciences into the technologies of support our highly technologised societies are now capable of producing - on unprecedented scales - for the improvement of the welfare of the increasingly large segment of our societies over the age of retirement. Technology companies need to expand their workforces to include social scientists as well as technicians, user experience specialists as well as coders.

Most importantly, with the principle of skeuomorphic reassurance, the authors enjoin technologists to remember that the balance between novelty and recognisability is inevitably a moving target: the digital exclusion of the elderly is not a one-off problem that will be overcome once those currently over 65 have all died.

[8] [38 pp. 7–8].

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Ethical and Legal Issues Involved in the Pro-active Collection of Personal Information with the Aim of Reducing Online Disclosure

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Abstract. Pro-actively finding leaked information online can potentially reduce detection times to limit the exposure time of personal information on publicly accessible networks. Often the breaches are discovered by an external third party and not the data owner. The time that data is exposed on the Internet has severe negative implications since a significant amount of information disclosed in a data breach has been proven to be used for cybercrime activities. It could be argued that any reduction of data breach exposure time should directly reduce the opportunity for associated cyber-crime. While pro-active breach detection has been proven as potentially viable in previous work, several aspects of such a system still need to be investigated. This paper aims to highlight some of the major ethical and legal issues when pro-actively collecting personal information, through a South African case study, to assist in reducing the amounts of personal information being disclosed online.

Keywords: Data breach · Ethical and legal issues · Privacy · Personal · Identifiable information

1 Introduction/Background

Data breaches occur more frequently nowadays and are becoming an inescapable risk factor for individuals and organisations [1]. In the event of a data breach, large amounts of personal data, often intimate details, may be exposed. Cyber criminals and hackers are regularly making use of these Personal Identifiable Information (PII) obtained by exploiting it in numerous ways such as identity theft, spamming, phishing and cyber-espionage [2]. Detecting and removing exposed data is therefore of utmost importance; yet the average breach remains undetected on average in excess of three months [3].

Privacy laws are being instantiated internationally to serve as a safeguard of PII. For example, in South Africa the Protection of Personal Information (PoPI) Act has

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been adopted in November 2013 [4]. South Africa needs to make use of this new legislation to make adjustments to the way information is stored and processed by organisations that are not yet compliant to the Act. The possibility of pro-active automated breach detection is discussed in previous work as a mechanism to potentially reduce detection times to limit the exposure time of PII on publicly accessible networks. The aim of the pro-active collection process is to highlight the amount of PII being disclosed online in order to assist in the reduction of the information being leaked, whether by choice or coercion. However, an operational pro-active detection system may give rise to ethical and legal issues. This paper focusses on some of these issues when pro-actively collecting PII online. Although pro-active detection of data breaches is internationally applicable, this paper will investigate ethical and legal issues in pro-actively collecting PII through a South African case study, based on the relative newness of the South African PoPI Act. While the results of a previous experiment on the pro-active detection system focus on the South African landscape (refer to Sect. 2), the system is capable of assisting in global ethical application and privacy regulation that is customised to country specific requirements.

2 Pro-active Data Breach Detection

In order to gauge the level of existing PII disclosure before the promulgation of the PoPI Act, a custom developed software application, called Cyber Protect, was used in an experiment to pro-actively scan the Internet in search of leaked PII in 2014, shortly after the PoPI Act was put in place. Another experiment was conducted in 2015 to determine how effective the PoPI legislation is in reducing the amounts of PII detected online. This was done by collecting datasets using the custom application and examining the results for indicators of how effective the PoPI legislation has been since its inception. These experiments will be referred to as previous work performed [5]. This paper will investigate the ethical and legal issues based on the results of these experiments.

2.1 Application Architecture

The application serves as a PII detection and collection service that is capable of scanning the Internet for PII that are being disclosed in electronic documents. In this context, a scan on the Internet refers to the application making use of public data sources, provided by Google, Bing and Twitter. Application Program Interface (API) calls are being used in search of PII being leaked within electronic documents found freely available on the Internet. These documents are stored within the website domain space. For the scope of the experiment performed in the previous work, the scans were limited to the co.za domain [5]. Further data processing takes place in order to obtain an IP address and approximate geo-location for each website found responsible for disclosing personal information. Figure 1 shows the architecture of the custom application.

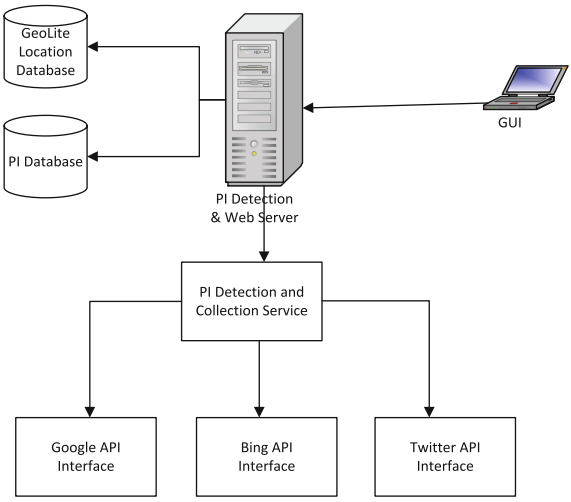

Fig. 1. PII detection application [5]

The type of PII extracted during the experiment was limited to South African Identity (ID) numbers, land line numbers, cell phone numbers, email addresses, credit card numbers and addresses. Other personal information such as names, job location or religious believes requires significant lexical analysis since no dominant standard of identification currently exists. The electronic documents scanned were limited to the most commonly used files such as Text, MS-Word, MS-Excel and PDF files, as well as SQL scripts and XML files. These file types are identified to be most likely responsible for the leakage of PII. Information might reside in other formats, but each document type has unique characteristics that need to be catered for on a technical level and this adds significant overhead to development time that will be addressed in future revisions of the application [5].

2.2 Information Visualisation

The application has a staged approach where information is first collected, then processed and lastly visualised. The image presented in Fig. 2 illustrates how a single server responsible for the leakage of PII is presented by a blue antenna icon with its approximate geo-location. When multiple servers in the same area are found, they are grouped together with the count of servers displayed in the grouped icon as shown in Fig. 2. A count of 234 servers was found in South Africa.

Zooming into the map allows for the opening of specific server nodes and displays more details on that particular server. Figure 3 shows the details on a website URL that

Fig. 2. PII visualisation [5] (Color figure online)

has been opened in the application, indicating that the particular website is responsible for leaking 171 telephone numbers and nine cell phone numbers. The approximate geo-location for this web-server is identified as Durban, South Africa. The complete URL for the file found is hidden due to privacy reasons.

The application only makes use of the limited free queries provided by each of the data sources. This was a deliberate limitation on the research team's part to investigate what could be achieved with little to no resources in terms of pro-active data breach detection. A further study comparing the current free results obtained with a funded approached will be conducted in future work.

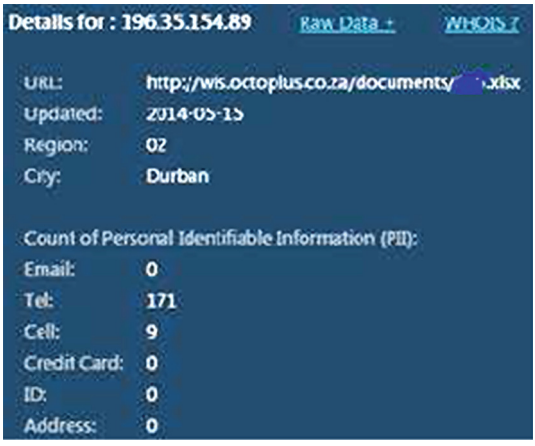

Fig. 3. PII details [5]

3 Personal Information Detected

Two datasets were collected by using the application. Both datasets were collected over a three month period. The first dataset was done six months after the instantiation of the PoPI Act [4]; the second dataset was done one year and eight months after the instantiation of the Act. A general hypothesis would be that the amounts of leaked personal information should have decreased [6].

The automation of data processing and the ease of online transactions have generated increased opportunities to commit various offences (often financial cybercrimes) with personal and financial information [7]. Examples of personal information which is targeted online include:

- Address and phone details, dates of birth and identity numbers can be used to commit identity theft if combined with other information. Having access to information such as a date of birth and address of a person can help the perpetrator to circumvent verification processes.
- Financial information or data is a popular target in cyberspace. Financial information or data which is targeted in cyberspace are information regarding saving accounts, credit cards, debit cards and financial planning information.

The findings from the application on the amounts of leaked PII of both datasets in the experiments indicate that the amounts of PII disclosed in 2015 have slightly increased as the country progress further into the PoPI Act online compliance timeframe [5]. Using the custom detection system, it is possible to geo-locate the webservers or hosts found responsible for the disclosure of PII. A notable finding is that 10718 hosts or servers were detected as responsible for the leakage of personal information. If it is assumed that each

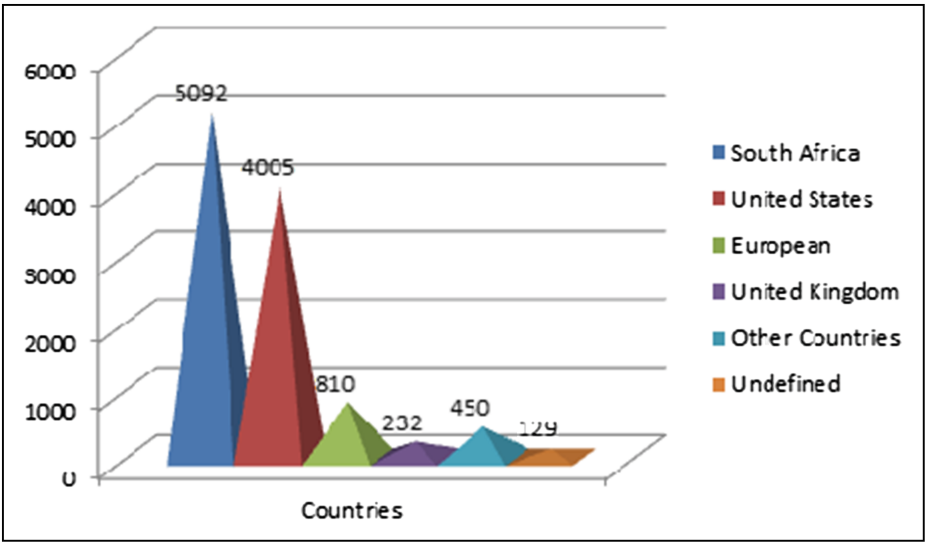

Fig. 4. Host count per country of leaked PII [5]

individual server represents an individual or company, it points to 10718 transgressions of privacy protection legislation. Figure 4 shows a breakdown of the number of hosts found per country. Although the focus is only on South Africa and the co.za domain, the websites can be hosted outside the borders of South Africa. This could highlight non-compliance issues as the PoPI Act (condition 6 Section 18(g)) states that PII may not be stored at international locations without the consent of the data subject [4].

Taking into consideration the time period since the instantiation of the Act and the amount of PII data leaked in 2014 and 2015, one can see that the privacy legislation has very little effect on the amounts of PII data being leaked. It seems that South Africa still has a long road ahead towards the compliance process and possible improvements on the Act to better control the amounts of personal information being leaked.

4 Ethical and Legal Aspects of a Pro-active Detection System

In the digital era, protecting personal information online can be a daunting task. Therefore, having a system in place that could detect the online leakage of PII could be very beneficial. The purpose of the proposed system is to detect leaked or disclosed PII online, regardless of whether the disclosure is a result of inadvertent or malicious actions. To accomplish this, personal data needs to be collected from the Internet with the use of public data sources and analysed.

In order to fully utilise the potential of the system to pro-actively collect personal information online in a legal and ethical manner, an analysis of the relevant ethical and legal aspects should be done. The collection and processing of personal data should be done in such a way that it complies with applicable privacy laws.

4.1 Ethics

Ethical behaviour can be regarded as a set of rules that establishes the boundaries of generally accepted behaviour and is often loosely based on legislative measures [8]. Due to the large dependence on human nature and behaviour, ethics often presents contradictions in terms of two sets of acceptable behaviours, or the application of existing ethical rules in new situations. A company's policy for tracking employee email and Internet usage, for example, stands largely contrasted by the support of personal privacy. Legislation may cover both sides of the argument - the need of the company to protect its resources by ensuring valid use thereof, as well as an individual's right to privacy. The ethical aspects also need to inspect a variety of other related factors. A situation may arise where the law offers little or no guidance and the decision-maker has to do what is regarded as ethical in the situation.

Especially when dealing with customer data, strong measures are required to avoid the development of customer relationship problems. The collection of PII from individuals is often done with the intention of the company to make better decisions in serving the individual, for example, banks require personal information to verify the identity of an individual before performing sensitive financial transactions. However, this should be done in balance with the needs of the individual to have his/her rights and desires protected and adhered to since the use of information technology can lead

to a potential violation of right to privacy. According to the South African Constitution, the right to privacy is put in place to protect an individual. The detection system addresses the protection of an individual's name or likeness through identity theft, by collecting leaked PII online and creating awareness in terms of online data leakage.

4.2 Legal Aspects

Laws and regulations are put in place to prescribe the required conduct in given situations. As such, governments around the globe have been assigned the responsibility of protecting personal and sensitive data of consumers and companies [9].

In terms of privacy on the Internet, five privacy laws are applicable in South Africa:

- The common law dictates that the right to privacy is recognised as an independent personality right that is protected by the South African law of delict. This requires that an infringement must be wrongful (as opposed to be only an act of omission) and determined by the *boni mores* or reasonableness criterion [10].
- The Constitution enforces rights such as the right of respect for privacy. Three obligations are in place, but only the horizontal obligations, where all persons (natural and juristic) have a general duty to respect these rights in their everyday interaction, are applicable to the application.
- The Electronic Communications and Transactions (ECT) Act contains universally accepted data protection principles setting out how personal information may be collected, used and disclosed. These principles are not enforced and thus the adherence to these is voluntary [10].
- The PoPI Act aims to promote the direct protection of personal information processed by both public and private bodies (thus focusing on the obligations as set out by the Constitution). It further introduces certain conditions in which personal information may be processed, and put in place an Information Regulator in South Africa [4]. The PoPI Act prescribes eight conditions or principles under which personal information may be processed (refer to Table 1).

4.3 Ethical Issues Mapped to Legal Issues

Looking at the current implementation of the proposed system, the biggest concern is the fact that the system actively searches for leaked PII on the Internet. Depending on the interpretation of the applicable legislations, it is questionable whether this is allowed. However, the purpose of the system is to identify leaked content and the location of the responsible servers in order to have it removed from the Internet. Although the system is not responsible for the data breach, it does access the data and as such, is in possession of data that may be leaked as a result of either inadvertent actions or criminal activity. Since it is imperative that the system adheres to all South African privacy legislation (refer to Sect. 4.2), it is necessary to analyse the legal requirements and map the potential ethical issues on these. Table 1 shows the applicable South African legal principles related to PII with the respective ethical

Table 1. Legal principles related to PII and ethical implications

Legislation	Legal principle	Ethical implication
Common law	*Boni mores* criterion	In the event of a data breach, should the rights of the breached company or the rights of the individuals take higher preference? For example, the disclosure of breach information related to a listed company would probably have a negative impact on the company's stock. Should the individuals whose PII were breached be notified at all costs, or should the economic stability of the entity rather be protected?
Constitution	Horisontal obligation	The application should not be made available to the general public, due to the collated repository of PII made available through the system interface. However, the application only makes use of freely available data sources in collecting information, and as such it can be argued that it does not impose further infringements than when the PII was found on the Internet
ECT Act	Opportunity to review, correct and withdraw	Any affected data subject who has been identified can ask for information being found on themselves and it will be provided if found in the system. Since people are not being notified at this stage, no one is requesting access to the information being found
	Personal information collection	Since the system makes use of freely available data sources, the data participant does not give express written permission for the data collection by the system. In addition, since the system is not the original source of the leaked information, the system does not notify the person whose information was leaked on the purpose of the system
PoPI Act	Accountability	The system owners are accountable to ensure that the system adheres to the principles of PoPI
	Processing limitation	In the intended operation of the proposed system, by default no consent is given by the data participant. Although the system makes use of freely available data sources, is it ethical to proceed with the collection of the PII, even if the intention is to assist the process of identifying data breaches?
	Purpose specification	The purpose of the proposed system is to highlight the amounts of PII being leaked in order to assess whether the PoPI Act has any effect on the leakage amounts as time progresses. The proposed system enables the identification of

(*Continued*)

Table 1. (*Continued*)

Legislation	Legal principle	Ethical implication
		the person responsible for a specific server (through the WHOIS lookup function), and thus the de-identification condition is not strictly adhered to
	Further processing limitation	Any further processing of the PII should be compatible with the purpose of the collection. The system allows further data processing to obtain an IP address and approximate geo-location for each website found responsible for disclosing PII. The purpose is to assist in the process of eliminating leaked PII, and as such, the system adheres to this
	Information quality	Reasonable steps must be taken to ensure that the PII is complete, accurate and not misleading. Since the proposed system does not make any changes to the retrieved PII, this is not applicable. However, a large number of phone numbers and email address are false positives. For example certain email addresses found were found in documents used as marketing material and therefore does not count as leaked PII
	Openness	Documentation regarding all processing operations must be maintained and the data subject be notified when PII is collected. At this stage the affected parties are not being notified. The purpose is only to keep count of the amounts of PII being leaked since the inception of the Act. The intention is to eventually notify parties involved, but as this paper states there is certain legal and ethical issues involved in doing so
	Security safeguards	Security measures should be in place in terms of integrity and confidentiality of PII, and notification should be given of security compromises. Collected data is stored in a secure environment not accessible by the public or any unauthorised parties
	Data subject participation	Any affected data subject who has been identified can ask for information being found on themselves and it will be provided if found in the system. Since people are not being notified at this stage, no one is requesting access to the information being found

implications, as compiled by the authors. These principles and implications are derived from various sources [4, 9, 10].

Looking at the ethical implications of using such a system on an international level, the PoPI Act is largely representative of the EU Data Protection Directive [11, 12]. Comparing the PoPI Act to the UK Data Protection Act (DPA), USA privacy laws and AUS privacy laws, a lot of similarities were found in the principles of these Acts [11]. This would imply that the same ethical implications will apply if the system was to collect information in Europe, the UK, USA or Australia.

5 Using the Detection System in an Ethical and Legal Manner

Using the system in an ethical and legal manner, it might be possible to reduce the amount of online PII disclosures.

5.1 Addressing Legal and Ethical Aspects

Non-compliance with laws has set results, whilst non-compliance with ethical rules is less predictable [13]. However, as noted in Table 1, the ethical implications raised allows for interpretation based on a set of circumstances. The use of such a detection and collection system by government, industry and an individual user will be theorised. Regardless of the user type, the legal principles listed in Table 1 are non-negotiable and the system has to adhere to this.

Depending on the purpose, a government department using the system may be faced with a variety of ethical issues and legal issues. For the most part government departments are kept accountable for the PII in their possession through the office of the South African Auditor General. This office plays an oversight role to ensure that government adheres to all applicable regulations.

Depending on the purpose, a business using the system may be faced with a variety of ethical and legal issues. Similar to government use, businesses are held publicly accountable for the PII in their possession. Businesses generally have codes of conduct and formal mandates in place, giving the use of such a detection system more credibility. The biggest concern with regard to corporate use would be the intention, and as such, the industry of the business. It would be ethically more acceptable for a law firm or technology company to make use of such a system. A company in the medical or hospitality industry may be frowned upon since the link to their purpose of the developed system may not be clear.

An individual using the system may be faced with a variety of ethical issues. Although the purpose of using the system may be to assist in awareness of leaked PII with the intention of having it removed online, an individual in possession of potentially millions of records of PII may be faced with ethical problems, even if all legal aspects are addressed. Without the regulatory backing of government or the accountability of a business, it may be frowned upon that an individual have access to such a magnitude of PII, since an individual with no oversight or formalised accountability

may be perceived as tempted to use the information for his own personal gain. Although the functionality is currently not in place, the laws require that data subjects must have access to interact with the data available on them. With only a single individual processing these requests, he/she may soon have a backlog, and as a result, not adhere to the legislation anymore.

In all instances, the data subject needs to give express permission that PII may be made available. In none of the instances this would be adhered to, unless the system is further customised to only show and store PII that meets specific criteria, e.g. only phone numbers that belongs to a specific network. However, to facilitate this, the data will have to be cross-correlated with another database.

5.2 Reducing the Amount of PII Disclosures

A number of options to reduce the amount of PII being disclosed online have been identified; such as raising awareness, communicating with the affected parties and informing the privacy regulators.

Raising Awareness. One of the best ways to reduce the amount of PII being disclosed is to raise awareness regarding the leaked information as well as the requirements to be compliant with the PoPI Act [14]. Research shows that 91 % of successful data breaches rely on employees and customers falling victim to spear phishing and social engineering attacks [15]. This links strongly to ethical aspects in terms of personal information. PII may only be collected, used and disclosed with the knowledge and consent of the individual [16]. Although companies with an online presence have a responsibility towards their customers to protect their personal information, the customers should also be aware of the status and availability of their data. A customer can, for example, not sue a company for online PII disclosure if the customer himself inadvertently shares his personal information on Facebook.

In addition, awareness on data breaches can protect people from legal actions (individual as well as vicarious liability). It is a common assumption that most company data breaches can be attributed to technology and software vulnerabilities [15]. Awareness also enables people to identify possible breaches, for example if a person is contacted by an international company, the possibility exists that the PII was transferred across the country's border. To address this, additional measures can be implemented to limit the amount of system abuse by authorised users by implementing logging of all system accesses and putting in place a double authorisation system.

The use of the application in a legal and ethical manner may contribute to raising awareness since real life statistics on South African PII leakage can be made available. The benefit of raising awareness is that it assists in avoiding unfavourable publicity. In the business world, public reputation strongly influences the value assigned to its stock by shareholders. If a company is often linked to data breaches, customers will lose confidence in the company's ability to adequately protect their information.

Communicating with Affected Parties. While the way in which PII is leaked on the Internet differs from instance to instance, the cumulative results of disclosed data (as obtained by the developed system) provide a quantitative measurement indicator.

This measurement is useful to express the seriousness of the problem or to act as a baseline for future experimentation. As a starting point, the measurement indicator can be communicated to the website owners where the information resides. However, the website owners often only act as service providers and not the data custodians responsible for the data. South African privacy legislation dictates that the responsibility to safeguard personal information lies with the data custodian. The measurement indicator thus needs to be further communicated in order to make the data custodian aware of the transgressions. It is, however, not always an easy task to locate the data custodian.

Whether used by an individual, business or government department, an alternative approach is to notify the person whose personal information is being disclosed, with the intention that it becomes their responsibility to follow up on the removal of the leaked PII. This in itself may be a difficult task. The PII disclosed might be only an ID number without any additional information. In order to identify the affected person and obtain up-to-date contact information may require co-operation between more than one entity adding complexities to the potential solution. In addition, if an affected individual is notified, a link to the leaked data should be provided in order for the individual to follow up with the service provider on the removal thereof. However, in doing so, the PII of other affected parties will be further distributed. A solution to the identified difficulties would be to work in close partnership with law firms where the law firm could use the personal data being disclosed to force the service provider to take responsibility and notify the parties involved.

Informing the Regulator. The PoPI Act prescribes the establishment of a juristic person to be known as the Information Regulator, which will act independently and only be subjected to the Constitution and to the law. The overarching functions of the Regulator in terms of the PoPI Act are to promote an understanding and acceptance of the conditions for the lawful processing of personal information, provide education and monitor and enforce compliance to the PoPI Act [4]. At the time of writing, such a regulator was not yet put into place, but it is estimated to be established by middle 2016 [17].

The Regulator will be tasked with monitoring and enforcing compliance, supporting privacy related codes of conduct, handling complaints and facilitating cross-border cooperation in the enforcement of privacy laws [18]. As such, once operational, the Regulator will be responsible for addressing instances of breached data in South Africa. However, a concern in terms of informing the Regulator unless legally required is that it might raise unwanted questions on why this kind of data is collected and what methods were used to obtain this information. Collection could be perceived as Government interference or may raise spying concerns. Notification of leaked data might also lead to the assumption that it is the responsibility of the person who notified the third party to take action on the matter and to help remove the leaked information from the responsible websites. However, if the system is used by a government department in this case, there should not be an ethical concern.

6 Conclusion

Technology is becoming an integral part of life, and is often entwined with intimate, personal details. In recent years, the frequency of data breaches are increasing and the problem is that the data disclosed may be used for various criminal activities and cyber-attacks [19, 20]. Previous work examined the amount of PII publicly available at a stage in time when privacy and data breach legislation were introduced in South Africa. The Cyber Protect system that forms the basis of this paper is currently used as a research project, collecting leaked personal information online.

The purpose of the research project was to see if the amount of PII found online reduces over time, since the PoPI Act has been signed into law. The expectation was that the recently enacted South African privacy legislation would lead to a reduction in the amounts of PII being publicly disclosed. However, upon examination of the temporal data gathered from 2014 to 2015, only a slight improvement could be observed with the amounts of personal information being disclosed still substantial. One argument for the slow reduction in leaked information is that while the PoPI Act has been promulgated, it is not yet enforced. In addition, the South African privacy regulator is not yet appointed. There have thus been no formal charges and cases presented in a court of law against an individual or company that could spur greater public compliancy. This paper investigated the legal and ethical issues involved when using the system to pro-actively collect personal information being disclosed online. Although it is a research project, the system still needs to comply with the law and must be done in an ethical manner. It is argues that by using the system in an ethical and legal manner, it might be possible to reduce the amount of online PII disclosures.

As discussed, the user of the system has a potentially big impact on the ethical use of the system: it is generally accepted that government departments have access to personal information; businesses that are properly governed may also have access to personal information; however, an individual that are not accountable to a higher authority may potentially use the collected personal information for his own personal use. The PoPI Act is in line with similar International Acts, it could be beneficial to look at the legal and ethical implications that were involved in those Acts at the time of compliance and enforcement.

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A Comparative Legal Study on Data Breaches in Japan, the U.S., and the U.K.

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Abstract. This paper focuses on the liability and duties of data controllers regarding data leaks and compares the relevant legal schemes of Japan, the U.S., and the U.K. There are three primary approaches to reducing or redressing damages caused by data leaks: (1) providing remedies for data leaks; (2) data security obligations; and (3) notification obligations in the event of a data breach. The aim of this article is to compare the measures on data breaches from the above viewpoints and highlight the relevant issues in order to reach an appropriate solution.

To address the issues related to data breaches, legal rules among countries should be common to all due to the worldwide circulation of personal data. Nonetheless, different features are recognizable through the analysis in each chapter.

Companies in Japan have thus far eagerly abided by data security obligations even if they are ineffective for data protection. Conducting PIAs is another option to prevent security incidents. If data breach notification rules are introduced, the subject matters to be publicized must be identified and followed by enforcement actions. Also, such rules should contribute to the avoidance of secondary harm.

In the U.S., while compensations for data leakage and security breach notification rules have apparently been effectively managed, it is needed to reduce serious harm arising from massive data breach. Obliging companies to maintain data traceability might serve this.

In the U.K., data breach notification rules imposed as part of the General Data Protection Regulation need to connect with other effective enforcements and contributions to avoiding secondary harm, so as not to become meaningless.

We must harmonize the above differences and make ongoing efforts to improve the effectiveness of rules.

Keywords: Data breach notification · Tort liability on data leaks · Data security obligations · ID theft · Criminal uses of leaked data

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1 Introduction

This paper focuses on the liability and duties of data controllers regarding data leaks and compares the relevant legal schemes of Japan, the U.S., and the U.K. Because data leakage is currently a hot topic, issues such as determining how to prevent data leaks, reducing the associated damages at a time when massive amounts of data are processed and circulated all over the world, and protecting data from illegal or improper breaches is becoming increasingly important.

Outlined below are the three primary approaches to reducing or redressing damages caused by data leaks: (1) providing remedies for data leaks; (2) data security obligations; and (3) notification obligations in the event of a data breach.

1. Remedies for data leaks
   Data leaks can result in tort liability in Japan and the U.S., while in the U.K., the Data Protection Act 1998 (DPA) provides rules for compensation. These approaches are to redress the damage resulting from data leaks.
2. Data security obligations
   Data controllers are accountable for the security of the data they process. Legal frameworks for data protection generally include the data controller's obligation to keep personal data secure—an approach designed to prevent data leaks in advance.
3. Notification obligations in the event of a data breach
   Many states in the U.S. have rules for notifying victims of data breaches, and the EU's General Data Protection Regulation (GDPR) proposes similar rules. The use of notification rules for data breaches is an approach to prevent further damage and ensure the law enforcements.

The aim of this article is to compare the measures on data breaches from the above viewpoints and highlight the relevant issues in order to reach an appropriate solution. The reasons for comparing conditions in Japan, the U.S., and the U.K. are as follows.

First, it is indisputable that the concept of the right to privacy was created in the U.S. and that the E.U. is proud of its advanced data protection capabilities. A recent massive data leakage case has now prompted Japan to address the issue of data breaches. One measure the government has taken in this regard is the introduction of penal sanctions on illegal transactions involving personal databases, in an amendment to the Act on the Protection of Personal Information (APPI) in September 2015. While we referred to the criminal provision of the DPA during the amendment process, the effectiveness of the provision is still unclear. The data breach notification rule, which the U.S. first made into law, should also be considered. Japan has partially introduced this rule in the relevant act, although this might not be sufficient to address data breaches.

Second, in the U.S., massive data leakages have resulted in huge amounts of pecuniary damage. The Federal Trade Commission (FTC) has enforced penalties in those cases where security measures were violated. The U.S. has developed data breach notification rules as a legal obligation. The situation in the U.S. carries vital lessons for other countries.

Third, Europe has long been held up as the most advanced region when it comes to the field of data protection. The E.U. adopted the GDPR on the April 14th, 2016, which

includes a data breach notification rule inspired by similar efforts in the U.S. Of the various European countries, the U.K. has exercised enforcement actions regarding violations of the DPA and stipulates criminal sanctions against unlawful obtaining or disclosing of personal data. We need to research the situation in the U.K. to evaluate the effectiveness of this provision.

Once a data breach occurs, the leaked data can instantly be circulated all over the world. Establishing common rules among countries is therefore the ideal; however, there are many differences in the surrounding circumstances of particular data breaches and the legal approaches employed to address them. We must conduct a comparative study, taking the above difficulties into account.

In Sects. 2, 3 and 4 we present our research on the facts on data breaches and the three legal measures of compensation, data security obligations, and data breach notification rules in the three countries. In Sect. 5, we analyze the common features of and differences among the said countries, and consider the effectiveness of possible data flow and legal schemes for addressing data breaches. In Sect. 6, we discuss the issues and available solutions, followed by the advantages and drawbacks of the said legal measures in order to establish a common rule for the future.

2 Legal Remedies for Data Leakage in Japan

2.1 Tort Law and Data Leakage

Claiming damages for data leakage in Japan is based on tort law from the Civil Code. Article 709 stipulates that "a person who has intentionally or negligently infringed any right of others, or legally protected interest of others, shall be liable to compensate any damages resulting in consequence." When the injured party incurs mental or psychological harm, he/she can make a claim for compensation under Article 710. In addition, Article 715 rules that a person who employs others for a certain business shall be liable for damages inflicted on a third party by his/her employees with respect to the execution of that business. However, one challenge is that even if an injured party files suit against a perpetrator, the plaintiff is often awarded only a small amount in pecuniary damages.

The first court case involved the city of Uji. The city negligently leaked approximately 220,000 personal records from the resident registration system. In 2001, the Kyoto District Court awarded damages of 10,000 yen for each plaintiff.[1] The Osaka High Court and the Supreme Court both dismissed Uji city's appeals.[2]

A case involving Waseda University was heard before the Supreme Court. The university invited Mr. Jiang Zemin, the former President of China, to lecture in front of a large audience. It provided a list of 1,400 student participants to the Tokyo Metropolitan Police Department for security purposes, but the participants did not consent to the provision of this information. Some students brought actions against the

[1] Kyoto Chiho Saibansho [Kyoto Dist. Ct.], Feb. 23, 2001, 265 Hanrei Chihoujichi 11 (Japan).

[2] Osaka Koto Saibansho [Osaka High. Ct.], Dec. 25, 2001, 265 Hanrei Chihoujichi 11 (Japan). Saiko Saibansho [Sup. Ct.], Jul. 11, 2002, 265 Hanrei Chihoujichi 11 (Japan).

university. Although the Tokyo District Court and the Tokyo High Court dismissed the students' claims, the Supreme Court reversed the decision of the High Court and awarded consolation damages of 5,000 yen to each student.[3]

In the Yahoo! BB case, subscribers of Yahoo! BB brought an action against the Yahoo Japan Corporation and BB Technology Ltd. for leaking their data. The leakage was caused by a former employee and an acquaintance of his, who stole approximately 10 million records by illegally accessing the server. The Osaka District Court granted the plaintiffs' claim, which was upheld by the Osaka High Court.[4]

Another case concerns so-called "sensitive data." A large aesthetic service provider, Tokyo Beauty Center (TBC), negligently released customers' online questionnaire results, which led to the disclosure of their bust-waist-hip measurements and interest in epilation services, in addition to their names, ages, addresses, phone numbers, and e-mail addresses. The Tokyo District Court granted damages of 35,000 yen to several plaintiffs and 22,000 yen to one plaintiff.[5] The Tokyo High Court upheld the decision.[6]

2.2 Recent Massive Data Leaks

Data leaks occur nearly every day. One noteworthy case involved the Benesse Corporation in 2014. A giant education company, Benesse, leaked approximately 29 million pieces of customer data, including dates of birth, the gender of children, and the names, addresses, and telephone numbers of parents and children [1]. One of the employees of the subcontractor allegedly copied the data list from the firm's database and sold it to three data brokers. The data brokers re-sold the data to other brokers; then, finally, competitors of Benesse bought the data. Benesse sent tradable coupons worth 500 yen to each victim, which did not sufficiently compensate the victims for their damages. As of December 4, 2015, over 10,000 people have sued Benesse, claiming damages of 55,000 yen each.

As a result of the Benesse case, the APPI was amended. When a business operator handling personal information (business operator) discloses personal information from a database to a third party, both parties must keep a transaction record for traceability (Article 25 of the amended Act). Additionally, the third party must confirm the name of the disclosing business operator and the background of such operator's obtaining the data (Article 26 of the amended Act). As for criminal sanctions, if a business operator, an employee, or a former employee discloses or misappropriates personal information from a database concerning the business to others for the purpose of unlawfully benefitting themselves or third parties, he/she shall be punished by imprisonment with work for not more than one year or with a fine of not more than 500,000 yen (Article 83 of the amended Act) [2].

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[3] *See also* Ishini Oyogu Sakana Case [Sup. Ct.], Sep. 24, 2002, 207 Shumin 289 (Japan).

[4] Osaka Chiho Saibansho [Osaka Dist. Ct.], May 19, 2006, 1948 Hanji 122 (Japan), Osaka Koto Saibansho [Osaka High. Ct.], Jun. 21, 2007, Unpublished (Japan).

[5] Tokyo Chiho Saibansho [Tokyo Dist. Ct.], Feb. 8, 2007, 1964 Hanji 113 (Japan),

[6] Tokyo Koto Saibansho [Tokyo High. Ct.], Aug. 28, 2007, Unpublished (Japan).

The Japanese data protection scheme has not been effective in reducing the trade in illegally obtained data. Thus, in recent reforms of the Japanese data protection scheme have introduced new rules for tracking data transactions and imposing criminal sanctions.

2.3 Legal Obligations for Security and Data Breach Notifications

The APPI requires data security (Article 20). Business operators shall appropriately supervise employees and subcontractors (Articles 20 and 21). Failure to comply with the Act may result in administrative penalties. The competent minister may issue a recommendation or order. In recent reforms of the APPI, the Personal Information Protection Commission was established as an independent regulatory authority for data protection and in 2018 will gain the power to issue a recommendation or order.

Table 1 shows the number of regulatory actions by competent ministers in recent years.

Table 1. The number of regulatory actions by competent ministers from 2005–2014

Fiscal year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Reports requiring (Article 32)	87	60	83	28	18	15	16	8	2	3
Advice (Article 33)	0	0	1	0	0	0	1	1	0	0
Recommendations (Article 34)	1	4	0	0	2	0	0	0	0	1

Source: Consumer Affairs Agency, Government of Japan, "Regulatory actions based on the Act on the Protection of Personal Information," 2005–2014, http://www.ppc.go.jp/personal/information/

If a business operator does not comply with an order, the person responsible for the breach of such order may be accused of a criminal offense (imprisonment for up to six months or a fine of not more than 300,000 Japanese yen). Also, the entity itself could be held criminally liable. Thus far, however, there has been no case in which a person or entity was held criminally responsible.

In Japanese culture, companies confront severe condemnation regarding their leaks from the general public and mass media. They lose customer trust and it lowers the value of their brands, which could lead to a big financial loss. For instance, Softbank, the parent company of Yahoo Corporation and BB Technology Ltd., announced a net loss of 107 billion yen after the 2004 data leakage incident [3]. The Benesse Corporation lost 940,000 customers from its main service after its massive data leak [4]. The company also made public a sales decline of 1.07 million yen in May 2015 [5]. For fear of losing consumers' trust, companies are usually eager to maintain security measures, regardless of the existence of legal obligations.

There is no provision that requires data breach notifications in the APPI. The "Policies Concerning the Protection of Personal Information" (partially revised in April 2008) put forth by the Japanese Cabinet in 2004 "in accordance with" the APPI states

"in the case of incidents such as data leakage, it is important for business operators handling personal information to disclose information about the incident as far as possible in order to prevent secondary damage or similar cases."

Many business operators disclose information regarding data leaks in accordance with the policy. The number of published data leaks in 2014 was 338, and approximately 66 % were small cases involving no more than 500 records. Employees brought 67.5 % of the cases, and most were caused by carelessness on the part of workers. Parties outside the company brought 26.6 % of the cases, over 90 % of which were committed intentionally (Table 2).

Table 2. The number of published data leaks under the policies concerning the protection of personal information

Fiscal year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Number of cases	1,556	893	848	538	490	413	420	319	366	338

Source: Consumer Affairs Agency, Government of Japan, "Regulatory action based on the Act on the Protection of Personal Information," http://www.ppc.go.jp/personal/information/.

The Ministry of Economy, Trade, and Industry (METI) provides guidelines pertaining to the APPI that target the business sector [6]. The guidelines recommend contacting the person(s) potentially affected and reporting to the competent minister or the authorized personal information protection organizations. The METI has received 3,146 reports directly or through authorized organizations, most of which are minor cases caused by negligence. There are 15 cases of data leaks involving over 50,000 records; 11 of these cases were caused by malware or unlawful computer access [7].

One of the relevant acts of the APPI is the so-called National ID Act (formally named the Act on the Use of Numbers to Identify a Specific Individual in the Administrative Procedure), which covers handling personal data related to individual numbers. Individual numbers are allocated to each person and processed for administrative procedures in the field of Social Security, Tax and Disaster Response. Article 29-4 of the act obliges on relevant institutions (mainly governmental agencies) to report data breaches to Personal Information Protection Commission.

3 Legal Remedies for Data Leakage in the United States

3.1 Litigation Involving Massive Data Leaks

In the United States, individuals who disclose personal data are subject to tort liability[7]. Notably, hacking often leads to massive data breaches. Table 3 below summarizes the cases involving massive data leaks caused by hacking in the last five years.

[7] Restatement (Second) of Torts § 652D; W. Page Keeton, Dan B. Dobbs, Robert E. Keeton., David G. Owen: Prosser & Keeton on Torts 856-63 (5th 8 Supp.).

Table 3. Cases involving massive data leaks caused by hacking from 2011–2015 (The source of the chart is primarily the Chronology of Data Breaches Security Breaches 2005 – Present, from the Privacy Rights Clearinghouse https://www.privacyrights.org/data-breach).

Date of Breach	Name	Entity	Data that could have been compromised	Amount of data
April 27, 2011	Sony PlayStation Network (PSN), Sony Online Entertainment (SOE)	Businesses - Retail/ Merchant	Names, addresses, gender, email addresses, dates of birth, login names and associated passwords, phone numbers, online IDs, users' purchase history, billing addresses, passwords security questions, user credit card accounts, and bank accounts	101.6 million (12 million unencrypted credit card numbers)
October 4, 2013	Adobe, PR Newswire, National White-Collar Crime Center	Businesses - Retail/ Merchant	Customer IDs, encrypted passwords, names, encrypted credit or debit card numbers, expiration dates, and other information related to customer orders	2.9 million (38 million user emails and passwords exposed)
December 13, 2013	Target	Businesses - Retail/ Merchant	Customer names, credit or debit card numbers, card expiration dates, and card security codes	40 million (reportedly up to 110 million)
May 21, 2014	eBay	Businesses - Other	Email addresses, encrypted passwords, birth dates, mailing addresses (no financial data or PayPal databases were compromised)	145 million
August 28, 2014	JP Morgan Chase	Businesses - Financial and Insurance Services	Names, addresses, phone numbers, and email addresses (no financial or bank account information was accessed)	76 million

(*Continued*)

Table 3. (*Continued*)

Date of Breach	Name	Entity	Data that could have been compromised	Amount of data
September 2, 2014	The Home Depot	Businesses - Retail/ Merchant	Information on credit and debit cards, e-mail addresses	56 million
February 5, 2015	Anthem	Businesses - Financial and Insurance Services	Names, birth dates, medical IDs, Social Security Numbers, street addresses, e-mail addresses, employment and income information	80 million
June 4, 2015	OPM (The Office of Personnel Management)	Government	Employee job assignments, performance and training information, SSNs, fingerprints	21.5 million

Class actions have been brought against the above companies, and many cases have been resolved by consent judgments. In the Target case, the United States District Court for the District of Minnesota granted the plaintiffs' motion for approval of settlement but payments for claims can only be made after any appeals are resolved and after claims are finalized in 2015[8]. In the Adobe case, the District Court Judge granted the plaintiffs' motion for approval of attorney fees in 2015[9]. The company had already paid an undisclosed amount to settle customer claims [8]. Home Depot was also hit with a class action lawsuit in September 5, 2014 [9].

Though such companies are liable for invasions of privacy, plaintiffs face many challenges to be authorized that they have standing to be considered their merit in the actions. In the e-Bay class action, the District Court judge dismissed the plaintiffs' claim for lack of standing[10]. The judge held that the plaintiffs had failed to allege a cognizable injury-in-fact, and therefore lacked Article III standing to pursue the case in Federal Court. This case raised the issue of whether an increased risk of future identity theft or identity fraud posed by a data security breach confers Article III standing on individuals whose information has been compromised by a data breach but has not yet been misused[11].

[8] In re Target Corporation Customer Data Security Breach Litigation, MDL No.14-2522 (PAM/JJK) (D. Minn. 2015), http://www.mnd.uscourts.gov/MDL-Target/Orders/2015/2015-1117-14MDL2522-M&O.pdf.

[9] Adobe Systems Inc. Privacy Litigation, No. 5:13-cv-05226-LHK (N.D. CA. 2015).

[10] Collin Green v. eBay Inc., No. 2:14-cv-01688 (E.D. LA. 2015).

[11] Clapper v. Amnesty International USA, 133 S. Ct. 1138 (2013).

Neiman Marcus uncovered 1.1 million pieces of disclosed customer data, which led to a class action. The U.S. Court of Appeals for the Seventh Circuit held that data breach victims satisfied the Article III standing requirements and plaintiffs could make a claim in court against companies that failed to protect their personal data[12].

3.2 The FTC's Role in Maintaining Security

While many cases have been brought against companies, the Federal Trade Commission (FTC) has also played an important role in data breach cases. Article 5(a) of the FTC Act (15 U.S.C. § 45(a)) stipulates that "unfair methods of competition in or affecting commerce, and unfair or deceptive acts or practices in or affecting commerce, are hereby declared unlawful." The FTC has the authority to investigate and initiate an enforcement action against a company in violation of the FTC Act, and recently has actively exercised enforcement actions against data breach cases[13].

Under Section 5(b) of the FTC Act (15 U.S.C. § 45(b)), the FTC may challenge "unfair or deceptive acts or practices" (or violations of other consumer protection statutes) through maintenance of an administrative adjudication. When there is "reason to believe" that a violation has occurred, the FTC may issue a complaint setting forth its allegations. If the respondent elects to settle the case, it may sign a consent agreement (without admitting liability), consent to the entry of a final order, and waive all rights to judicial review. If the FTC accepts such a proposed consent agreement, it places the order on the record for thirty days of public comment (or for such other period as the FTC may specify) before determining whether to issue a final order [10].

However, when it comes to data security, the authority for initiating an enforcement action becomes an issue under the terms of Article 5 of the FTC Act. In the case of Wyndham Worldwide Corp., the U.S. Court of Appeals for the Third Circuit affirmed the FTC's authority to bring actions in data security cases[14]. There are other cases where the FTC has approved final orders setting charges against companies lacking security[15]. However, the FTC bears the burden of proving that the allegedly unreasonable conduct caused or is likely to cause substantial injury to consumers. If the FTC fails to meet this burden, the complaint is dismissed [11].

In addition, the FTC values the importance of Privacy Impact Assessments (PIAs) and Privacy by Design (PbD). PIAs involve an analysis of how personally identifiable information is collected, used, shared, and maintained [12]. One of the advantages of a PIAs is that it allows entities to discover security risks in the lifecycle of personal data, which can support data security management. PbD is a framework that was developed by

[12] Helary Remijas v. Neiman Marcus Group LLC, No. 14-3122 (7th Cir. Dec. 20, 2015).

[13] Wyndham case in September 2015, cases of GMR Transcription Services, Fandango and Credit Karma in August 2014, https://www.ftc.gov/news-events/media-resources/protecting-consumer-privacy/enforcing-privacy-promises.

[14] FTC v. Wyndham Worldwide Corporation, et al., No. 14-35414, (3rd Cir. Aug. 24, 2015).

[15] Final order cases on Cbr Systems, Inc. in 2013, HTC America in 2013, TRENDnet in 2014, Fandango, LLC and Credit Karma in 2014, and GMR Transcription Services, Inc. in 2014 under the tab News and Events on the FTC website, https://www.ftc.gov/news-events.

the former Information and Privacy Commissioner of Ontario in Canada, Dr. Ann Cavoukian. According to the definition, PbD advances the view that the future of privacy cannot be assured solely by complying with legislation and regulatory frameworks; rather, privacy assurance must become an organization's default mode of operation. PbD has seven basic principles: 1. proactive not reactive-preventative not remedial; 2. privacy as the default setting; 3. privacy embedded into design; 4. full functionality (positive-sum, not zero-sum); 5. end-to-end security (full lifecycle protection); 6. visibility and transparency (keep it open); and 7. respect for user privacy (keep it user-centric), which have been widely accepted in many countries [13]. The FTC strongly supported PbD in its Privacy Report of 2012 [14]. PIAs contain the essential aspects of PbD, playing an important role in satisfying the above principles [15].

3.3 Security Breach Notifications

There are more security breach issues in the U.S. than any other country in the world. Most states in the U.S. have legislation setting forth obligations for data breach notifications, but the specific rules vary from state to state. The U.S. also has Federal laws governing data breach notifications such as the Health Insurance Portability and Accountability Act (HIPAA) (45 C.F.R. §§ 164.400-414), the Gramm-Leach-Bliley Act (GLB Act) (15 U.S.C. § 6801), and so on.

The first state to pass legislation requiring data breach notifications was California. The California Security Breach Notification Act requires a business or state agency to notify any California resident whose unencrypted personal information, as defined in the act, was acquired, or is reasonably believed to have been acquired, by an unauthorized person (California Civil Code s. 1798.29(a) and California Civ. Code s. 1798.82(a)). Any person or business that is required to issue a security breach notification to more than 500 California residents as a result of a single breach of a security system shall electronically submit a single sample copy of that security breach notification, excluding any personally identifiable information, to the Attorney General (California Civil Code s. 1798.29(e) and California Civ. Code s. 1798.82(f)). ChoicePoint's data breach, disclosing more than 163,000 pieces of consumer data, is a well-known case to which the California Data Breach Act was applied. The case is said to have motivated other states to enact their own data breach notification laws because the company did not send notices to people who were affected in other states. The FTC eventually ordered the company to pay $10 million in civil penalties and $5 million for consumer redress purposes [16].

According to the California Data Breach Report of 2014 [17], reports of 167 data breaches affecting more than 500 California residents were submitted. The number of reported data breaches increased by 28 % and the number of records affected increased by over 600 % from the previous year. The latter increase was primarily due to two massive retailer breaches, Target and LivingSocial, which together involve over 15 million records of California residents. As for the type of breach, malware and hacking comprised the majority (53 %) of all breaches reported. Nearly half of the data breaches reported in 2013 involved Social Security numbers (56 %), followed by payment card data (38 %).

The report suggests that recent technological advances offer means to devalue payment card data, making it an unattractive target for hackers and thieves, and emphasizes the importance of improving retailer responses to breaches of payment card data. In California, as well as in most other states in the U.S., a data breach is discussed in the context of a criminal offense for using or targeting the compromised data, such as ID theft or fraud [18].

4 Legal Remedies for Data Leakage in the United Kingdom

4.1 Data Protection Act 1998

4.1.1 Legal Foundation

Article 13 of the DPA provides data subjects with the right to receive compensation for any contravention by a data controller. It seems to be less common to bring class actions in the U.K. and other European countries. However, in the Vidal Hall v. Google case, the U.K. Court of Appeal raised two issues. The claimants insisted that Google had collected their data using cookies without their consent. The first issue was whether the cause of action for misuse of private information is a tort; the second was the meaning of damage in section 13 of the DPA, particularly whether there can be a claim for compensation without pecuniary loss[16]. On March 27, 2015, the court ruled in the claimants' favor on both issues.

In addition to Article 13, the Information Commissioner has used other sections of the DPA against data controllers in many security breach incidents. Schedule 1 of the DPA prescribes seven data protection principles that data controllers must follow.

The first principle of the DPA in the U.K. is that "personal data shall be processed fairly and lawfully" and "whether personal data are processed fairly, regard is to be had to the method by which they are obtained, including in particular whether any person from whom they are obtained is deceived or misled as to the purpose or purposes for which they are to be processed" (Schedule 1, Part II, 1(1) of the DPA). The seventh principle requires that appropriate technical and organizational measures be taken against unauthorized or unlawful processing of personal data and against the accidental loss of, destruction of, or damage to personal data.

Concerning enforcement, Article 55A of the DPA authorizes the imposition of monetary penalties by the Commissioner. Additionally, section 4(4) states that the data controller must comply with the data protection principles in relation to all personal data with respect to which he or she is the data controller.

Under the above conditions, the Commissioner may serve a monetary penalty notice on a data controller, requiring the data controller to pay a penalty of an amount determined by the Commissioner and specified in the notice, not exceeding £500,000 (Data Protection (Monetary Penalties) (Maximum Penalty and Notices) Regulations 2010, S.I. 2010, No. 31).

[16] Vidal Hall v. Google, [2015] EWCA Civ. 311.

In addition to the provisions referenced above, the DPA has a unique article that prohibits unlawful obtaining etc., of personal data. Pursuant to Sect. 1 of Article 55, a person must not knowingly or recklessly, without the consent of the data controller, obtain or disclose personal data or information contained in the personal data or permit the disclosure to a third party of any information contained in the personal data. Any violation of this provision is subject to criminal sanctions.

4.1.2 Recent Data Security Trends and Major Incidents

The Information Commissioner Office (ICO), the office for the independent supervisory authority for the DPA, announced recent data breach trends. Based on the ICO's information, the graphs below (Fig. 1) show trends regarding incidents under the ICO consideration in relation to data security from April to June of 2015. Information regarding security incidents comes from a variety of sources, including self-reports from data controllers, media reports, whistleblowers, and reports from data subjects. The ICO reports that the health sector continues to account for most data security incidents. This was due to the combination of the National Health Service (NHS) making it mandatory to report incidents, the size of the health sector, and the sensitive nature of the data processed [19].

The Table 4 below summarizes the main data leakage cases that occurred in the U. K. between 2007 and 2015. Though the scale of the leakage is not as large as that of the U.S., the Commissioner imposed penalties on the perpetrators in some cases.

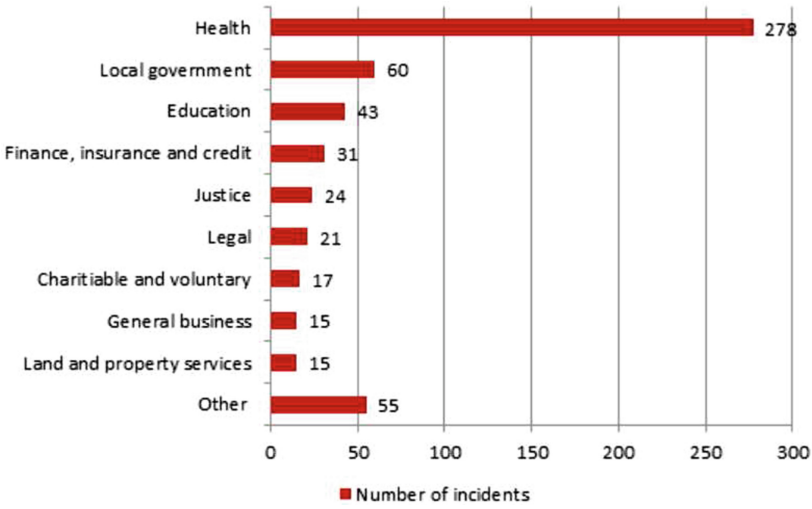

Fig. 1. Data security incident by sector (Source: ICO, *Data security incident trends*, https://ico.org.uk/action-weve-taken/data-security-incident-trends/)

Table 4. Primary data leak cases, 2007–2015 (This chart was made with information from the case list of the ICO, https://ico.org.uk/action-weve-taken/enforcement/.) [20]

Date	Name	Entity	Data that could have been compromised	Cause	Amount of data
2007	HM Revenue & Customs	Government	Child benefit records	Loss of two CDs	25 million
March 2008	Brighton and Sussex University Hospitals NHS Trust	NHS Trust	Patient data	Loss of hard drives	79,000
December 2008	T-Mobile	Telecommunication Company	Customer records	Sales staff sold the data to data brokers	Millions of records
2011	Sony Computer Entertainment Europe Limited	Entertainment company	Names, addresses, email addresses, dates of birth and account passwords, customer payment card details	Hacking	Up to 3 million Britons
December 24, 2012	Think W3 Limited	Online holiday firm	Credit and debit card records	Hacking (SQL injection attack)	1,163,996 [21]
2014	Mumsnet	Parenting Network	User accounts	Hacking	1.5 million
2014	Staffordshire University	University	Data on students and applicants	A computer stolen from a car	125,000
2014	Morrison's Supermarket	Retailor	Workforce database	Insider attack	100,000
October 22, 2015	Talk Talk	Telecommunication provider	Bank account numbers and sort codes, credit and debit card numbers	Hacking	156,959 (as of October 30, 2015)

(*Continued*)

Table 4. (*Continued*)

Date	Name	Entity	Data that could have been compromised	Cause	Amount of data
January 2015	Moonpig	Online retailer	Customer registration details	Hacking	3 million

4.2 Enforcement Actions

Regarding the cases discussed in Sect. 4.1.2, the Commissioner imposed pecuniary sanctions on some companies. Fines were imposed on Think W3 (£150,000), Sony Computer Entertainment (£250,000), and Brighton and Sussex University Hospitals and the NHS Trust (£325,000). Two employees of T-Mobile, penalized under Article 55 of the DPA, were issued confiscation orders and were ordered by the court to pay £73,400 in fines in June 2011. In addition to those cases, a number of entities have been ordered to improve their data protection practices or to pay penalties.

PbD and PIAs are also valued by the ICO. The ICO has made the PbD webpage public [22], and the foundational principles of PbD are relevant to U.K. data controllers, as can be seen in the document entitled "Conducting Privacy Impact Assessments Code of Practice" [23]. PIAs are definitely important to ensure compliance with the seventh data principle.

4.3 Data Breach Notifications

Though the current laws and their enforcement results have been summarized above, the U.K. DPA will be dramatically altered by the EU GDPR which was finalized on the April 14th, 2016 [24]. PbD, PIAs, and data breach notifications are introduced in the GDPR. We should keep an eye on the changes that occur with the implementation of the GDPR.

The ICO enforces not only the DPA but also the Privacy and Electronic Communications Regulations of 2003 (an EC Directive). Service providers (e.g., telecom providers or internet service providers) are required to notify the ICO if a "personal data breach" occurs. They must report to the ICO within 24 h of becoming aware of the essential facts of the breach. They must also keep a log and notify customers if the breach is likely to adversely affect customers' privacy [25]. The ICO uses significant human resources to investigate inappropriate data transactions. Additionally, an expert at the ICO says that the introduction of a rule for data breach notifications in all sectors would make data flow clearer and would provide greater opportunities for enforcement.[17]

[17] According to the interview with the ICO in September 2015.

There is one more provision to ensure the transparency of data circulation in DPA. The first principle of the DPA in the U.K. is that "personal data shall be processed fairly and lawfully" and "whether personal data are processed fairly, regard is to be had to the method by which they are obtained, including in particular whether any person from whom they are obtained is deceived or misled as to the purpose or purposes for which they are to be processed" (Schedule 1, Part II, 1(1) of the DPA).

5 Consideration

Data leaks can cause two types of concerning issues. One is the privacy risk caused by the wide circulation of personal data and the other is the risk of economic damage. As mentioned in the introduction, there are three approaches for reducing the two types of risk; (1) providing remedies for data leaks; (2) data security obligations; and (3) notification obligations in the event of a data breach.

Table 5. Outlines of the regulatory schemes in Japan, the U.S., and the U.K.

Approach	Japan	U.S.	U.K.
1. Compensation for data leaks	Tort liability: Articles 709, 710, and 715 of the Civil Code	Tort liability: Common Law	Right to receive compensation: Article 13 of DPA
2. Data security obligation	Obligation of business operator: Article 20 of APPI	Prohibition of unfair or deceptive acts or practices: Article 5 of the FTC Act	Appropriate technical and Organizational measures: 7th Principle
3. Data breach notification	Recommendation for data breach disclosure: Policies by Cabinet	Obligation to notify Notification to Attorney General and disclosure: Californian Act	Notification to Supervisory Authority and Communication to Data Subjects: EU Data Protection Regulation

Table 5 shows the outlines of the regulatory schemes concerning these approaches in Japan, the U.S., and the U.K.

The common feature of the three countries is that they all have basic legal or quasi-legal measures for compensation, data security obligations, and data breach notifications. However, the surroundings of data breaches, approaches toward harm arising from leakages, and issues among each country are different.

First, the compensation for data leaks is to provide remedy for damages caused by an actual data leak. While privacy infringement by wide circulation could be the reason for damages as well as economic harm, economic damages seem to easily go higher in

terms of the amount of compensation than the damages arising from wide circulation of personal data itself.

In Japan, most data leaks are made by employees or subcontractors who disclose a small number of records. Business operators have had to pay compensation in relatively insignificant amounts thus far, even if they were ordered to pay damages to victims. Although compensation is higher when sensitive data is disclosed, an entity's obligatory compensation is still low. Therefore, tort liability for compensatory damages seems to be ineffective for compensating privacy victims. Nevertheless, as the number of plaintiffs in the Benesse case is growing, the monetary damages that are awarded might have some impact on the company, depending on the end results of all of the lawsuits.

Secondary harm such as identity theft and fraud have been outside the scope of consideration by courts because of differences in the causes of action. If such harm actually occurs, business entities are forced to face additional litigation.

In the U.S., hacking and malware issues are common causes of data leaks and economic damages are crucial in this issue. There are many class actions seeking compensation for data leaks, and the compensatory amounts are generally high. While many cases have been solved by consent agreements, proving the standing of plaintiffs is still the issue.

In the U.K., there are not as many leaks as in the U.S., and few cases seem to lead to the economic damages that result from fraudulently using credit card information. Although class actions against data leaks seem to be rare, there are cases in which the interpretations of Article 13 of the DPA were disputed. Rather than claiming compensation by individuals, such cases have been dealt with enforcements by the ICO.

Second, the data security obligation imposes an obligation on data controllers and is intended to reduce the risk of both wide circulations of personal data and economic damage. In Japan, for fear of losing consumers' trust, companies tend to eagerly maintain security measures, regardless of the existence of legal obligations. While it might be sufficient to protect personal data in our culture, the APPI's data security obligation seems to be insufficient, and the introduction of PIAs would be another option to ensure the sufficient level of security. In this case, we need to be careful of a drawback of PIAs that might become a dead letter due to focusing on procedures. As for the new criminal sanction against illegal provisions of personal database, we need to keep an eye on their effectiveness in the U.K.

In the U.S., the FTC exercised enforcement actions against perpetrators based on "unfair acts or practices" provided by Article 5 of the FTC Act in the case of a data breach. The FTC's role in this regard has been effective, except for the issue of proving that the allegedly unreasonable conduct caused or is likely to cause substantial injury to consumers. The FTC also values the importance of PIAs and PbD as proactive measures.

In the U.K., the ICO has exercised enforcement actions against violations of the seventh data protection principle. Although there have been no massive data leakages on the scale of those in the U.S., the ICO has compiled a list of enforcement cases. The ICO also views PIAs and PbD as important. In addition, the DPA stipulates criminal sanctions against the unlawful obtaining of personal data. Along with the sanctions, confiscation orders seem to be effective in reducing illegal data transactions.

Currently, making use of breached data for a criminal offense in Japan and the U.K. does not seem to be as pressing as in the U.S.

Third, data breach notifications were originally introduced in almost all the states and sector-based federal statutes in the U.S., where they were essential to reduce the damages resulting from the criminal use of leaked data. Apparently, they have proven effective in requiring security breach notifications from entities as soon as possible in order to effectively respond to the unlawful use of breached data.

In Japan, the APPI does not provide the obligation to notify victims of data breaches. The amendment of the National ID Act has partially introduced the rule, although the legal system might be insufficient to implement it. However, companies tend to follow the breach notification rule even if it is just a recommendation by the Cabinet. As a result, a lot of reports have been submitted to competent ministers, including small cases. Given our tendency to keep security in a diligent manner, legal obligations might be burdensome for some entities.

In the U.K., the rule was introduced as a sector-based rule in the Privacy and Electronic Communications Regulations of 2003. As the GDPR is formally adopted, the scope of the rule will be expanded generally. The ICO views this positively, as it is expected that the introduction of a general data breach notification rule in the U.K. will improve the transparency of data circulation.

However, it is questionable that data breach notifications will also be effective in improving the transparency of data circulation, because notification will never reduce the data circulation by itself; it only alerts victims to the situation. In fact, the practice of data breach notification in Japan seems to lose substance in this regard.

It will be necessary to review whether the data breach notification rule is not only effective for addressing the criminal use of breached data, but also increases the transparency of data circulation and reduces inadequate data flows.

According to the above analysis, Fig. 2 shows the possible data flow and legal schemes for addressing data breaches. The compensation for data leaks is to make data controllers pay data subjects for damage due to an actual data leak. While harm caused

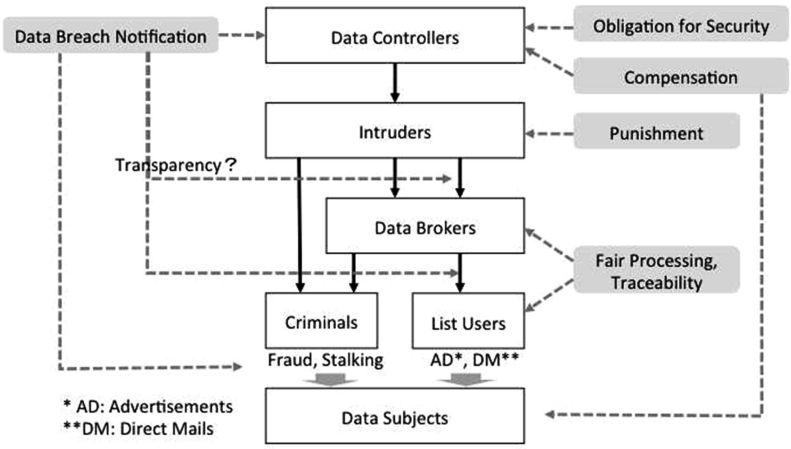

Fig. 2. Possible data flow and legal schemes for addressing data breaches

by the wide circulation of personal data could be compensated, as well as economic damages, the latter seems to easily lead to a higher amount of compensation than the damage done by the wide circulation of personal data. The data security obligation is designed to make data controllers keep personal data secure. The obligation is expected to reduce the risk of both wide circulations of personal data and economic damage. Data breach notifications, intended to make data controllers report and disclose data leaks, were originally introduced in the U.S., where it is essential to reduce the damage resulting from the criminal use of leaked data. Although it is clearly effective in preventing the unlawful use of breached data, it is questionable that data breach notification is effective in improving the transparency of data circulation, because notifications will never reduce data circulation by itself—it only alerts others of the data circulation.

6 Conclusion

To address the issues related to data breaches, legal rules among countries should be common to all due to the worldwide circulation of personal data. Nonetheless, different features are recognizable through the analysis presented in the preceding chapter. According to this analysis, the following statements are the issues and measures that should be addressed and taken in each country.

Companies in Japan have thus far eagerly abided by data security obligations, although these seem to be not necessarily effective for data protection. There is another option, in which entities handling personal data conduct PIAs to prevent security incidents. In that case, it would be necessary to avoid bureaucratic procedures, and such action would entail the risk of data breach notification rules being a mere façade. If such notification rules are introduced, the subject matters to be publicized must be identified and followed by enforcement actions. Also, such rules should contribute to the avoidance of secondary harm. Newly introduced obligations on data traceability should be managed in a manner that harmonizes with effective enforcements.

In the U.S., compensations for data leakage and security breach notification rules have apparently been effectively managed. This comes from a background in which data breaches and the secondary harm arising there from are extremely serious compared to similar events in the other two countries. To reduce this threat, there is an option to oblige companies to maintain data traceability.

In the U.K., data breach notification rules imposed as part of the GDPR need to connect with other effective enforcements and contributions to avoiding secondary harm, so as not to become meaningless. The purpose of notification should be clear, which might avert wide circulation of personal data or the risk of economic damage.

We must harmonize the above differences and make ongoing efforts to improve the effectiveness of rules.

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Ethics and Professional Intimacy Within the Search Engine Optimisation (SEO) Industry

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Abstract. Search Engine Optimization (SEO) is the process of increasing a digital profile's visibility within a search engine for relevant search engine results pages. SEO is playing a critical role within the digital marketing and communication strategies of many organizations globally. Particularly in the UK, digital marketing budgets have continued to rise in the last decade, despite the economic uncertainties.

With the increase of spending in SEO related activities, a number of businesses focusing on SEO services have emerged, offering SEO services with unfounded promises. The SEO services are not regulated and do not have recognized ethical standards.

Key influences such as a lack of professional intimacy and the velocity of market change are considered, as well as the possibility that the SEO community is becoming divided in its own understanding of what it fundamentally is. Dilution of industry specialism, through a continual attempt at self-preservation and cannibalization of other methods of online communication, is leaving not only SEO practitioners vulnerable, but also the very clients and consumers they are hired to serve. This raises a clear ethical issue that requires further exploration.

Keywords: Search Engine Optimization · SEO · Ethics · Professional intimacy

1 Introduction

This paper identifies a need for ethics and professional intimacy within the Search Engine Optimization (SEO) industry. To date, Marketing, Business and IT research publications have covered a wide range of material on practical guidance for the SEO practitioner, however, detailed discussion into the significance of ethical SEO conduct is yet to be explored. This paper aims to determine if there is a need for transformation of the SEO industries current practice and processes in order to safeguard the future of the industry and defend its reputation.

This is a position paper underpinned with accounts from scholarly literature as well as practitioner opinions from industry related blogs and reports. It will commence with an analysis of the current condition of the SEO industry and its stance on ethical SEO. The paper will finish with a discussion of ethics and professional intimacy in the SEO industry, as well as justification for further relevant research into the unique area of SEO.

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2 The State of Digital

Consumer behavior has changed considerably over the last decade with the evolution of multi-device and multi-channel buying patterns and behaviors, forever influencing how organizations communicate with their consumers [25]. This has placed pressure on the organization to become multidisciplinary with their marketing approach [3]. As a result, organizations have been presented with too many complex strategic choices regarding how best to remain competitive and cut through the variety and multiplicity of information on the web [16].

Whilst some align new technology with innovation, others see change as disruption [7]. Convergence of new technology and data available to organizations has rapidly become overwhelming, with many organizations failing to meet the growing demands of their markets relative to internal capacity [10]. As such, a current perspective held by academics and practitioners is that there is a 'digital skills gap', specifically within the marketing industry [38].

Following a report released by Lloyds Bank in association with the Government's cross-sector partnership and digital initiative 'Go On UK' [30], findings showed 75 % of 1,988 organizations surveyed were not investing in developing and improving digital skills (defined namely as internet, ecommerce, digital marketing and IT literacy skills). Of the 25 % seeking to improve their organizations' digital proficiency, the primary option was to pursue professional consultancy and advice from Tech, IT or digital marketing practitioners, taking a dominant 35 % share of all support options.

Whilst the Government has gone so far as to commission a survey of organizations digital literacy, the inquiry stops there. What then becomes of those organizations that go on to obtain professional digital support and how is it ascertained that they are actually getting a quality digital service needed to 'fill the gap'?

2.1 A Digital Marketing Skills Gap?

A recent study undertaken by Adobe Systems Limited revealed that only 9 % of 1000 digital marketers strongly agreed they had the optimal skills to deliver a successful digital marketing campaign [1], however such skills were not clearly defined. There is also little scholarly literature that explores where specific competency issues rest due to the emerging nature of the skills gap. As such, no research has gone so far as to explore how this should be managed.

There has, however, been online discussion of a skills deficit resting with a particular sub-sector within the digital marketing industry, with one scholar, Dr. Aleksej Heinze, suggesting the area worst affected is that of Search Engine Marketing and the specific practice of Search Engine Optimization or 'SEO' [17]. Heinze advocates that this is potentially down to two areas:

> "ignorance, where people just don't know they're not getting it right; or incompetence, where they know about it but just assume because they know they're doing something in that area, they must have it covered."

Such behaviors of SEO practitioners explored by Heinze are detrimental to the SEO industries reputation and the SEO clients in need of quality SEO services, particularly as it is happening at a time where changes in digital technology and marketing techniques are occurring at a rapid rate [29]. This places more pressure on SEO practitioners to 'keep-up' as well as putting participating businesses involved at threat of maltreatment and exclusion.

2.2 SEO – A Brief History

SEO is the culmination of long term optimization techniques, tactics and strategies to help a web presence (namely websites, social profiles, videos and apps) achieve sustainable rankings in search engine results pages for related search queries [12]. The aim of SEO is to drive traffic back to a web presence to generate brand awareness and engagement as well as leads and conversions.

Whilst advances in technology push for greater cohesion of digital marketing practices, SEO is very much impacted by search engine processes and the opacity of their algorithms, a factor which makes SEO unique from other digital marketing disciplines [46].

Search engines are "special websites that have indexed billions of pages - and make it easy for [users] to find a website or page in an instant" [4]. Popular search engines include Google, Bing and Yahoo however, popularity of search engines vary from country to country. A search engine algorithm is a computational process that determines what content should be served in its search engine for any given query [40]. It is compounded of 200 website signals such as region, on page technical elements, content and backlink profiles [33].

Each year search engines roll out 500–600 changes to its algorithm without forewarning or indication of what the algorithmic changes will be [36]. This means the SEO industry is based solely upon an ever changing and undisclosed algorithm that lacks transparency and can be difficult to predict [47].

However, search engines such as Google do offer some guidance to webmasters and SEOs about recommended routes to optimizing a website through their "Quality Guidelines" [13]. The guidelines can be described as a compendium of best practice standards, SEO practitioners can either choose to comply with or not. Not complying with best practice guidelines runs the risk of being excluded from Google's search results index [50]. A number of papers have been published focusing on identifying the key variables of the search engine ranking algorithm [15, 43, 48], however full transparency on all algorithmic processes and search engine ranking factors will likely never be achieved [49].

Further to this, though an SEO practitioner may follow all best practice guidelines specified by a search engine, results are not guaranteed or take a considerably long time to manifest in search engine results pages (SERPs) [44]. In response, some SEO practitioners choose to adopt other less virtuous manipulation tactics to unnaturally and, in most cases, temporarily boost a digital profile up search engine rankings [5]. Knowingly or unknowingly utilizing such SEO practices is harmful to most organization's digital profiles and webpages.

With such exploitative techniques still occurring, this raises the question of whether an intensified focus on the concept of ethical practice is needed to protect clients and consumers against inadequate or negligent SEO services.

It is important to note that this paper does not aim to demonize an entire industry, which like any other occupation has both moral and immoral actors operating under a shared occupation [14]. That being said, the actions of a less honorable subset of SEO practitioners have tarnished perceptions of the SEO industry [52], with the use of unnatural manipulation tactics posing just one explanation for the stigma surrounding SEO. Concepts such as the velocity of change, industry fragmentation and professional intimacy are explored later in this paper to further enhance understanding of unethical behavior.

2.3 A Fractured Industry

One subset of SEOs willingly engaging in foul play does not define and ethically shape an entire generation of SEOs, rather, an analysis of available literature and opinions of key industry speakers has been analyzed to determine if there is a more obtrusive barrier to ethical practice occurring. Research shows that velocity of change in the industry is inextricably linked to a practitioners' ability to adapt to new skills, resulting in dilution of technical and strategic understanding as well as a destabilized professional identity [51].

Since the launch and continual revision of two of Google's biggest algorithm updates ('Panda' and 'Penguin'), traditional SEO changed drastically, shifting its focus from paid practices (considered 'spam') to 'earned' methods, as with more traditional marketing processes [35]. It gained mainstream attention and did not do much to help the reputation of an already abstruse industry. Whilst the algorithms helped to improve quality of output, SEO has needed to adopt new verticals such as content marketing, public relations and social media marketing [31] as a form of self-preservation and to remain competitive.

For practitioners who attempt to adapt to new digital communications practices, formulating an SEO strategy becomes a minefield of its own as each new vertical has its own best practice guidelines, as well as advertising standards, that must be expertly abided by to avoid any legal and ethical pitfalls [28].

Sourcing succinct and direct information on new marketing disciplines becomes increasingly difficult with the amount of disinformation perforating the SEO community [18]. As the SEO industry splinters into its own esoteric factions of routes to best practice [54], SEO's are challenged with making the most accurate and ethical decision. This is typically undertaken through consultation of peer reviews, effectively relying upon other people's intuition, which can be "well-meaning but misguided"[1]. This can mean the route to mastering a practice becomes convoluted as the SEO practitioner is required to continually seek answers and regain familiarity with an ever changing algorithm and

[1] [26, p. 8].

required strategic responses [24]. As a result, this increases subsequent risk of "slow learning and the tendency to revert to previous approaches"[2].

Therefore, can practitioners say they have truly grasped the complexities of present day SEO and deem themselves an expert, or have required changes to procedure and skillsets tempered this development? For this very reason, when looking at SEO as a whole, it is becoming more difficult than ever to define exactly what the industry is [55] and ultimately, harder to implement a unified code of ethics.

3 Towards a Code of Ethics?

As defined by Cornell [9], a 'Code of Ethics' can be typically segmented into distinct elements "(1) an introduction or preamble, (2) a statement of purposes and values, (3) specific rules of conduct which may be subdivided in various ways, and (4) implementation of the code, which will define administrative processes, reporting, and sanctions".

Whilst it is believed that some SEO companies have developed their own code of ethics [27] this is not true for the SEO industry in its entirety. Individual SEO freelancers, SEO departments and SEO companies may have unique ethical codes relevant to their own SEO service but the industry is without a unifying and sanctioned ethical code or rational process for its implementation. This situation has been described by one online publisher as a gesture without "teeth" [8].

Despite an increasing awareness of a need for a unified ethical code of conduct [45] within the SEO industry, the process is made more complex as SEO practices and processes transcend various industries, devices and countries. Therefore, with so many factions to consider, it raises the question of who would, or could, take ownership of managing and enforcing such a code of ethics [37]?

3.1 Existing Regulatory Guidelines

Although there is a "Consumer Protection from Unfair Trading Regulations" act, with an intent to protect consumers from unfair, misleading or aggressive online marketing practices [20], this is only in the context of the following breach of law: 'spam' ('unsolicited solicitations by telephone'), 'unclear advertorials', 'targeting of children' and casual use of the word 'free'. Such areas are not relevant to the practice of SEO.

The Internet Advertising Bureau [21] has begun to recognize the apparent need to regulate the Search industry, with the introduction of a 'CAP code' for non-broadcast marketing and advertising [6]. However, search regulation appears to focus exclusively on paid search techniques such as pay-per-click (PPC) with no concrete guidance on organic SEO. Instead, the SEO practitioner is offered the following information:

> "For policies related to Search Engine Optimization (SEO) – see the individual policies of Search Engines" [22].

[2] [39, p. 116].

Whilst search engines release their own best practice policies there is no sanction that states it must be followed explicitly.

3.2 Search Engine Marketing Trade Association (SEMTA)

In October 2014 the SEMTA (semta.eu) was founded – a trade association representing search engine marketing business in the UK and Europe. At the time of writing this paper, the association is still in beta and as such, the association is yet to gain traction within the Search Marketing and SEO community. Whilst this is most definitely a positive step towards delivering a unified ethical message of progress, in keeping with marketing demands for the SEO industry, this alliance has a long way to go to help elevate the confidence in and reputation of the Search industry [42].

3.3 Lessons from SEMPO

Taking key learning's from the SEO industry within the United States of America, a not for profit trade organization that represents the search and digital marketing industry, called SEMPO (sempo.org), was formed out of a desire for Search Marketers to work towards a more centralized understanding of Search Marketing best practice. A code of ethics was defined for SEO practitioners to follow and each year an annual industry survey, in association with Econsultancy, is released to give some insight into the "State of Search". Whilst this offers a much needed insight into search standards within the US, SEMPO has defined itself as the following:

> "SEMPO is not a standards body or a policing organization. Membership in or involvement with SEMPO is not a guarantee of a particular firm's capabilities, nor does it signify industry approval or disapproval of their practices" [41].

The contentious issue of whether the SEO industry needs a centralized association that works to lobby on behalf of the disadvantaged SEO practitioner and misinformed client, is still open to debate. However, it does raise the question of whether the SEO industry needs, not only a self-regulated legislative framework that defines broad principles for best practice, but also a route to actively enforcing industries commitment to said principals. Much like Google can penalize a website for violating best practice guidelines and even go so far as to 'de-index' a site from its search engine, if an SEO practitioner cannot deliver on best practice, should they have their ability to practice revoked?

Conversely, would this be unfair punishment when SEO activity is founded upon an ambiguous algorithm that is infamously hard to predict no matter how much integrity the SEO practitioner has?

Whether the SEO industry should adopt a transcendent, practicable and potentially enforceable code of ethics is an important topic yet to be discussed in detail by scholars and practitioners. However, in order to obtain and secure professional autonomy, it is imperative the SEO open a dialogue to discuss the possibility of ethical regulation soon, as "if an industry cannot regulate itself a body will step and it will regulate that industry, whether they wish it or not" [28].

4 Ethics and Professional Intimacy in SEO

Many concepts form the foundation of ethics in the practice of SEO. As explored in the previous sections, they can be circumstantial, knowledge or competency driven [19]. This section of the paper explores whether ethical practice is intrinsically linked with the concept of professional intimacy, that which is between the SEO client and SEO practitioner.

Professional intimacy is described as the openness between that of a client and practitioner [2]. It is a philosophy that frames the importance of company-client relationship management with an aim to improve customer satisfaction [32].

Typically addressed in 'service management literature [2, 11], the concept of professional intimacy contextualized in a digital marketing setting is yet to be documented.

The implications of professional intimacy in the context of SEO, suggests the SEO practitioner should have an implicit understanding of their client, their needs and overall objectives [34]. This can be difficult to achieve due to common stresses in a marketing agency setting such as "overburden, overwork, corrosive stress, and unrelenting time pressures"[3]. This, in conjunction with a rapidly evolving industry, can diminish intimacy over time if not controlled.

As aforementioned within previous sections of this paper, a subset of SEO practitioners have become notorious with exploiting SEO clients lack of understanding of a search algorithm [5]. Doing so takes advantage of the trust intimacy conjures, and has the potential to undermine the practitioner-client relationship [23]. As a result, a lack of intimacy can breakdown the positive regard the client holds for the SEO practitioner, negatively impacting SEO practitioner and industry reputation [2].

In response, Hollyoake [19] suggests it is valuable for SEO practitioners to challenge existing cultures and systems within a company to understand what part of the practitioner-client experience is destroying perceived value and leaving clients vulnerable. As such, further research is required to determine where tensions are encountered throughout the practitioner-client experience to determine how a more meaningful and profitable relationship can be achieved. Such insight into intimate relationships could inform a motion to improve industry reputation and ethical conduct.

Whilst assessing the practitioner-client relationship is vital to becoming a critically reflective SEO practitioner, it is important to consider whether true professional intimacy is obtainable within the constraints of the SEO industry? As search engine algorithms are ambiguous, it can be argued that full disclosure on SEO processes and their outcomes can never be attained, as practitioners may not be able to "explain why any particular outcome was produced" [27]. This raises the fundamental question, can genuine professional intimacy ever be achieved if search engine algorithms cannot be known intimately?

[3] [53, p. 19].

5 Conclusion

The paper focused on the topics of industry fragmentation, exploitative SEO practice and a lack of professional intimacy between the client and company as possible reasons for a breakdown in ethical conduct within the SEO industry. Conceptualizations of such themes in the context of SEO have been arbitrary and relatively underexplored to date. As such the position paper advocates the value of further research into this area.

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A Participatory Design Program for Making Ethical Choices in Client Vendor Relations in ISD

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Abstract. We propose a program for developing ethically sustainable cultures in client–vendor relations in information systems development (ISD). The program is based on the participatory design approach and is motivated by the findings of our survey (n = 20) that explored ethical challenges and good ethical practices in the IT field. The data showed that client–vendor relations are ethically conflicting as profitability pressures, for example, induce IS managers to undertake unethical practices. Based on the results of our survey, we identified a dialectical process in client–vendor relations in the form of thesis, antithesis, and synthesis. In the process, impulses inducing questionable or unethical practices (thesis) confront the guidelines for good ethical practices (antithesis). This confrontation between a thesis and an antithesis is implemented through the program we propose, and as a result, morally better practices are expected to emerge (synthesis).

Keywords: Client–vendor relations · Participatory design · Dialectics · Ethics

1 Introduction

Client–vendor relationships in IS/IT projects are common, as in business and the public sector, the actors aim for efficiency by concentrating on core processes and outsourcing development projects or functions that are better implemented [1]. However, by aiming for efficiency via outsourcing IS/IT development work, the client engages in vendor risks when contracting a project to outside vendors [2]. Client–vendor relationships in IS/IT projects have been recognized as having inherent problems, some of which are ethical in nature, such as problems relating to honesty [3, 4]. Client–vendor relations have been studied from a variety of viewpoints, including outsourcing [5, 6], risks [7], and fault responsibility [1]. Although in these studies there are discussions that touch on the morals and ethics of client–vendor relations, we did not find studies directly focusing on ethical or moral issues in these relations. Therefore, we gathered data on IT professionals' perceptions on client–vendor relations, analysed them, and found that

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there are major moral issues to consider in these relations. As an implication, we will propose a participatory design (PD)-based program that uses a dialectical approach to develop practices. The PD approach takes the viewpoint that stakeholders are involved in the development process, and that they themselves determine the outcome instead of an external actor imposing a pre-established solution [8]. In participatory design, dialogical communication is encouraged, instead of linear communication. This suggests that dialectics might serve as a proper process in developing relations. In IS research, dialectics have been proven to be useful in understanding the totality of ISs and their development [9, 10]. Therefore, we adopt dialectics (e.g., [11]) in developing practices. We aimed to see whether the IT professionals were able and willing to describe and discuss the ethical dilemmas arising from their field of work, and to our joy, the results will show that the professionals are capable of both describing ethical challenges in client–vendor relations and produce solutions for ethically good practices. Our study is constructive and normative [12] in the sense that a program for developing client–vendor relations in IT is our main contribution.

After the Introduction, in Sect. 2, we introduce literature describing client–vendor relations both in the public and private sectors, dialectics, and participatory design. In Sect. 3, the research design and data gathering methods are presented. In Sect. 4, the analysis process on empirical data and the dialectical model development are presented. Section 5 discusses the results.

2 Theoretical Background

2.1 Client–Vendor Relationship in ISD

Claybaugh and Srite conducted a grounded theory-based study on client–vendor relations in IT and determined a model explaining good and bad relationships (Fig. 1) [3]. In their model, there are categories as follows (including concepts): (i) individual (e.g., customer service), (ii) technological (e.g., product), and (iii) organisational (e.g., customer service). These have an effect on two high-level categories, (i) good relationships and (ii) bad relationships. As an example, good customer service was identified by their interviewees as being relevant, response times were excellent, and the client's needs were satisfied. Taking the viewpoint of bad relations in customer service, slow response times, being pushy or antagonistic, and avoiding contact altogether were mentioned as examples.

The model by Claybaugh and Srite interprets the relations from the viewpoints of good and bad [3]. However, it is noteworthy that good and bad in their analysis do not directly imply good or bad in a moral sense, although honesty, for example, emerged in their interviewees' perceptions. Considerations on client–vendor relations have been typically divided into the private and public sectors (e.g., [13, 14]). Next, we briefly describe the characteristics of these sectors.

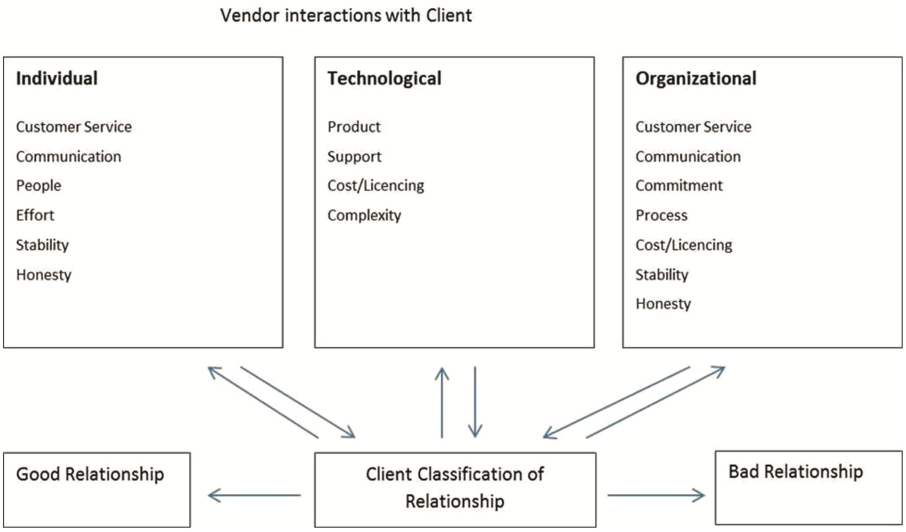

Fig. 1. Model of client–vendor relations. [3, p. 31].

2.2 Public vs. Private: The Main Differences and Commonalities

In this paper, there are three different organisation types to consider: public organisations as clients of IS procurement, private organisations as clients, and private organisations as the developers of the IS. Rosacker and Olson [15] state that there are many similarities between organisations in the private and public sectors, yet they are clearly distinctive from each other in many substantive ways. As an example, Rosacker and Olson present the idea that the portfolios and stakeholders of these two different types of organisations vary significantly. In addition, Rosacker and Olson argue that "public sector organisations will likely use and manage information systems differently than their private sector counterparts"[1] In the private sector (business-to-business), what drives clients to pursue IT projects is competitors' pressures that drive them to innovate in the short term [15]. Indeed, the turbulent business world means that product cycles become shorter and shorter, and outsourcing—having a third party performing work—is used to become more competitive [16]. Taking into account client–vendor relations in the public sector, the client organisation's goals relate to generating services. In democratic societies, the public sector upkeeps various services for the citizenry. These services can include, but are not limited to, public health care; military, border, and police services; public schools; taxation; etc., which can include personal information from every citizen in the country, or in some cases international databases concerning hundreds of millions of people. The aforementioned services are—or at least should be—designed for the best intentions of the citizens' health, safety, and well-being, and are mostly funded through taxation; in comparison, the private sector acquires money from customers in a form of trade for products and/or services.

[1] [15, p. 67].

There are also differences between the ideologies in procurement. While public organisations' procurement processes are in many countries limited by law (see "Directive of the European Parliament and of the Council on Public Procurement"[2]), private organisations can use easier and more agile methods of defining and procuring their information systems. Hence, these agreements in the private sector can vary in the methods of, e.g., payment, development, upkeep, etc., while in the public sector, the agreements are more or less unified.

2.3 Environment: Various Information Systems

Even though private vs. public organisations is one clear and understandable division of organisations, and thus their IS needs, it is hardly the only division. Within these spheres, different kinds of ISs are needed, as information systems requirements vary greatly both by the task the information system is built to solve and by the availability of the information systems built to solve the problem. Most common IS solutions for organisations are bulk solutions (e.g., standard operating systems that come with the computers or office solutions, both of which are available off the shelf, or even embedded software, such as mobile operating systems or specific but one-purpose designed machines) that require little or no customisation and offer various functionalities compared to one-time solutions developed for one specific situation required by only one customer (e.g., special military systems or a custom-made Enterprise Resource Planning (ERP) solution). Another important factor in defining the client–vendor situation is the size of the information system required: whereas big organisations with multitudes of users or subjects can require large and complex systems (e.g., hospital information systems), some organisations require only a tiny fraction of functionalities and information processing capability from their information systems [20].

While organisations procure information systems, non-customised bulk solutions can easily be counted out from unethical procurements, as (a) the price of these systems is usually predetermined, (b) they usually are available for testing, and (c) there are ample test data from different solutions (see various professional magazines that do comparisons and reviews of suitable off-the-shelf software). This is true at least when compared to custom-made software, where the development and implementation of the information system is billed to the customer, whether or not the solution meets any of the customer's actual requirements.

Thus, the ethical analysis of procurement and development of information systems—at least according to the previous points—can primarily be focused on large-scale tailored software. Our empirical data, shown later in this paper—at least according to the topics covered in it—also support this claim.

The responsibility of a private company to forge profits lies within the board and the CEO, as well as those on whom the aforementioned actors have laid the responsibility (e.g., in the case of a system purchase, the CIO). The existence of this sort of organisation lies within the profit and productivity of the organisation, or its part and thus the

[2] http://www.europarl.europa.eu/document/activities/cont/201309/20130913ATT71292/20130913ATT71292EN.pdf.

responsibility—while not always fairly—actualises to the actors within the organisation. While it is not always ethical, the organisation therefore has a mandatory need by its very actors to be efficient and economical and, when compared to the public sector, redeem its right to exist with this very fact; thus, the responsibility in these organisations are not only with the CEO, but with the whole organisation. As an example of the requirement for a private company to be efficient and economical, should an incorporated company want to do something else than profit, in Finland, they have to specify in their charter that this is the case (see, e.g., [17]).

This redeeming of existence becomes quite different when it becomes publicly funded. When procuring governmental information systems, it is more difficult to find the responsible parties. This is especially pertinent in cases where the procurement is for critical governmental information systems, where the responsibility is not only to the stockholder, but also to other stakeholders, in the public domain case, especially the citizen [18]. In many cases, the responsibilities remain undefined, and even if they are defined, the responsibility often does not actually land on the responsible party (see, e.g., [19, 20]). If we do not, or cannot, hold any party responsible for the development of the system, responsible development is not possible: the responsible agent seems to be missing [20].

We have a hard time answering who the responsible party for errors in the system is if we cannot find them. Thus, effective safeguards are necessary, but they are difficult to implement. If the professionals' responsibilities towards society can be justified by committing them to the public good (see, e.g., [21, p. 183]), we can have an environment where proper discourse on the consequences and responsibilities at society's level can start [20].

When procuring (critical) governmental information systems, the citizen is in no position to choose an alternative, as they as a consumer and any private business are, when choosing a different system [20]. To illustrate this, when a citizen selects word processing software or when a company is choosing between potential enterprise resource planning systems, they can pick between many (privately provided) alternatives. On the other hand, when a citizen needs an electronic passport, the one provided by their government is it.

2.4 Dialectics and Participatory Design (PD)

According to dialectic process theories, entities (e.g., humans or organisations) live in a pluralistic world [11]. They are faced with rivalling forces and colliding events with contradictory values that compete with one another for control and domination [10, 11]. This is visible through the design decisions made when ISs are designed (by the people in the organisations). An example of dialectic process theories is the dialectical theory of human development by [22]. Value contradictions between rivalling forces that an entity confronts make the entity develop from one stage to another. In dialectics, the rivalling forces have been named as thesis and antithesis. Confronting these tensions helps create synthesis, which, in turn, assists the entity in moving to the next stage. Often, the synthesis is a new solution that differs from the thesis and the antithesis [23]. In reality, things do not always happen according to

dialectical theory. Sometimes, the synthesis is actually a win-win situation, and sometimes the opposite group has enough power to fully overthrow the dominant group so that no synthesis exists [23].

We can find dialectical characteristics in PD. In PD, the stakeholders are involved in the design process to make it possible for the results to meet their needs [24, 25]. This means that, when workshops for designing a new information system, for example, are arranged, the boundary between future users and designers may become blurred [25]. This also means that competing interests among future users or between future users and designers, for example, may emerge, and these conflicts need to be resolved. This means that a PD process may be perceived from the thesis, antithesis, and synthesis viewpoints.

Participatory interventions may target the following goals [8]: (i) psychosocial outcomes in increasing feelings of ownership of a problem, (ii) improvement of competencies and capacities required to engage with the development problem, and (iii) actual influence on institutions that can affect an individual or community. Those effects of the PD should be ethically consistent and positive [26].

PD development projects typically have the following stages [8]: (i) research stage: the development problem is accurately defined, and all relevant stakeholders are involved; (ii) design stage: actual activities are defined, and the commitment of stakeholders is supported via participation, with the quality and relevance of actions guaranteed by participation by stakeholders; (iii) implementation stage; and (iv) evaluation stage: the most significant changes are voiced and brought to common attention and assessed.

There are different types of PD, and when defining the goals of programs or development projects, the type of PD should be defined [8]. First, passive participation means that primary stakeholders are informed about what is going to happen or has already happened. People's feedback is minimal. Second, participation via consultation by outside researchers or experts provides answers to the questions. Third, participation by collaboration forms groups of stakeholders to participate in discussion and analysis of pre-determined objectives. Fourth, empowerment participation means that stakeholders are capable of and willing to initiate the process and take part in analysis. This leads to joint decision-making.

To summarize, in this study, we apply the PD framework to attain morally good relations between clients and vendors in ISD. To strengthen the PD approach, we use dialectics to develop better practices from a morals viewpoint. In the next chapter, we will show how we collected empirical data about client–vendor relations. The empirical results will be used in the formulation of the PD-based program.

3 Research Design and Analysis

Interpretive approaches are recommended for studying complex IS phenomena [27]. Such approaches involve studying how individuals interact with the world around them and how they understand reality [28, 29]. As our research question concerns a complex real-life phenomenon, ethical issues in the IT field, we adopted an interpretive approach,

and we gave the subjects the opportunity to express themselves in their own terms in textual survey responses [30]. Next, the data gathering is described.

Dialectics (e.g., [9, 11]) steered the question formulation as follows. According to dialectics, social intercourses are inherent contradictions, or opposing forces. Therefore, we asked our respondents to define both the moral concerns in the IT field and good practices (thesis and antithesis in Fig. 2). We expected to receive responses that reflect opposing sides for the same concerns. By having the moral concerns and good practices confronted in a PD-based program, the practices might change (synthesis in Fig. 2).

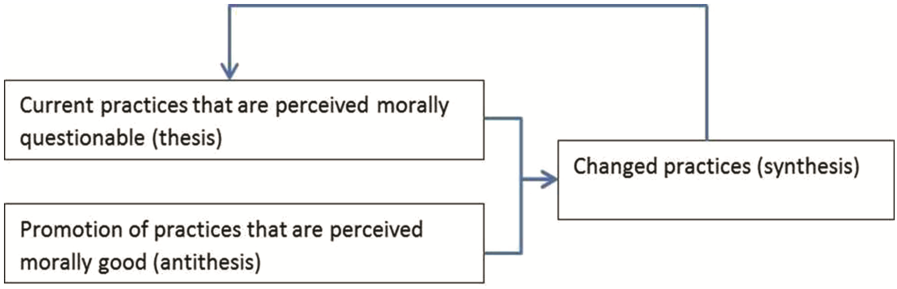

Fig. 2. Model to develop ethically sustainable cultures in client–vendor relations in the IT field.

To gather data about moral concerns and good practices, we developed a survey including the following tasks for the respondents:

1. What ethical and moral questions have you confronted in your IT jobs during the few last years? Describe your role in those situations.
2. Describe the reasons or factors that affected the emergence of the above-described questions. Reasons and factors may be values, norms, or interests that are in conflict with each other.
3. What ethical and moral questions are topical now?
4. What ethically sustainable and good practices you have observed in the IT field and in your own workplace?

To get a representative sample, we used the membership records of the Finnish Information Processing Association. First, we sent the survey to 1,000 members. We got 11 responses. Then we published the survey on the Association's web page and got nine responses. In total, we received 20 responses.

Eleven respondents were male and nine were female. With respect to age, one was in his thirties, seven in their forties, seven in their fifties, and four in their sixties. Six of the respondents were employed in ICT services, three by industries other than ICT, and two by the government. Four represented education. With respect to position, five respondents represented project management, four ISD development, three education, two IS support, and two management.

The majority of the responses considered client–vendor issues. Therefore, as Claybaugh and Srite had found three issues in bad and good client–vendor relations—individual, technological, and organisational—our analysis process focused

on the identification of morally questionable practices and good practices relating to these three issues [3]. After recognizing the practices, we used the dialectical framework together with the PD framework to define a PD-based program for client–vendor relations in ISD. Next, the results are presented.

4 Results

In the following section, we show the moral issues and good practices reflected through Claybaugh and Strite's classification [3]. After that, we provide a suggestion for a PD-based program to develop client–vendor relations.

4.1 Practices Reflected Through Claybaugh and Srite's Categorization

4.1.1 Individual-Related Practices

With respect to individual-related immoral practices working against one's conscience, inequality in the workplace and inadequate education or training for the work tasks emerged. Some of these issues directly affect client projects, such as issues on education and training. In some issues, it is possible that they indirectly affect projects, such as working against one's conscience and unequal treatment of employees. Examples follow:

"Ageism - oppressing the weak ones." (Respondent 3)

"Management does not care about employees education: Certain skills are needed for the client project but management does not care."

The subjects raised the following good practices that relate to individual levels: Taking responsibility for one's work, respecting humans, taking consciously into account equality issues, and honesty and trustworthiness. Exemplary extracts follow:

"Making learning in workplace possible (master-apprentice)." (Respondent 3)

"Respect other people as humans. Trustworthiness and honesty - also when confronting problems. In my current workplace there is unfortunately no sustainable or good practices." (Respondent 11)

4.1.2 Technological-Related Practices

With respect to technological-related immoral practices, the respondents raised the issues of using certain methods that do not serve larger purposes of the client. An example follows.

"Also the agile methods are a problem. We quickly produce a prototype that works but we do not consider the business setting as a whole and we do not produce solutions that would be for use in larger context." (Respondent 17)

With respect of good practices a practice related to long-term planning was raised:

"Architectural planning is sustainable development, you get good systems and you are able to maintain and extend them in a sensible way." (Respondent 1)

4.1.3 Organisational-Related Practices

With respect to immoral practices, the relations between client and vendor seem to be disturbed by economic interests and disputes. According to the respondents, the economic benefits override the needs of clients both at individual and organisational levels. Examples follow.

"You have to produce an oversized system for the client. You take the extra money from client. You do not respect the client anymore. … The management had interests that are against morality. I hold my beliefs and produced the solutions that are in accordance with the needs of the client. I was not fired." (Respondent 5)

"Hunting for personal bonuses overrides sensible comprehensive solution. A duet between a foreman with low self-esteem and a subordinate with more knowledge is rarely enjoyable. A subordinate with knowledge is a threat to the foreman." (Respondent 13)

"When leading IT projects, I feel it as a constant conflict that the best possible solution for a client (internal or external) is not implemented. The other problem that I confronted in the public sector was that the best solution does not win the competitive bidding, but the solution is selected from the vendor that best 'fits' to the individuals that make the decision." (Respondent 17)

Public sector-related immoral practices emerged in the data. According to the respondents, the set-up of procurement in public sector IT solutions is biased in such a way that making honest bids is not possible. Two examples follow.

"A problem that I confronted in the public sector: the best IT solution does not win the call of offers, but instead the solution is bought from the vendor that best 'suits' the decision-maker. … It is sad to be forced to lead a project that you know that the end results will not serve the users in the best possible ways and that the other option would have been better and cheaper. Public procurements are a farce. You can twist the selection criteria and the arguments to the form that the selected solutions pretend to be the best ones. There is no use to use time for assessment rounds when the decision is based on how well the decision-makers have been bribed." (Respondent 15)

"I am working in IT sales and most of the ethical and moral problems that I have confronted I have confronted in situations when a public client has had too strict requirements in their call for offers. If vendors acted ethically and morally and they honestly and correctly made an offer, no one would get any points in the competition. To succeed in the competition, one has to knowingly interpret incorrectly [the call for offer]. This harms the buyer and society." (Respondent 16)

With respect to good practices at the organisational level, the respondents raised honesty and transparency as important values. Examples follow. "Guidelines and policies take into account ethical and moral viewpoints, and they are adequately raised in discussions (cf. corporation values)." (Respondent 4)

"Honesty, and the practice that we help clients in need, although their problem would not concern us at all." (Respondent 7)

"Old people who have experience are 'mixed' into projects to bring capabilities on wholes. Internal calls for jobs inside the firm. With this kind of practice we avoid a professional becoming a person of one application." (Respondent 13)

"Honest practices in work, towards each other. You quite seldom see it, but I believe that it sustains. Many clients do not appreciate honesty, and public procurement does not favour that." (Respondent 16)

"Good management is vital in getting good end results. Motivated staff does the work well. Transparency of the corporate culture is important […] in the way that there is nothing that needs to be disclosed." (Respondent 17)

4.2 Participatory Design-Based Program for Developing Client–Vendor Relations

We propose a program based on PD [8] to develop client–vendor relations in ethical issues. The goal of this program is to achieve the state of "morally good relations" (an extension of "good relationship" by Claybaugh and Srite [3]); it adopts the viewpoint of empowerment, presuming that the stakeholders are willing and capable of collaboration, developing the relations, and taking actions. In practice, this kind of program could be organised by national or international associations.

Table 1 describes the stages of the program. Currently, we are at the research stage. Our current findings show that there are major moral issues to be considered, and therefore the next step in this stage is to get stakeholders involved for collaboration. When at the design stage, the practitioners representing both client and vendor roles are invited to develop joint norms for the client–vendor relations. The workshops might start with the presentation of the results of this study and then with the contemplation of morally suitable practices (synthesis). This requires that the participants not only become aware of the moral challenges in relations (cf. moral sensitivity [32]) and have willingness to make changes, but also to act upon the new practices (cf. moral motivation and character [32]). This also requires that the underlying reasons for the emergence of the ethical issues are articulated. For the implementation phase, the guidelines for better practices should be enforced into practice. The evaluation phase would assess the possible needs for the succeeding rounds.

Table 1. The stages of the PD-based program

Stage	Description
Research stage	Moral concerns and good practices understood at the individual, technological, and organisational levels
Design stage	Production of action-guiding norms for client–vendor relations in ISD
Implementation stage	Implementation of norms in ISD
Evaluation stage	Evaluation of the implementation of norms

Taking the types of PD [8] from passive participation to participation by consultation or collaboration and empowerment, it is important that, in the PD-based program, the stakeholders are committed to the program. Commitment might be best achieved via participation by collaboration and empowerment. Participation by collaboration means

in this program that stakeholders are invited to workshops to design solutions. Empowerment means that those who take part in workshops aim to put forward the action-guiding norms in their organisations.

Example Collisions of Thesis and Antithesis. By forcing thesis and antithesis to collide, we aim to morally develop the current practices. The recognition that there are competing forces—immoral impulses and understanding of what is morally good—represents the two contradictory sides of the same phenomenon (cf. [9, 10]). As an example, the respondents raised many issues on treatment of client staff, such as not having the proper education or training and unequal treatment. As good practices, respondent described conscious training of staff and mixing people with different experience levels on projects. The discussions on these polarities might entail guidelines for client organisations, such as emphasizing education, training, and knowledge transfer in an organisation.

5 Discussion

First, we were able to show that there is a moral aspect inherent in the client–vendor model by Claybaugh and Srite [3]. All three categories of the model—interpersonal, technical, and organisational—include moral questions that our respondents were able to report. Our results show that client–vendor relations are prone to serious moral hazards, such as dishonesty towards the client by the vendor by abusing the client to the vendor's own financial benefit and not investing in serving the needs of the client. Also, the reverse was visible: the client tried to "smuggle" into the deal parts that would cost the vendor extra, but not be clearly visible during the negotiations. Therefore, it is not surprising that the core categories of the relations were named "good relations" and "bad relations" by Claybaugh and Srite [3].

Second, the results show that perceived immoral practices in client–vendor relations concerned economic issues. These practices could be explained by the dirty hands dilemma of business [31]: The dirty hand dilemma is based on the tension between efficient functioning of the business and stakeholder interests. Stakeholder demands have to be met at minimal cost; otherwise, the corporation will not function efficiently. Therefore, to simplify the dirty hands dilemma, and to act responsibly (ensuring the existence of the corporation), one has to act immorally (regarding individual stakeholders). With respect to our results, it seems that profit maximization prevails in client–vendor relations: Clients' needs are not of real concern, but instead clients are used as cash cows, and resources for staff education are not allocated, affecting the quality of client solutions.

Third, our results showed that there are differences in public and private sector IS procurement. On the public side, the organisations were worried about budgets that went over, content that was not delivered, and promises that were not kept, whereas the private side was concerned with the client trying to get considerably more out of the deal than was—according to the vendor—negotiated for. There seems to be increased concern and frustration towards public sector IS development. While the answers indicated the frustration in observing and working on unethical projects for both the procurement

process (e.g., mandatory lying, biased selection of providers, etc.) and development (e.g., poor quality, intentionally increased amount of work to charge more), the underlying reasons for bad client–vendor relationships [3] should be considered: As Heimo et al. [20] state, the responsibility in the public sector lies with the governmental office. The activities of these offices are directly mandated by laws and regulations, and their motivation differs from the motivation of a private organisation. According to our survey, the client–vendor relationship between the vendor of the IS and the governmental office seems to be missing efficient, economical, and ethical factors required for the IT specialists to be satisfied with the ethicality of the situation. While the procurement and development should only be a technicality in choosing the best vendor available, our data indicate that the developer is not only chosen unethically, but there also lies disagreements during the development and upkeep processes. These problems should, according to Heimo et al., be solved by allocating responsibility and encouraging public discussion [20].

The different responsibilities in the situations of a private organisation versus a public organisation are shown partly similarly, partly differently. In a private organisation, there is, at least theoretically, a responsible party (CEO, CIO, the board) who is responsible to the stockholders. In a public organisation, the responsibility disappears into the system if the procurement process has followed the requirements of the law, however deficiently it may have been applied. We argue that, through the thesis-antithesis-synthesis thinking, the responsibility could be made visible to the parties participating in the procurement, and thus it could be included through PD practices, but only after it is visible.

Even if we keep in mind the difference in public and private sector portfolios and stakeholders and organisational motivation, as well as the use and management of IS in general [15], it would be naïve to assume that there are no problems in the private sector. The problems can vary according to the organisation, but the information about the problems in private sector IS procurement is not that likely to reach the public. This is due to the private nature of these organisations, and thus it is not represented in a similar magnitude in both scientific and public discussions.

Fourth, we proposed a PD-based program for developing practices in client–vendor relations. The program suggests that the immoral practices and morally good practices should be put under analysis by IT professionals to develop morally better practices. The dialectical process is beneficial from the viewpoint of developing awareness of moral issues [32]. However, awareness is not enough; good practices should be put into use.

Evaluation of the Study and Future Studies. Although the number of respondents in our survey was relatively small, the respondents described moral concerns and good practices in many sentences. As a collective, the respondents were capable of producing contradictory perceptions on similar issues. This suggests that the dialectical process we defined might work in a PD environment. This also strengthens the internal validity of our study. As the program we propose in this study is in its early stages, future studies should continue with the action research approach.

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Narrative Ethics of Personalisation Technologies

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Abstract. Personalisation of digital content is becoming one of the major focus areas of contemporary research in human-computer interaction. Interactions between humans and computer systems such as information retrieval operations, digital learning and self-monitoring are "tailored" to the needs of the human user. In this paper, we aim to increase our philosophical understanding of personalisation and of its ethical implications. We utilise a framework of ethics of narrative technologies that is based on the narrative theory of Paul Ricoeur to explicate how personalisation processes shape the person and interpersonal relations. We argue that personalisation processes can actively configure the narrative understanding of a person they interact with – by which they can implicitly change or re-enforce a person's normative worldview. Also, personalisation processes can abstract from the world of action by means of profiling – which can have significant risks with regards to the consistency of a person's character.

Keywords: Personalisation · Ethics · Narrative technologies · Ricoeur

1 Introduction

Computational processes become increasingly "close" to us: they interact with our bodies, movements and emotions and occupy a central place in our daily lives. In line with this development, "the person" has been brought to the centre of the research on design of computer systems. In the contemporary context of "Big Data" systems [1] and an increasing "information overload" on the web [2], it has become progressively important to get the right information in the right way to the right person at the right moment in time [3]. In marketing studies, this has led to questions such as how "to tailor electronic commerce interactions between a business and each individual customer" [4]. In computer science, it has led to improvements of methods for "user profiling", "behaviour preference" and "personalised search engines and recommendation systems" [5]. Basically, research in personalisation aims at adjusting digital content to the needs, preferences, desires and whims of the person interacting with it.

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The process of personalisation invariably integrates underlying assumptions about what a person is and – more importantly – about what we can understand as the right information for the right person. It is an automated process of categorisation, and therefore of inclusion and exclusion of both digital content and of "digital personae" or profiles from the information we access. As a result, personalisation processes can influence what type of information we retrieve from our search engine, what kinds of products are recommended to us when browsing online, and what kind of feedback we receive about our daily activities. Also, personalisation processes are used by intelligence agencies to identify suspicious individuals and by insurance companies to establish people's personal credit ratings. Accordingly, these increasingly ubiquitous computational processes that directly influence many aspects of our everyday lives can have significant ethical implications. For instance, de Vries argues that ethical concerns arise from cases of implicit discrimination based on profiling [6]. Moreover, Bohn et al. argue that the practice of matching digital persona with profiles that present a public security concern has ethical implications because it can lead to mass-surveillance practices [7]. In a different vein, Schubert argues that the use of personalised technologies that nudge their users in certain directions can lead to a reduction of personal autonomy and agency [8].

Most of these ethical analyses of personalisation processes seem to focus directly on their effects, without explicating how we can actually understand the process of personalisation. In this paper, in contrast, we aim to contribute to the existing ethical reflections by engaging in a discussion of how personalisation processes mediate "the person": showing that the person is often wrongfully understood as a collection of static attributes and offering an alternative understanding, in which the person and the technology are co-shaped, or rather configured, through interaction with personalisation processes. We argue - to use the terms of Verbeek - that in order to understand the ethical implications of personalisation processes we need to understand what kind of "I-technology-world" relationship they constitute [9], that we should make explicit how they interact with a human and how the human is transformed in this process. However, we also aim to overcome some problems that theories of technological "mediation" such as Verbeek's confront us with in understanding personalisation processes. As an alternative approach, we use a framework of narrative technologies, which is based on Paul Ricoeur's major work on narrativity: Time and Narrative [10]. With this framework, we can better understand how human understanding of our technological world changes through interaction with textual technologies such as computer systems. We will first investigate the concept of personhood in the context of personalisation technologies. Second, we will present the framework of narrative technologies that is based on Ricoeur's narrative theory. Third, we will apply this framework in order to identify and understand the ethical implications of personalisation technologies.

2 Personalisation Technologies as Adaptive Mirrors of Personhood

The process of personalisation is applied to a wide range of different technologies; but it generally revolves around notions of "adapting", "fitting" or "tailoring" digital

content to the human being(s) interacting with it. A central term in personalisation research is said to be the "adaptability" of a system [11]. Adaptive systems include three basic models in their design: a "user model" that is a structured model for the collection and categorisation of personal data belonging to a user, "an application model", which is a description of relevant features of the application, and an "interaction model" that is meant to structure the organisation of interactions between a user and a system [11]. Asif and Krogstie argue that multiple personalisation approaches exist that can be based on "machine-learning algorithms, agent technology and ubiquitous and context-aware computing". They identify a "basic level" of personalisation, at which a user selects a certain configuration of a computing device or interface, which subsequently remains the same [12]. This basic level corresponds with the conventional, instrumental view of a personalisation technology: of the human user actively configuring its settings. Then there is a "second level", at which the configuration of a system is based on a "profile" of the user, and a "third level" at which both the profile of the user and his or her "context" (mostly comprised of meta-data such as location, time of the activity, type of activity) are used as the basis for the configuration of the system. Bouzeghoub and Kostadinov make a distinction between profiles and queries: a profile being a "user model" "defined by a set of attributes" and a query being an "on-demand user need" [13]. Roosendaal offers an additional, distinction, namely one between "digital personae", which are representations of known individuals in the real world and "digital profiles" which are sets of characteristics about persons that can be used as inputs for algorithmic decision making [14].

A clear example of personalisation based on a digital persona and profiles is an automated passport check at an airport [15]. When someone's passport chip is scanned, the retrieved data is compared with a data entry containing the document number belonging to the respective person, accompanied by her picture, biometric information and information about country of origin, age, and so on. Based on an algorithmic assessment of this personal data, the person can either pass through or will be held and interrogated by the border police. In this process, the digital persona can be compared with and transformed into a digital profile, for instance by linking it with a certain profile containing passport features that are deemed "suspicious", or by using it to add to the digital profile of people originating from the same country. What all processes of personalisation such as the automated passport control have in common is that they use interactions with humans to gain knowledge about them and create a representation that changes the behaviour of a system in order to fit, adapt to or be tailored to this representation. The purpose of many instances of personalisation research is to make sure that the behavioural changes of the system approximate the expectations, wishes and/or needs of the human interacting with it. Terms like tailoring suggest that the user – the human agent – is seen as a given, as a static point to which the personalisation processes need to adjust. Just like a tailor adjusts the sizes and shapes of a piece of clothing to the human body that remains the same (or rather, that is defined by fixed measurements), personalisation processes are supposed to be tailored to users who are presumed to remain the same. Accordingly, user needs or preferences are supposed to be fixed. For instance, it might be assumed that the user of a weather application has the fixed need

of knowing what the weather will be the next day in her city and on request a personalisation process will link the data of her location and weather forecasts to provide for the desired information.

However, scholars in the area of philosophy of technology have claimed that such an instrumental approach does not adequately capture how humans and technologies interrelate. Ihde explains that "technologies transform our experience of the world and our perceptions and interpretations of our world, and we in turn become transformed in this process" [16]. Accordingly, we argue, personalisation processes could be seen as "mirroring" processes, in a similar sense as Hegel and Lacan gave to them, rather than as mere adjustments of computational outcomes to the static user needs [17]. By looking into the mirror, the perception of the self changes because the subject suddenly becomes aware of herself as an object as well: she engages in a process of self-reflection. Dennett argues that the consequent idea of "self-consciousness" – or the ability of the self to reflect on the self – is one of the necessary conditions for personhood [18]. However, the "mirror" that we engage with in the sense of personalisation processes differs from the static idea of a glass mirror for it actively adjusts to the user interacting with it. Here, we juxtapose the conception of a static person "subjected to a set of rules in whose making he or she had no part" [19], which supports conventional views of personalisation, with a mediated conception of the person as changing during interaction with personalisation technologies. This confronts us with the question: if interaction between a human and a personalisation technology results in a constant "mediation" [9, 16] of the "I-technology-world" relationship, and consequently in a mediation of the personhood of a user of the technology, how can we make sense of this process? To answer this question, we turn to the work of Paul Ricoeur.

3 A Framework of Narrative Personalisation Technologies

Current theories of technological mediation have certain drawbacks in accounting for the kinds of mediations (the kinds of human-technology relations) personalisation processes constitute. First of all, after the so-called "empirical turn" [20], theories of technological mediation have been drawn away from analysing the linguistic aspects of technologies, as they were present in classical analyses of technology (Heidegger; Ellul), because they became preoccupied with technologies' material dimensions [21]. This disregards the highly linguistic, or textual character of many of the mediations that personalisation technologies bring about. This problem not only relates to the linguistic nature of software in general but also, and perhaps more importantly, to the linguistic nature of the information with which the user engages (search results, nudges for information input, etc.). Secondly, these theories often display a highly individualised approach (focusing on the "I" in technological mediation) and therefore can less adequately account for the mediation of what van den Eede designates as "being-with-each-other" relations [22], in the context of personalisation. As Kitwood argues, personhood needs to be understood as requiring a "living relationship with at least one other" person [19]. We cannot talk about an "I-technology-world" relation when the technological mediation of a "person" essentially revolves around a "we-technology-world" relation. For instance, consider a personalisation process that tells an intelligence agency

something about a designated category of individuals. In this case, a mediation of an inter-subjective relation is at play - between an institution and a socially constructed group of people.

Coeckelbergh and the first author of this paper have started developing a "theory of narrative technologies" that tries to account for the abovementioned inadequacies of current theories of technological mediation [23, 24]. This was done by taking the work of Ricoeur as a valuable starting point for thinking about technological mediation, as Kaplan already suggested [25]. The suggestion is that the model of mediation of human experience by means of a text, as explicated by Ricoeur, can be used as a model for explicating the mediation of human experience by technologies. In his seminal work Time and Narrative, Ricoeur develops a theory that draws from the writings of Augustine and Aristotle to provide a structural account of how narrative understanding, through the engagement with texts, mediates human experience [10]. He aims to ground what happens once a human interacts with a text, by conceptualising it as a process consisting of three distinct moments: the prefigured time at the initiation of the interaction, the configured time during the interaction and the refigured time after the interaction has taken place, at which the world of the text merges with the world of the reader. Ricoeur argues that texts mediate our narrative understanding, which is always a public understanding [26] and therefore deals with inter-subjective relations. We argue that the process of configuration, as explicated by Ricoeur, offers an adequate model for understanding mediation of information and communication technologies (ICTs), especially in the case of personalisation technologies.

Even though a theory of narrative technologies might be less suitable for understanding the individual, material co-shaping of humans and technologies, such as is at stake with wearing classes or a prosthesis, we argue it can much more adequately account for text-like technological mediations that revolve around inter-subjective relations, which are at stake in this paper. Based on Ricoeur's theory, we established two dimensions of technological mediation that characterise the process of configuration: the dimensions of activity and of abstraction [23]. Activity refers to the extent to which technologies actively configure human narrative understanding. This can be explained by drawing an analogy between "reading" of personalisation processes by a user and the "reading" of data by a computer. Notably, we do not want to argue that interpreting of information by a human is in any way the exact same process as symbolic manipulation by a computational system (see e.g. Searle [27]). Rather, we want to draw the attention to the simultaneity of the activities we usually designate separately as reading and writing. Whenever a computer reads out certain data, simultaneously data are written, which implies that the processes of reading and writing interrelate. Similarly, whenever a person "reads" the output of a personalisation process, her narrative understanding is "re-written", which means that her experience of the world changes. At the same time, interactions with personalisation processes "re-write" those processes, which leads us to the claim that the technological mediation of personalisation processes can be characterised as a process of active configuration. Arguably then, the three levels of personalisation identified by Asif and Krogstie signify an increase with regards to this dimension [12]. This means that the more personalisation technologies are able to interact with the context of a user (location, time, personal network), the more that they

actively engage in a process of changing her narrative understanding, and consequently in configuring her experience of the world. To illustrate this difference: a modern technology such as a microwave might be personalised, in the sense that a user can configure its settings according to her personal preferences, but such a basic, non-contextual level of narrative configuration is still fairly passive. In contrast, the earlier mentioned automatic passport check can be regarded as an active personalisation technology for its configuration changes according to its interaction with a human and simultaneously the human understanding of the technology is configured (as a result of displayed information and nudges to engage in certain actions).

The second dimension of abstraction can be understood in line with Heidegger's notion of modern technologies transforming aspects of the human life world into "gestell", or standing reserve [28]. The collection and processing of personal data transforms aspects of our personhood (e.g. age, gender, occupation) into standing reserve, the raw material of the personalisation process. Abstraction, in Ricoeur's work, is the result of narrative structures in a text that enable it to configure so-called "second- and third-order entities", or higher-order entities [10], which are entities that abstract from the world of human action. For instance, although somebody engaging with his phone to buy and sell derivatives on the stock market is a first order entity directly engaged in the world of action, the "derivatives" and "stock market" she engages with are abstracted from the worlds of action they mediate. That is, a derivative trade configures a "distance" between its interaction with a user (the person initiating the trade) and the effects it has on the world of action, in which for instance people are forced to sell their house because the derivatives drop in value [29]. The closer mediated interactions with ICTs stay to the world of action, as for instance in a game in which the characters and the plot are configured in a meaningful narrative whole for the player who "acts" in it, the less abstraction a narrative configuration brings about. In that sense, the construction of a "digital persona" as described by Roosendaal leaves the user relatively close to the world of action though the "profiling" of a user [14], in which types of persons defined by measurable variables invoke certain responses of a system abstracted from the world of action. For instance, the automated adjustment of credit ratings based on certain profiles (containing for example gender, ethnicity and occupation), is an example of personalised abstraction for it detaches the generated process from the world of action of a particular person.

4 The Narrative Ethics of Personalisation Technologies

By using the framework of narrative technologies, we have established two claims: (i) that personalisation processes actively configure our narrative understanding - progressively so the more they interact with the context of a user - and that they – depending on the design of the technology – (ii) are capable of abstracting from the world of action. As such, we contend, personalisation technologies are highly similar to the paradigm of the text as discussed by Ricoeur (reference): they are very textual technologies. This means that, just as a reader's experience of the world might change by engaging with a piece of literature or by watching a stage play, his experience of the world might change by interacting with digital personalisation processes. Such a process of personalisation

is perhaps best described by Needham, who argues that personalisation in a context of the design of public services "can best be characterised as a 'story-line'" [30]. In other words, personalisation processes configure the narrative structures, or "stories" in an abstract sense, that underlie what Dennett described as one of the necessary conditions for personhood.

This view firmly opposes the idea that personalisation processes in some way get tailored to static user needs. Rather, they in turn configure these "needs": these needs change according to the changes in the narrative understanding of a person. The idea of the person that underlies this argument ties in with the ideas of the 'narrative self' as put forward by scholars such as McIntyre and Taylor, who argue for the "narrative character of human life" [31] and that we "grasp our lives in a narrative" [32]. According to this idea of personhood, a person's character is shaped according to the narrative structures (the "stories") that configure her narrative understanding through interaction with her life world, which in our time is highly technological. According to Kamtekar, we can understand the notion of character as: "a more-or-less consistent, more-or-less integrated, set of motivations, including the person's desires, beliefs about the world, and ultimate goals and values" [33]. When engaging in an ethical analysis of such a notion of configuration of a person's character, we are not merely focussing on evaluating the direct consequences of actions or the design of rule-based patterns of behaviour that can be either right or wrong. The focus on configuration of a person's character instead of consequences (which would lead us to consequentialism) or rule-based systems (which would lead us to deontological ethics), leads us to consider virtue ethics - which takes character as a central notion - as an adequate basis for evaluating personalisation processes in the framework of narrative technologies. Indeed, as van Hooft shows [34], Ricoeur's hermeneutics is strongly related to the tradition of virtue ethics and adds to it in important ways. In virtue ethics, the notion of a "virtuous" character, or virtuous person, depends on the consistency of motivations and on the extent to which these are non-conflictual. Thus, in order to evaluate the configuration of the person through personalisation processes, we should inquire how the narrative structures configured by these processes influence a person's motivations: the extent to which those are configured in a consistent and non-conflictual manner. Notably, we are therefore not only interested in the ethical impacts of a personalisation process on the user, but also on other people affected by it, such as care-givers in the case of assistive technologies or on insurance agents in the case of personalised credit ratings.

First, we consider the ethical implications of active configuration. This characteristic of personalisation processes implies that they are very powerful tools for either re-enforcing the world-view of the user or for refiguring it. A strong example of this is what Introna and Nissenbaum designate as "the political effects" of search engines as they exclude certain political sources and include others, based on a user's profile [35]. A democratic voter in the United States might therefore be confronted with search results that exclusively link to media that favour the views of the Democratic Party; based on her "personal needs" and re-enforcing her narrative understanding. However, this process applies also to the more ordinary, everyday activities of users of personalisation technologies. For instance, wearable personalisation technologies such as assistive technology devices constantly monitor the location and bodily state of a person who is in

need of care and interact with this person or with her caregivers [36]. Similar wearable devices can also be used to interpret a user's behaviour and bodily processes according to profiles of "productive" and "non-productive" workers, and can nudge a user to engage in daily exercise in order to be more productive at work. Such technologies are less explicitly political, but can have an even more pervasive influence on the "character" of the human interacting with them, for certain values like a "work ethic" and a preferred "life style" can be embedded in the personalisation processes. We argue that these effects show that we should consider personalisation processes as comparable to the conventional human processes in which media are produced: as automated journalists and writers who constantly confront us with information that configures our narrative understanding. Therefore, the ethics of personalisation processes should mirror an ethics of the public sphere, improving the means for a user to engage in a deliberative process with the technology and ensuring a pluralist character of information that can be accessed through the technology. For instance, this could imply that the underlying values of nudging technologies such as wearable devices on the work floor should be made explicit and subjected to a democratic process of deliberation between the workers. As such, design of the nudges configured by devices could change according to the agreed-upon purpose that is assigned to the technology by the workers.

Second, we consider the dimension of abstraction from the world of action. This implies that a user's narrative understanding engages with "second- and third-level" – or higher order - entities as conceptualised by Ricoeur that abstract from the world of action they mediate (reference). This process reflects what Coeckelbergh designates as the "distancing" effect of technologies; the capacity of technologies to constitute (moral) distances between humans who engage with them and the reality they mediate [29]. We argue that abstraction by means of personalisation technologies carries with it the risk that a person's motivations are made inconsistent and brought into conflict with one-another. Kitwood discusses this risk in the context of care relations, arguing that the normalisation that is implied in many personalisation processes (for instance, "profiling" a patient to fit care services to needs of her patient type), goes fundamentally against the idea of being a person [19]. Personalisation, he argues, ought to account for the uniqueness of the person. As Ricoeur [10] also argues: narrative structures help to understand the particular, the situated, rather than the general, the universal. The risk for inconsistent or conflicting motivations especially persists when personalisation processes are used to confer indirect, technologically mediated judgement on a person based on information generated by profiling. For instance, an insurance agent might reject a person's request for an insurance contract, based on a digital profile that itself is a higher-order entity. Inconsistency can arise because even though the insurance agent might be motivated to provide people with the best insurance contracts, his judgement can be misguided for it is not based interaction in the world of action but on an abstract representation; by for instance including variables like a person's music taste or ethnicity. This process simultaneously mediates the world of the user who tries to obtain her insurance contract; for decisions based on the digital profile she is related with can influence her senses of financial freedom, status or self-respect. As such, even abstract personalisation processes can function as the earlier mentioned adaptive "mirror" that changes the self-perception of the persons interacting with them.

5 Concluding Remarks

In this paper, we discuss the narrative ethics of personalisation processes that increasingly influence our daily lives. Adding to existing ethical analyses, we base our investigation on an understanding of technological mediation of the "person". To do so, we depart from established theories of technological mediation and utilised a framework of narrative technologies that is inspired by Ricoeur's work. We first argue that personalisation processes are powerful tools for re-enforcing or configuring the narrative understanding of the people interacting with them. This makes them into technological agents that can influence people's political or even everyday worldviews. Secondly, we argue that personalisation processes configure narrative structures that abstract from the world of action. This carries with it the risk that they configure inconsistencies and conflicting motivations with for the virtuous character of the persons interacting with them.

Our analysis contributes in different ways to existing debates on the ethics of personalisation technologies. First, we provide a philosophical understanding of personalisation that goes against instrumental the idea of "tailoring" digital contents to the static needs of a user and instead shows how a "person" also changes in the process of interaction. Second, we link the structured understanding of technological mediation that we gained from Ricoeur's narrative theory to ethical theories of person's character, which enables us to provide a normative account of "personalisation". Third, our analysis goes beyond explicating ethical implications for only the users of personalisation processes. For instance, not only the person whose interaction with personalisation processes results in a credit rating is affected, but also the person consequently utilising this rating.

An initial step in dealing with the ethical implications of our analysis would be to include considerations of narrativity in the design process of personalisation processes. This approach is currently gaining momentum, being referred to as the "narrative approach to personalisation" [37]. Especially in game-oriented designs of digital education environments, designers focus on the "personalisation and adaptation of Story-based Digital Educational Games" [38]. For instance, by using technologies based on these design principles, a user can "co-author" the narrative structures she engages with. These design practices could deal with the issues of abstraction, for users would be drawn nearer to the world of action. Eventually, a broader ethical program would be needed to ground the effects of personalisation technologies that will become increasingly pervasive in our lives. One of the key issues will be to discuss the impact of these technologies on the mediation of our public sphere: how we want them to configure our public deliberations in the political and cultural realms.

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Communications

“Break the Ice”: The Use of Technology to Initiate Communication in Public Spaces

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Abstract. The use of mobile technologies in public spaces often serves to disconnect users from their surroundings and alienate them from current social setting. However, digital interactions are often seen as the most appropriate method for communicating with strangers because they can be impersonal and free people from the fear of face-to-face rejection and social judgment that is based on first appearance and impression. This paper aims to explore if the perceived sense of security when using internet and mobile technologies for communication could also be established in a public setting of a cafeteria and benefit individuals when they are lonely in a public space. For this purpose, we built a technology probe that facilitates digital interactions (e.g. games, instant messaging, collaborative sketching, etc.) between collocated individuals in a public settings of a cafeteria by placing tablet computers on all tables. Our exploratory study shows that people could benefit from such a system as it is likely to alter their common behaviour—a result of a new possibility of initiating communication without the fear of jeopardizing their integrity.

Keywords: Privacy · Mobile technology · Security · Intimacy · First contact · Rejection · Digital interactions · Technology · Communicating with strangers

1 Introduction

The research on internet use and its effects on sociality has produced a significant amount of work ranging from studies that suggest internet’s negative effects on one’s social network to studies that emphasized benefits of using such technology to increase one’s social capital. The latter have dominated in the last decade underlying benefits such as relative anonymity, perceived sense of security behind the screen, and absence of physical contact. However, the anonymity and lack of nonverbal clues can leave digital only relationships open to wrong interpretations and assumptions about the person on the other side [1]. Moreover, all the studies presented in next section have focused on distant communications which gained dominance with ever greater connectivity and availability of mobile devices. In this paper we aim to exploit the benefits of mobile technologies and internet communication to initiate collaborations within physical public space where people could end up being alone (e.g. cafeteria).

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2 Related Work

Over the last three decades a large amount of literature on correlation between the use of internet and social interaction has been published. Earlier studies suggested that internet use at home has a strong negative impact on time spent with friends and family [1] and contributes to: smaller social networks, a decline in social engagement within one's household and increases the risk of depression and loneliness [2]. However, more recent studies have found that internet usage does not make users depressed or lonely but instead facilitates communication between geographically dispersed family members and friends [3], and supports communities through discussion and mobilization around local issues [4]. Internet can also foster new relationships based on shared values, beliefs and interests [3]. Moreover, if sufficient trust is established these relationships may reach out of the digital domain [3, 5, 6].

Several models of who is benefitting from online communication have been proposed. The "rich get richer" suggests that people who do well socially in the physical world benefit most in the digital domain [7, 8]. Alternatively, "social compensation" model predicts that those with difficulties in maintaining offline social networks might benefit from internet sociality [8]. Both models have been criticised for not taking user beliefs, motivations and other personality variables into account [9, 10]. Tufekci's study supports "seek and ye shall find" model, which assumes that for a variety of reasons, users either believe or not in online friendships and it is this belief, which affects acquiring new friends online [10].

Studies have consistently shown that users disclose large amounts of personal information online (e.g. on social networking sites (SNS)) [11, 12], which builds one's personality, establishes common ground and declares friendship connections [13, 14]. The anonymity of others who might access this information does not impact the amount of information revealed. It has been suggested that revealing information has the roots in the "stranger on a train" effect by making people feel comfortable sharing their lives without fearing disclosure [15, 16]. Besides, other factors have been proposed such as larger perceived benefits of revealed information than the perceived costs of possible privacy invasions, peer pressure, herding behaviour, trust in SNS and its members, and the service's own default privacy settings [11].

In addition to relative anonymity, internet also offers relative absence of nonverbal interaction cues, which encourages self-expression. Lack of visual cues has been also seen as liberating users from social judgment of physical appearance and attractiveness which is the norm offline [17, 18]. However, these features of internet communication tend to leave a lot unsaid, unspecified, and open to inference and interpretation. It is not surprising that "one's own desires and goals regarding the people with whom one interacts have been found to make a dramatic difference in the assumptions and attributions one makes within that informational void"[1].

The above has triggered our research question whether these two worlds — (i) the anonymity and perceived sense of security when communicating using internet and mobile technologies, and (ii) the physical presence and nonverbal communication of

[1] [3, p. 586].

physical world — could be coupled and benefit users when alone in public spaces. More specifically our aim is to find out whether mobile technologies can support the outreach to other people in the same physical space (and assist local rather than distant communication) by offering a level of privacy and anonymity when attempting to make the first contact. The privacy can be achieved by keeping the interaction within the digital domain and visible only between the instigator and receiver whilst allowing users to bring communication to the real world through nonverbal communication cues and face-to-face interactions, whereas the perceived anonymity comes from the nature of digital interactions commonly perceived as less personal when compared to face-to-face interactions.

3 Method

For the purpose of this exploratory study we have used technology probes [19]. The study itself has been divided into two parts: (1) the use of probe in real life settings of a cafeteria which focused at understanding the needs and desires of users in a real-world setting and testing the technology, and (2) a focus group session aimed at understanding the needs and desires of users in a real-world setting and inspire users and researchers to think about alternative use cases and technologies.

Participants: We have chosen to recruit students at our university for this exploratory study because students are regular visitors of cafeterias and are heavy users of mobile technologies. In return the students were offered a drink in the cafeteria. 18 participants (referred to as P1 to P18) from 4 different departments applied: mathematics, economics and finance, computer science and bioinformatics. Of these 5 were females and 13 males. The average age was 21. All have been using mobile technologies for 5 years or more. Participants have been randomly divided in two groups of 9 students to make focus groups more manageable.

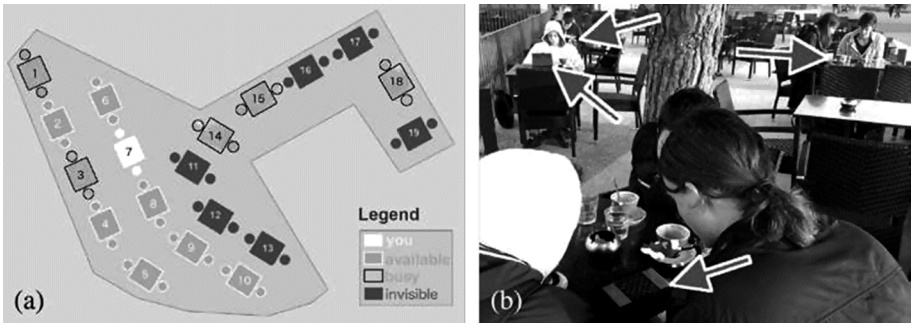

Fig. 1. (a) The map of the cafeteria presented to users on the tablet screen allowing table selection with a screen tap. Tables are colour coded to indicate availability (available, invisible or busy). (b) Users sitting in the cafeteria and using the probe tablets marked by the red arrows. (Color figure online)

1st PART. The probe are tablet computers placed on each of the cafeteria's tables. On a tablet screen, users see cafeteria map with tables layout as shown in Fig. 1a. By selecting one of the available tables on the screen, users can invite visitor(s) sitting at that table to a range of activities (chat, collaborative games and sketching or selfy picture sharing). By default, all tables are in "available" mode and visitors can select the "invisible" mode or simply ignore the requests. The first part lasted for about half an hour in a cafeteria where participants had been having a drink and using the probe. They have been sitting at the table either alone or in groups up to three (see Fig. 1b).

2nd PART. The second part was carried out in a private room where a focus group session was conducted. The questions aimed at discussions about: (i) being alone in public spaces, (ii) technologies to assist people in engaging with strangers in public spaces, and (iii) other non-premeditated topics. The sessions have been filmed, videos transcribed and coded by two researchers. The main findings are presented in the following section.

4 Results and Discussion

In this section, we present results and observations from our study. We describe three main findings about: being alone, breaking the ice when making new friendships, and the probe built to support this process.

Being Alone. All participants do not like the idea of being alone in a public place (e.g. cafeteria). Being alone has been associated with negative feelings, stigmatised and labelled as non-conformant with social norms. The majority of participants eat lunch or drink coffee in various cafeteria around town, however, when they are alone they actively avoid such settings and satisfy their basic needs such as food, coffee and drink in alternative non cafeteria settings (e.g. buy a sandwich or drink from the shop or vending machine and sit on the bench or walk around). However, there were situations when participants do find themselves in public places by themselves. For example, when they are waiting for somebody in a cafeteria or practicing individualistic sport (e.g. running). In such situation they are trying to find something to do (browsing, crossword, observing the surrounding, reading a book, studying) not to broadcast to the surrounding that they are bored, lonely and unaccompanied. If someone looks busy it is harder for others to label them as such. Having said all the above, it is important to note that all participants were students in the age of quickly expanding social circle and being highly socially active [12].

Icebreaking Communication. Participants have all mentioned finding it stressful to initiate a conversation with a stranger. P5 remarked that *"when starting a conversation, I fear I'll make a fool of myself."* The majority have agreed that starting a conversation with a stranger is subjecting them to scrutiny; thus, they are trying to avoid it as observed in [18]. However, there are certain circumstances when this is not the case such as when asking for a little help or a small favour. For example, asking someone for time, directions, a chair in the cafeteria, bus timetables, or a lighter. Even if these conversation

starters look similar they have a decisive property whether the conversation will last or die after a couple of sentences. If the conversation starter is established on participants' common ground (e.g. both are smokers) the conversation may last longer. However, participants did stress out that the majority of such conversations finish after a couple of sentences are exchanged; which is when the stated conversation starting aim (getting help or a favour) is achieved.

Even higher fear of rejection [20] has been detected if a group of strangers is in question. P7 mentioned that joining a group of strangers, even if being invited, is risking of being ridiculed if saying something inappropriate. A constant theme coming up was not knowing strangers and their habits and thus not knowing what to talk about. One exception is team sports, which were mentioned by several participants. Joining a game played by strangers is not an issue since it does not expose one to communicate topics outside the scope of the game. As before, common ground facilitates collaboration and communication. Perhaps surprisingly, the participants would not join the same group if encountered in a different setting (e.g. cafeteria) even after playing a sport game with them.

Technology Probe. Participants in particular liked the possibility of breaking the ice with the probe. It was seen as an initiator of new relationship between people in the same physical space in a similar fashion as this happens on SNS [3]. Making a contact through technology does not feel so personal and even rejection (either rejecting or being rejected) is easier to handle. Rejecting others face-to-face is considered *"insulting for person being rejected and uncomfortable for the person rejecting"* (P7). This sense of anonymity behind digital interactions boosts one's confidence and makes playing games over the probe with a stranger (or a group of strangers) easier than playing physical board game even if both (all) are present in the same physical space. Immediate physical presence requires conversation which is not required by using the probe. Answering to invitations and inviting through the probe is thus not perceived as problematic and does not present a threat to one's' integrity. Nevertheless, participants missed the chat feature in games to be able to communicate. Communicating over the probe provided less chance to a make fool of oneself as users have more time thinking about what to type. Participants also enjoyed the scalability of playing options: table to table collaboration (between single players or groups of players at each table), single table collaboration (people at the same table collaborate and compete together against other tables), and all tables collaborate for a common goal (e.g. solving a quiz for a shared prize).

Another raised issue has been privacy. No technology that would require either personal information (login) or one's own device would be acceptable as it would require user's intervention to make their table available. Moreover, participants also mentioned that the additional step of making a table available through their own device or login would possibly categorize them as socially weak individuals. While dedicated devices all being available all the time would not highlight them in front of others in the cafeteria. Moreover, they mentioned that such technology would even encourage them visit such public physical spaces alone.

5 Conclusion

This paper presents an exploratory study into how the use of mobile technologies and internet could help users to initiate communication in public spaces. The main finding of the study is that even in public spaces where people are physically present technology provides a sense of anonymity and security, and can help people to break the ice in forming new friendships. However, technology should be provided and not require any user intervention for system setup. For the future work we plan to develop the probe into a fully functional product and deploy it into a cafeteria over a longer period of time to conduct a longitudinal study in real-life settings and conduct a survey and interviews with the willing participants.

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Enabling Socio-Economic Activities: Opening Global Markets for the Marginalized Through Secure ICT Use

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Abstract. This paper identifies and describes five economic activities through which ICT could effectively be used to open global markets for rural and marginalized communities. The activities are identified in contexts where there are no industries, there is limited or no access to markets, no access to capital, effectively leveraging and optimizing what already exists in communities. The paper borrows from the smart community centre model of Siyabuswa Educational Improvement and Development Trust (SEIDET) in South Africa and the Botswana Virtual Marketplace Trading Portal to illustrate and to argue that ICT could give marginalized individuals in rural villages in Africa, access to global markets and the technical means for packaging, marketing and selling their own products and thereby creating jobs and alleviating poverty.

Keywords: Rural communities · ICTS · Poverty

1 Introduction

This paper identifies and describes five economic activities through which ICT could effectively be used to open global markets for rural and marginalized communities. The activities are identified in contexts where there are no industries, there is limited or no access to markets, no access to capital, effectively leveraging and optimizing what already exists in communities. Building on a platform that has already been tested in Botswana called Products Botswana and leveraging the Smart Community Centre Model of SEIDET in South Africa [4, 5], the paper argues and demonstrates that ICT could be used to open global markets for marginalised communities; and in so doing, become an effective tool for job creation and poverty reduction in these communities. The paper addresses the following research question:

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How could ICT be used as a tool for poverty reduction and job creation in rural and marginalized communities?

The paper is organised as follows: Sect. 2. Identification of the four socio-economic activities and the rationale thereof; Sect. 3. Description of the four unique contexts; Sect. 4. Description of the actual portal platform with examples; Sect. 5. The smart community centre model of SEIDET; Sect. 6. Embedding the portal into the community centre model to produce a secure ICT trading platform; Sect. 7. Argument for effective and secure ICT use as the solution; Sect. 8. Concluding discussion.

2 The Socio-Economic Activities Identified and the Rationale Thereof

2.1 Arts and Crafts

Arts and craft refers to a wide spectrum of products, which include but are not limited to basketry, leather works, metal works, pottery, textiles/clothing, wood works, painting, sculpturing, design, fashion, photography, musical instruments, toys, decorations, jewellery, furniture etc., which are mostly handmade from a wide range of materials.

According to the International Labour Organisation (ILO) SEED working paper no 51 "Small enterprise development and job creation in the culture sector in the Southern African Development Community (SADC) region", the arts and craft sector in Southern Africa and indeed Africa has not been seen as a major economic driver and creator of jobs, however in more developed countries such as India, Brazil and the first world countries; they contribute a significant portion to GDP and job creation This is primarily because the vast majority of Arts and Crafts producers are small and micro enterprises.

The rationale for identifying the sector and arguing for its mainstreaming is that it is not on its own only a contributor to development and growth but also permeates many other sectors and is a major contributor to innovation and growth. The contribution of the sector to development is in three critical areas:

- *human development*: artistic and creative self-expression, self-esteem enhancement, emotional and intellectual stimulation, confidence building, catharsis, creative thinking and innovation, the exploration of the human condition
- *social development*: community participation, youth and gender involvement, contribution to democracy, social inclusion, social cohesion, the building of social capital
- *economic development*: income generation, poverty alleviation, employment, small business development, foreign exchange earnings, investment, city development and city regeneration.

2.2 Cultural Tourism

Cultural tourism (or culture tourism) is the subset of tourism concerned with a country or a region's culture, specifically the lifestyle of the people in those geographical areas, the history of those people, their art, architecture, religion(s), and other elements that helped shape their way of life according to the UN definition. It encompasses travel

concerned with experiencing cultural environments, including landscapes, the visual and performing arts, and special (local) lifestyles, values, traditions, events as well as other ways of creative and inter-cultural exchange processes. Some of the key aspects which form part of cultural tourism include:

- Heritage tourism;
- Art tourism;
- Creative tourism;
- Urban cultural tourism;
- Rural cultural tourism;
- Local cultural tourism;
- Contemporary cultural tourism;
- Cultural events tourism.

Culture is widely perceived as highly influencing visitors' initial decision to travel to destinations in different parts of the world. Therefore in most regions of the world, particularly in Europe and North America, cultural attractions have become important in the development of tourism according to the UN website on cultural tourism. The diverse indigenous African cultures can be perceived as having a latent comparative advantage in the development of cultural tourism because they possess unique cultural and nature based. These are the tourist attractions which people from major tourist generating countries are looking for.

2.3 Mobile Money

The advancement of technology is no longer the preserve of the developed economies. Globalisation forces and geopolitical shifts have made it possible that developing countries also gain remarkable access and use of technology, which has become ubiquitous. One successful branch of technology that has permeated developing economies, especially the African continent, is mobile money technology. Mobile money is a technological revolution across Africa and while the internet is not yet widely spread, the cell phone is widely accessible. The use of mobile phones for various payment and banking transactions gave impetus to Africa's socio-economic development particularly to villages and rural areas that are remotely located from the cities. The lack of infrastructure and adequacy thereof, in other instances, limits mobility and leads to difficulties for people living outside the cities to access services with potential to enable better living conditions and attain decent livelihoods.

The advent of mobile money technology has necessitated these communities to access services that contribute towards better living and improvement of daily lives. With poverty and unemployment still remaining the biggest challenge in most parts of Africa amid improved and promising economic growth patterns, the use of mobile money becomes a socio-economic imperative. Mobile money, used alongside synonyms such as mobile payment or digital wallet, has become central to the economies of Africa with specific reference to communities in countries that lack social and economic infrastructure such as roads, transport logistics and inclusive banking systems among others [1].

The invention of mobile money rooted in Kenya, the East African economy, through the mobile money application called M-PESA[1]. M-PESA, a service that allows money to be sent and received using mobile phones ("M" stands for mobile while "PESA" is Swahili for money) is a small-value electronic payment service developed by Safaricom, a Kenyan mobile phone operator, in 2007. By December 2011, the service had more than 17 million Kenyan subscribers and around 5 million in Tanzania as of May 2013. And similar programmes were developed, thereafter, in Afghanistan, India and South Africa. To date Kenya has been the success of this mobile money technology since its invention in 2007. By the end of 2013, M-PESA, was adopted by 70 % of the adult population and is a conduit for 25 % of Kenya's GNP[2] [11]. Since the adoption of this mobile banking technology in Kenya, many countries have launched such services for the betterment of their socio-economic development especially on providing banking services to the un-banked communities.

So what exactly is mobile money? Mobile money is used to loosely refer to money stored using the Subscriber Identity Module (SIM) as an identifier as opposed to an account number in the conventional banking business. It can also be defined based on its functionality by observing that it includes all the various initiatives (long distance remittance, micro-payments, and informal air-time) aimed at bringing financial services to the unbanked, as well as convenience for the banked, using mobile telephony technology[3].

In Kenya, for example, mobile money transfers and banking has had a remarkable socio-economic impact on the lives of women in the fishing industry on Lake Victoria [7]. Low levels of financial inclusion are recognized as a barrier to socio-economic development, yet globally, more than 2.5 billion adults do not have formal bank accounts, in developing countries only around 41 per cent of adults have one (ITU, 2013) and in Africa, just 20 % of families have bank accounts[4]. Three main reasons explain these figures: banks are just too expensive or too far away, especially in rural areas; people feel they do not have enough money; and there is a general lack of trust in banks. Therefore mobile money technology, however, has allowed millions of people to carry out financial transactions relatively cheaply, securely, and reliably.

The impact of social and economic development of mobile money is well documented. One such success story was the remarkable uptake and adoption of "digital wallet", another term for mobile money/payment, in 2011 by Haitians, citizens of Haiti that was destroyed by a devastating 7.0 magnitude earthquake death left over 250 000 people dead[5], a year prior [3]. Domestic money transfers, payroll, and basic banking services were first to go live. It immediately became apparent that giving Haitians the ability to instantly transfer money from one mobile phone to another – anywhere in the

[1] http://blog.private-sector-and-development.com/archive/2015/03/10/development-in-africa-through-mobile-money-democratization.html.
[2] http://www.economist.com/blogs/schumpeter/2013/01/mobile-money.
[3] http://transhumanity.net/the-impact-of-mobile-money-in-africa/.
[4] http://blog.private-sector-and-development.com/archive/2015/03/10/development-in-africa-through-mobile-money-democratization.html.
[5] http://fortune.com/2013/08/15/haitis-mobile-redemption/.

country without a banking intermediary – was a killer app. Amid the devastating tragedy, Many observers, including the Washington-based U.S. Agency for International Development (USAID), viewed the mobile wallet in Haiti, as a game-changer that dramatically accelerating economic development and helped transform a country that desperately needed some good news. In an analysis conducted by the World Bank in 2009, to test the impact of telecommunications penetration on economic growth rates at country-level. According to this analysis of 120 countries, for every 10 % point increase in the penetration of mobile phones, there is an increase in economic growth of 0.81 % points in developing countries, versus 0.60 % points in developed countries.

In addition to mobile money being used as a payment tool and banking, it has evolved to become a technological solution for various financial transactions and other social services. Mobile money is also having some surprising social impacts, reducing vulnerability particularly of the poor. For example, people are more likely to seek immediate treatment for illnesses as they are able to call on their social networks to provide immediate funds for transport and medical bills[6]. Women are also empowered. Whereas before mobile money, household finances were likely to be controlled by men, women can now easily manage their own private accounts to receive and spend money directly. Research in East Africa has shown that 85 % per cent of women in the study received income in this way and, it accounted, on average, for 33 % of their income. Mobile money also facilitates trade, making it easier for people to pay and receive payment for goods and services [8]. The FITS Tanzania study showed nearly 20 % of mobile money users were using it for business, mainly for transactions between the supplier and the retailer. In Kenya, formal businesses are more likely to use M-PESA to get paid by end-user customers than to pay their suppliers and employees.

The facilitation of trade through mobile payment services forms the theme of this paper. In the backdrop of the socio-economic impact that mobile money service has shown in the socio-economic development of the African economies, the writers of this paper sought to demonstrate the likelihood of success of facilitating trade transactions between the producers of arts and crafts in Africa and potential global customers through a global online platform as defined in preceding sections. There is no doubt that drawing from the successes of documented achievements of mobile money services elsewhere in Africa, there is also going to be recorded future successes of facilitating trade and mobile financial transactions of arts and crafts producers in rural areas in Africa and customers throughout the world. To this date, trade facilitation between arts and crafts producers and global customers using an online platform linked to mobile phones has proven an effective business concept, judging by the success of the initial project in Botswana.

2.4 E-Books on Undocumented African Stories

The African stories, legends and folklore have been very popular among the different cultures. These have been passed down from generation to generation and have been told around fire places. These stories served various purposes which included:

[6] http://blog.private-sector-and-development.com/archive/2015/03/10/development-in-africa-through-mobile-money-democratization.html.

- Educational stories
- Folklore
- Stories to highlight certain taboos
- Stories to pass down history from generation to generation
- Entertainment stories
- Stories of heroism and bravery
- Poems

These formed and still form an integral part of African culture and heritage and can form a strong component of cultural tourism. Sadly this piece of the African culture is rapidly disappearing, largely due to urbanization and lack of documentation. A lot of these stories we believe are undocumented and not available in electronic format, yet some of these make for fascinating reading. They also could form powerful promotional tools. There are many young people who are trained in ICT and multimedia most of whom are unemployed. This will also assist in bridging the generation gap by allowing young and old to interact on a regular basis. Therefore the necessary key ingredients are there to start publishing e-Books of African stories. These can be sold through the e-commerce platform. The products to be produced could include:

- e-Books
- Multimedia animations of stories
- Video/films

2.5 Made in Africa Cybersecurity Solutions, Products and Services

Cybersecurity could be considered a key enabler for digitally driven innovations. With Africa being arguably the least developed continent, we expect that most innovations in response to the cybersecurity challenges will come from Africa. These innovative solutions, products or services could then be delivered online to the rest of the world. A youngster in a remote and an unknown rural village in Africa could be an inventor of a very unique cyber solution, product or service and then have these delivered to global markets. Several studies conducted by the Council for Scientific and Industrial Research (CSIR) in South Africa point in this direction [2]. The Cybersecurity Awareness Programme and the Cyber Games are good examples. A variety of cyber solutions, goods, products and services are also expected from further development and implementation of CyberSAT [5].

The rationale of our thought is that more rural communities are becoming integrated into the global village due to increased hardware and software corporate donations, the proliferation of mobile Internet devices and government programmes aimed at bridging the digital divide through major broadband expansion projects.

3 Description of the Four Unique Contexts

The activities are identified in contexts where there are no industries, there is limited or no access to markets, no access to capital, and effectively leveraging and optimizing

what already exists in communities. These contexts are largely applicable to rural areas and to underprivileged individuals and communities. The contexts also look at existing socio economic activities already being carried out in these communities with the exception of e-Books.

Our emphasis is the rural and the marginalized. We think and argue that people located in these rural and marginal areas, but working in the five areas we have described above could be enabled to sell their produce/services/solutions globally.

4 Argument for Effective ICT Use as the Solution

The fundamental argument we present here is that ICTs are a means to an end and not an end by themselves. What is critical therefore is the innovative use of ICT to provide solutions for the above. The critical elements which ICTs could offer encompass:

- The ability to innovatively package and document content in digital format
- The sale and distribution of the various products and services to a wide market
- Removal of geographic boundaries and provision of easier access to markets for the products
- Putting buyers directly in touch with sellers on an internal scale
- Easy and secure payment solutions connecting the banked to the unbanked or under-banked

We therefore believe if innovatively and well used ICT could give Southern African countries, which are developing markets, the technical means for packaging, marketing and selling their own products especially through the internet (e-commerce and m-commerce). Below is an illustration of how ICTs provide a solution of opening global markets for local products from marginalized and rural communities:

5 The Portal Platform and Its Features

The web portal is based on a robust technology platform and application suite with specialist modules such as customer management and product management, which interact with each other to create a comprehensive integrated platform. The integrated browser and mobile based applications will enable producers/artists and other parties to contribute and manage their products online based on established business rules inbuilt into the system. Some of the key integrated applications in the system comprise of:

- Content management system
- Product management
- Producers registration and management
- Customer management
- Tracking management
- Sales management
- Transaction processing and management system
- E-commerce payment gateway

- Producer/artists payments management
- Mobile apps that link into the portal
- Messaging system (Fig. 1)

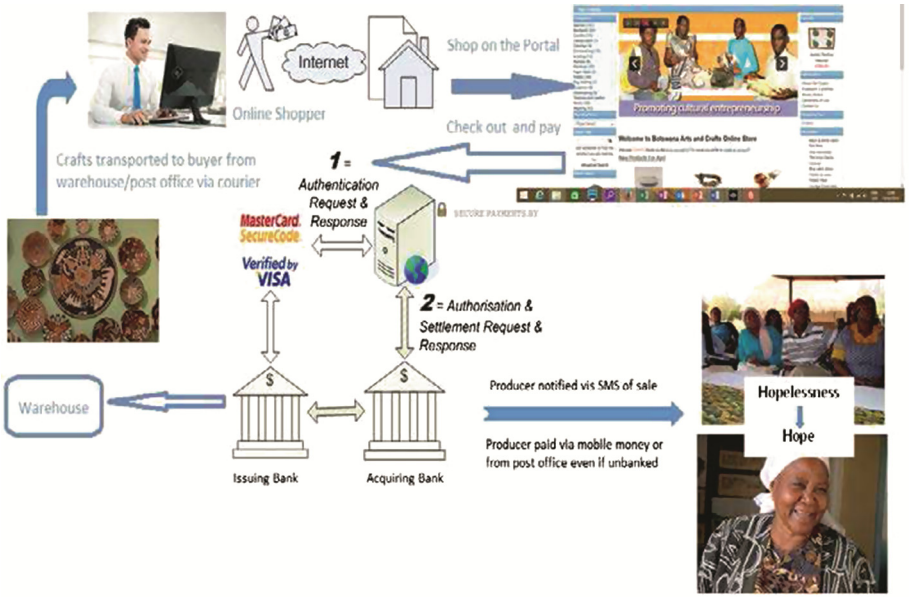

Fig. 1. Botswana virtual marketplace trading portal (Source: Kepaletswe [4])

The portal acts as a virtual marketplace and has the following features:

- Able to accommodate both physical and digital products e.g. crafts, e-books, music, videos
- Pictures and descriptions of the different products with the ability of ease to update information from anywhere around the country.
- Profiles of the producers and creation of mini-stores
- Online shopping carts, which will enable people from anywhere to order the goods online and pay online
- Online auctioning and bidding of artistic works
- Mobile apps that will be downloadable via google store and apple i-store and others
- Booking and reservations along with online payments for cultural tourism products
- Social media integration (facebook, twitter, Instagram, You tube etc.)
- The owners of the products to be alerted by email and/or SMS whenever their products are bought or when it time to collect payment for products bought
- Clients can place orders on the website for the artist to manufacture with the ability to take deposits
- The ability for people who have placed orders to track their goods online

- Ability for the artists/producers to receive payments even if they do not have a bank accounts through mobile money
- Range of reporting and business intelligence tools

5.1 Architectural Goals

The overall goal of the platform architecture is to provide a highly available and scalable portal(s), which engages users and ultimately becomes one of their most valuable resource. The portal(s) will not only provide information but will be used by traders and buyers to contact each other and conduct business, it will therefore incorporate calls-to-action. The portal(s) will be accessible by various devices including mobile devices therefore another goal is to ensure it is designed to cater for this accessibility. Another key Architectural goal is to leverage industry best practices for designing and developing a scalable platform.

5.2 Guiding Principles

Guiding principles provide a foundation upon which to develop the target architecture for the portal, in part by setting the standards and measures that the portal must satisfy. These in turn drive design principles that can be used to validate the design and ensure that it is aligned with the overall Architecture, Design Principles and Standards.

Some of the guiding principles that were followed during the design and development are outlined below.

Scalable. The platform must be able to scale both up and down to support varying numbers of users or transaction volumes. The application should be able to scale horizontally (by adding more servers) or vertically (by increasing hardware capacity or software efficiency).

Flexible. The portal platform must be able to adapt and evolve to accommodate new requirements without affecting the existing operations. This relies on a modular architecture, which isolates the complexity of integration, presentation, and business logic from each other in order to allow for the easy integration of new technologies and processes within the application.

Standards-Based. Portal services will comply with established industry standards. The standards-compliance will not only apply to application development but also to design, platform/infrastructure and other parts of the application.

5.3 Design Principles

Best practice and design principles dictate that there is separation of layers in the design of the portal. The three layers, presentation, business logic/rules, and data access will enable:

- scalability
- flexibility

- Uniform and common look across devices
- Running multiple portals from a single database thus enabling central management of data and product information while enabling for there to be different themed sites to accommodate the diversity of the products and different business rules
- Easier linking to other websites through APIs and widgets, which will allow for increased distribution of products thus higher sales.

6 The Smart Community Centre Model of SEIDET

The smart community centre model of SEIDET is based on a service oriented approach. From the definition of smart city, it was identified that the value is provided by the services that are delivered by the components (people, technology and governance); hence, the service oriented approach. It focuses on services required to achieve the goal of the smart community centre.

These services are; *smart users, smart infrastructure and ICT, smart applications and smart governance*. The services are shown in Fig. 2 and are discussed in detail below.

- **Smart Users**: These services are skills and knowledge based provided by the smart community centre such as education and training. These services empower the users with the skills to participate, and share resources. Examples of smart users within a smart community centre context include: training of users to able to efficiently utilize both smart applications and smart infrastructure to their benefits and the benefits of their businesses. This further improves quality of life and improved the economy, which can be summed as "smart living and smart economy". This will develop further participation in public life, flexibility, creativity/innovativeness, social and cultural plurality and affinity to lifelong learning.
- **Smart Infrastructure and ICT**: These services are network and ICT based and provide *two* functions. The first function is to create an information flow path. For an example, implementation of networks, such as the *mesh* (BB4All), allow information to flow. The second function is to provide access to the network through smart devices. For an example using *tablets, servers,* etc. Other examples of these services include; information systems (applications and data architecture), technological infrastructure, business architecture and communication protocol.
- **Smart Applications**: These are services that are provided by interactive software packages. These includes web portal in the remote servers, applications in the users' devices. For an example, in resource management, they enable visualisation of the resources and registration.
- **Smart Governance**: These are services that are provided by the stakeholders; public, private sector in a form of policies, rules and regulations for participation. These services aim to promote a system with predictable behaviour as participants are obliged to follow them. These rules, regulations, policies are formulated through active reviews, and inputs from all stakeholders. The main role for the smart governance is to promote participation and decision making in the smart community centre.

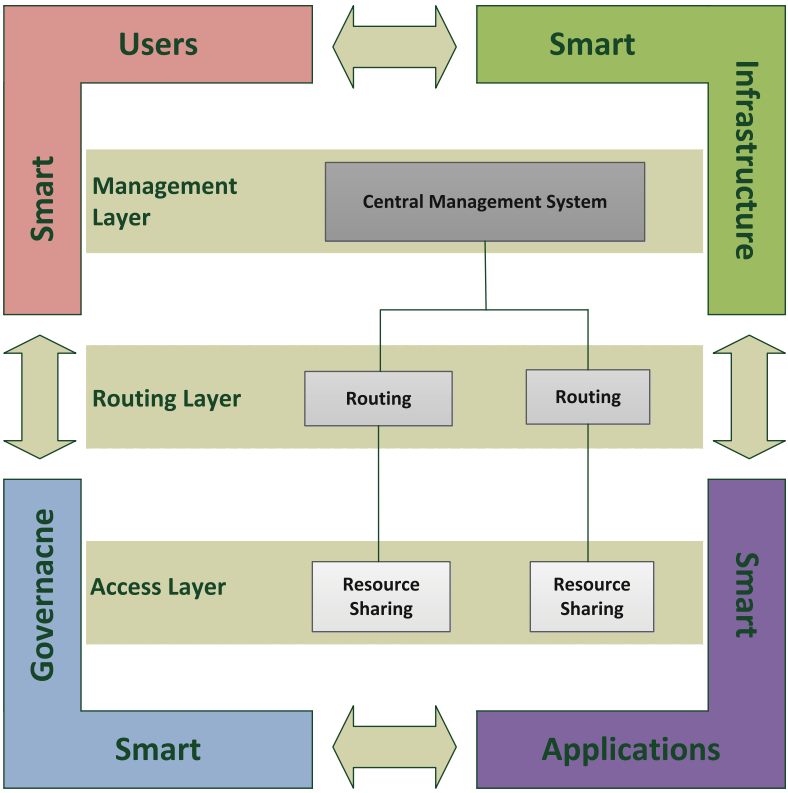

Fig. 2. Smart community centre model (Source [2])

6.1 Smart Community Centre Implementation Layers

There are three layers in the smart community centre model and are shown in Fig. 2. These layers are components which provide different services at different levels in a resource management process. These layers are described in detail below:

- **Access Layer**: This is the user layer responsible for access to the system. It consists of the users and devices (as data resources providers and consumers) of the traditional community centre. The main role of this layer is to enhance sharing amongst the user and also supply information about resources and available services between the users and the routing layer.
- **Routing Layer**: This layer is responsible for the routing of requests between the entities (users and CMS) in the system. All data shared by users is interconnected, structured, sorted, processed and routed to and from both the access and management layer.
- **Management Layer**: This layer is responsible for central managing of the resources. It is the layer where all the data (shared services, application, software, etc.) is stored

and managed for efficient utilization intelligent decision making, better service monitoring and easy access of services.

7 Embedded Portal into the Smart Community Centre Model of SEIDET

It is possible and practical to embed the portal into the smart community center model of SEIDET to produce a secure ICT trading platform that could connect the marginalized to global markets. Our argument is premised on the following:

- ICTs are a means to an end and not an end in themselves
- ICTs will only be adopted in communities especially rural communities if they clearly add measurable value and enhance existing socio-economic activities in these communities.

To provide a simple illustration, elderly people in villages always complain that their livestock is always disappearing as it is difficult to find good help e.g. herd boys, as they are not as active any more and their children all stay in urban areas. Livestock is the most important socio-economic assert and source of livelihoods in rural communities. The children of an elderly woman bought her a computer and smart phone to keep in touch with her. She used to clean around the computer and was afraid to touch it and never switched it on. One day she attended a community ICT awareness workshop/class where she learned to take pictures using her phone and download them onto the computer. The elderly woman took photos of her livestock and kept them on her computer and every time she visited the cattle post, she could see if any were missing. When her livestock fell sick she took pictures and sent them to her son via email so that when he came over he would know what medicines to bring. This clearly demonstrates how ICT was used as a means to an end and how it added value to her socio economic livelihood. Had this not been the case, it is unlikely that the elderly woman would have used or embraced the use of the computer and the smartphone.

It is our argument therefore that the portal does fit into the SEIDET smart community center model based on the following:

- An important social-economic activity in the Siyabusa community is the production and sale of arts and crafts especially Ndebele arts and crafts. Therefore the portal will help market and sell these crafts to a regional and international audience/buyers versus just the ones who visit there. This will increase production, sales and income and livelihoods as well as creating more jobs directly and for supporting industries/ activities e.g. transport, packaging etc.
- There is a cultural village, cultural events and other cultural products so the portal will greatly assist in marketing these products as well as enabling easy booking, reservation and payment online
- Cultural stories packaged as e-books, poems and songs will be sold through the portal as digital downloadable products

- Community/SMEs in the community to be given training on uploading content onto the portal as well as marketing and selling through the portal and other related tools e.g. social media using the community centres
- The SEIDET infrastructure e.g. web server to host the portal
- Producers/artists to receive their money easily through mobile money.

It is clear from the above arguments that the portal will not only fit in the SEIDET model, but will also greatly enhance it as well as become pivotal in opening up market access to the community and SMEs.

Our further argument is that the marginalized falling within the four contexts we have described (viz, no industries, there is limited or no access to markets, no access to capital, effectively leveraging and optimizing what already exists in communities), could be enabled, through secure ICT use to sell the products (arts and crafts, e-books on African stories, mobile money, cultural tourism) to the global market and thus create jobs and better their livelihoods and reduce poverty.

A powerful illustration of how ICTs can can really open up markets and improve livelihoods stems from the Botswana case of the Products Botswana (www.products-botswana.co.bw) online arts and crafts store. An elderly producer based in Kasane a tourist hub in Botswana who produces pottery and ceramic products, had never used a computer or smartphone. Through the intervention of the Local Enterprise Authority had her products and her profile listed on the Products Botswana portal and had a webpage developed linked to the portal. An investor in Europe who was building an exclusive lodge in Kasane was able to see her products and ordered ceramic basins for all the bathrooms and lamp covers. When we visited her a few months later she had bought a tablet and asked for training in order to check and fulfil her orders and check her emails. This clearly demonstrates how ICTs can open up market access for producers in the rural areas.

To ensure that the SEIDET embedded portal for traders is safe and secure and cannot be compromised, we would need to implement or create an environment that includes multiple steps such as the design of a clear secured network infrastructure that can be protected. This would ensure that the trading platform could be relied upon from cybersecurity, trust and privacy perspectives.

To carry out trusted transactions such as e-commerce and m-commerce we need to determine first the possible threats that come with the involvement of using web applications. In such transfers, details of a sender or even a user's payment information/card as well as personal information such as the names of the buyers or sellers may be used to carry out in order to make any kind of purchases/transaction from the system. In this case the threat could be what is called an eavesdropper. This is a person with knowledge of the Internet Protocol and could readily intercept the information that is entered on the order form and therefore use that information to make purchases of their own. Another threat could be in financial applications (e-banking), a buyer or even a seller may masquerade as another person and the final threat may be with a website/portal where the purchase is being made but in actual fact or reality may not have anything for sale.

In order to counter each of these possible threats for maximum security of the systems transactions, a widely used tool, the secure socket layer (SSL).

Protocol which will operate at the socket interface of the smart community access layer would be used. The SSL is between the transport layers (TCP) as well as the application layer in the TCP/IP protocol room. What the SSL does is that it carries out the authentication of our server when necessary by using a recognized certification authority plus the initiation of a consistent encryption algorithm and key for the session. It then uses the key, called the session key to encrypt or decrypt all of the messages that are transferred as part of the transaction.

When a user clicks on a link to an SSL-enabled server or the socket connection, the protocol part of the URL is https: rather than http: The HTML interpreter calls on the SSL protocol code which continues to carry out a secure transaction initiation/transfer (Fig. 3).

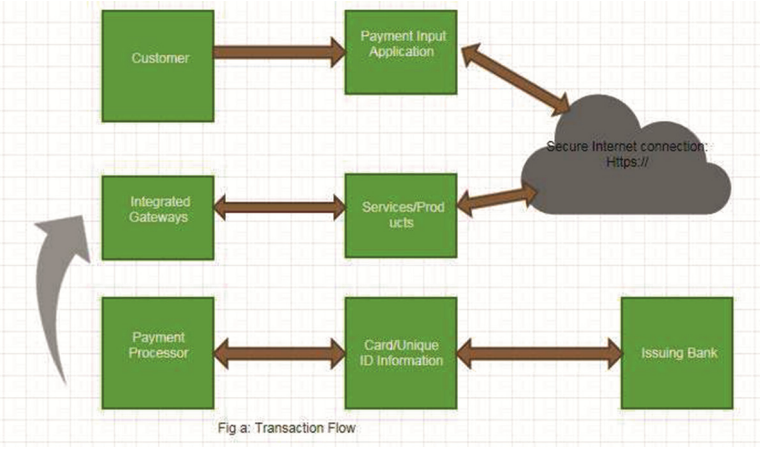

Fig. 3. An example of a possible transaction flow

8 Concluding Discussion

We identified and described in this paper five economic activities through which ICT could effectively be used to open global markets for rural and marginalized communities. These activities were identified in contexts where there are no industries, there is limited or no access to markets, no access to capital, and effectively leveraging and optimizing what already exists in communities. Building on a platform that has already been tested in Botswana called Products Botswana, and leveraging the proposed Smart Community Centre Model of SEIDET in South Africa [2, 3], we argued and demonstrates that ICT could be used to open global markets for marginalized communities; and in so doing, become an effective tool for job creation and poverty reduction in these communities.

The Products Botswana web portal we borrowed from is based on a robust technology platform and application suite with specialist modules such as customer management and product management, which interact with each other to create a comprehensive integrated platform. We also argued and demonstrated that it is possible and practical

to embed the portal into the smart community center model of SEIDET to produce a secure ICT trading platform that could connect the marginalized to global markets.

The services architecture in the Smart Community Centre model of SEIDET provides several possible anchor points for the trading portal. The obvious anchor points being the Smart Infrastructure and Smart Applications as the portal could be seen as the infrastructure platform or as a specialised application or both. The physical infrastructure at the SEIDET Community Centre around which the Smart Community Centre model is based complements the virtual nature of the trading portal. A complementary physical infrastructure such as a school or a community centre would be important if the embedded portal model was to be scaled up to deep rural areas.

We believe that our arguments and views are supported by a number of studies among them the GOOGLE study titled '*The internet economy, the quiet engine of the South African economy*' which has shown that e-commerce has grown by over 25 % year on year for the last 5 years. The same study has also shown that only 9 % of SMEs with web presence failed versus 39 % without an internet presence. Another study conducted by Boston University predicts that the value of e-commerce in Africa will grow from 18 billion us dollars to 75 billion dollars by 2025.

Current initiatives at a regional level by the Southern African Development Community (SADC) also support our arguments and have potential to enhance the viability of initiatives such as the one we propose in this paper. One particular initiative is the development of a regional trade portal by SADC secretariat which is meant to promote trade, especially by SMEs. The portal(s) will also be marketed through latest techniques such as SEO, Google adwords, social media, email as well as by trade promotion agencies, and tourism promotion agencies; thereby further improving its success and therefore the livelihoods of the producers, as they will have a successful channel to sell their goods.

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Adoption of Social Media for the Banking Sector in Sri Lanka

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Abstract. Despite social media having a remarkable success in many parts of the world in different contexts such as promoting brands to changing state leaders, the adoption by the banking sector to provide financial services remains relatively low across many parts of the world.

Many banking customers are still reluctant to consume financial services via social media. In fact, how banks should adopt social media still remains unanswered, possibly due to the fluidity of social media compared to the rigidness of the banking sector. The aim of this paper is to devise a framework to better understand the determinants of social media adoption among the banking sector based on the Technology Acceptance Model (TAM).

Keywords: Social media · Virtual worlds · Financial sector · Banking sector

1 Introduction

A new revolution has started, covering bricks and mortar to online retailers, schools to board rooms, and already shaken some governments in the making. This phenomenon is driven by revolutionizing the way we interact and is known as "Social Media". Armed with tools of Social media, people are taking communications and interactions to a whole new level.

The Social media has been widely adopted by many across the globe and it continues to grow until now. For example, Facebook (a widely used and very popular social media web site) in May 2013 exceeded 1.11 billion monthly active users, and daily active users passed 665 million [1]. To put this number in perspective, if Facebook were a country, it would be the third largest in the world tailing behind China and India. In the near future businesses will not have a choice on whether to go for social media, but it's how well they go about doing it.

Traditionally, banks have been slow to adopt change; and their existence predominantly has been through physical branches. Financial industry has been a risk averse industry by nature, and coupled with tight regulations and compliance requirements the social media adoption has been low [2]. However, the trends are changing and the financial services sector has realized that the technology platforms have improved thus

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providing better reliability and trust, and awareness among employees and employers have also increased and they have realized that there is a tremendous potential in social media for the financial sector if they get it right [3].

Effectively, social media usage is of prime importance to the organizations today to stay competitive and stay relevant. This could be of special importance to the banking sector, as social media could be used to buy back the lost consumer confidence by making financial organizations more transparent [4].

In 2014, one out of every five households had a computer in Sri Lanka [5] and this is expected to increase with the government's plan of providing access to the Internet for every citizen [6]. The change of government on January 8th 2015 has been cited as a revolutionary event partly sensitized by the social media at work by some quarters [7] opening up a window to look for the potential expanding status of digital social media revolution in Sri Lanka. In the area of financing economic growth, however, the contribution of the social media is not a widely researched subject. Over 20 % of population lack financial inclusion despite the recorded sound growth of the banking and finance industry due to the conducive business environment that prevails at present according to a leading commercial Bank [8]. The domestic savings rate is still at 20 % [9] leaving a wide domestic savings gap in the path to reaching and maintaining an 8 % economic growth [10]. The Asian Development Bank has drawn attention of the policy makers to focus on innovation and the needs for a knowledge economy at the threshold of gaining upper middle income country status [11].

2 Literature Review

2.1 Economic Theory

During 1950, Milton Friedman advocated free markets over government regulation denouncing Keynesian approach. Influenced by early free market thinkers such as Friedrich von Hayek, Milton Friedman argued that the governments should stay away from individuals' affairs, and that the markets can solve economic problems much more efficiently than governments can, giving rise to the "Chicago School of Economics" – a concept of free market capitalism [12]. Friedrich von Hayek believed that the free markets and the political liberty were heavily coupled with each other making it indissociable [13]. Free market thinkers such as Friedman and Von Hayeks' thinking paved the way to the privatization and deregulation.

John Maynard Keynes proposed that if investments exceed savings, there will be inflation. If savings exceeds Investment there will be a recession. One implication of this is that, in the midst of an economic depression, the correct course of action should be to encourage spending and discourage saving. Keynes was of the opinion that intervention by policymakers (the government) could make things better, whereas Hayek was of the opinion that the policymakers (the government) would only make things worse [14]. New economic theories also include knowledge as a key in production functions due to productivity enhancements introduced by investments in knowledge. This results in increased labour and investment productivity [15]. Nonaka and Tayama [16] has highlighted the importance of information in knowledge based economies and

how those economies are leveraging on new information for their competitive advantage. The entire world is moving towards a knowledge based society where individuals are linked using technology platforms, firms and countries are linked digitally and having common businesses [17]. This makes it vital for modern organizations to create new knowledge to initiate the innovation process [18].

2.2 Modernization Theory

Modernization theory is used to explain how the societies progress from "traditional" to "modern" societies. It is believed that traditional societies can be developed in the same manner as modern societies with the process of social evolution by adopting modern practices. The theory is believed to be emerged during 1950s as an explanation of how the industrial societies of North America and Western Europe were developed [19].

Modernity is indicated by attributes such as development of an industrial advanced sector, the breakdown of peasant economies, the spread of wage labour, urbanization, the pace of economic development, the capacity of countries to generate savings, and the emergence of more open and democratic forms of rule [20]. Traditional society is perceived as stagnant and static, where society's values are mostly spiritual without focusing much on the individual betterment [21]. Isbister [21] describes the modernization theory as the prevailing principal of social scientists in developed countries to understand the origins of underdevelopment and poverty in developing countries. He argues that the persistence of poverty is the result of policies implemented and decisions taken by world leaders in developing and industrialized countries. However, Isbister does not believe that rich nations are directly responsible for the predicament of the poor; however it's due to absence of democratic institutions, lack of capitol, old-fashioned technology and lack of ingenuity. Isbister also explains the positives of the traditional life such as more reliance on family, having no estrangement or alienation. However, he states that there is no or little progress from an economic point of view. He also points out that world's poor countries could be successful in this transformation by learning from mistakes made by European countries and by getting assistance from rich countries in terms of modern technology, capitol, etc. In summary, Isbister argues that for development to occur what is needed is better policies and planning, new technology, more capitol; not revolutionary changes in political or economic relationships.

A study published by World Bank [22] highlights how the economic growth is restricted to certain geographic areas in Sri Lanka. In order to bridge this gap, it is necessary to build the necessary infrastructure (such as roads, railways, airports) and also the Information Communication Technology [23]. There is also number of research [24, 25] suggesting the positive correlation between economic freedom and economic growth. Further, it is argued that developed and successful economies have better technologies and they are better prepared to use them for competitive advantage [26].

2.3 Diffusion of Innovation Model

The process of adopting new technologies and innovations has been studied for number of years under various disciplines such as political science, communications, economics, history, technology and education [27, 28].

Rogers [28] used "technology" and "innovation" as synonyms in his book titled Diffusion of Innovations. While explaining the model Rogers [28] describes technology as a "design for instrumental action that reduces the uncertainty in the cause-effect relationships involved in achieving a desired outcome". He [28] defines diffusion as the process in which innovations are communicated over certain communication channels among a social system. The diffusion itself is about a new idea which carries certain degree of uncertainty.

With the growth of the Internet and other new communication media such as social media many researchers have carried out diffusion studies on new communications technologies [29–33]. In summary, diffusion of an innovation is achieved by how well a social system accepts and begin to adopt the new technology and Rogers [28] argues that consumers' adoption of new technology depends on consumers expected loss or gain by using the new technology.

2.4 Technology Acceptance Model

Technology Acceptance Model (TAM) is a variation of Theory Reasoned Action (TRA) specifically crafted for modelling user acceptance model for information systems [34] as shown in Fig. 1.

Technology acceptance model can be employed for both predictions on whether an information system will be acceptable or not with an explanation [34]. As illustrated in the Fig. 1, three major constructs in TAM are Perceived Usefulness (PU), Perceived Ease of Use (PEoU) and Attitude toward using (ATU). Perceived usefulness is defined as the degree to which an individual considers that using a specific technology will enhance his or her job performance and perceived ease of use is the degree to which a person has confidence in the fact that using a particular technology will be free of effort [34] while Attitude towards using is defined as a user's perception about the system's usefulness and ease of use result in behavioural intention to use the system or not to use the system [34]. Therefore, the TAM can also be used to gain insights into what motivates users to adopt social media.

As discussed in Sects. 2.1, 2.2 and 2.3 there are number of theoretical models available to understand what motivates individuals to adopt social media. Among these, it appears that TAM is the most frequently employed theoretical framework to model new information system's acceptance [34–36].

3 Conceptual Framework

3.1 Introduction

The proposed framework is mainly based on the Technology Acceptance Model (TAM).

3.2 Perceived Risk of Social Media

Perceived risk refers to the nature and amount of risks perceived by the consumer while contemplating a specific purchase decision. Prior to purchasing the product, the consumer considers both anticipated and perceived risks [37]. If the perceived risk is

high, the consumer may not proceed with the social media based product procurement and may switch back to a traditional mode of purchase. However, if the perceived risk is low, the social media based product purchase decision may increase.

Perceived risks mainly arise due to failures in supporting technology infrastructure or due to human error. Mostly citied risks in online platforms includes "is my credit card information safe?", "is the product quality is same as what I see on the screen?", "will I understand how to order and return the merchandise if the need arises", "what if the product is not delivered?" [37].

Yates and Stone [38] defined the concept of risk using three elements: the potential loss, the significance of the loss and the uncertainty of the loss. Hausmann and Williams [39] have identified 30 risks types categorised under 5 headings (including technical, human, content, compliance and reputational) of risks arising from companies are experiencing from the business use of social media. Wamba [40] suggests that perceived risk of social media will have a negative effect on the intention to use social media:

H1: There is a relationship between Perceived Risk (PR) and Attitude Towards Using Social Media (ATUSM)

3.3 Perceived Cost of Social Media

Perceived cost is defined as the extent to which a person believes that using social media will cost money. Majority of the social media platforms available today including Facebook, YouTube and Twitter are free to use. However, there are certain specific social media platforms (e.g. LinkedIn Premium) which charges for certain value added services.

Many studies [41–45] have been conducted across the world highlighting how the cost is influencing the adoption of new technology by the consumer. A research done in Taiwan [46] highlights that financial cost has a great negative effect upon the behavioural intention to use Internet Banking. Koenig - Lewis et al. [47] in their research has proven that people perceive Internet banking to be a cheaper channel for using banking services compared to other channels.

H2: There is a relationship between Perceived Cost (PC) and Attitude Towards Using Social Media (ATUSM)

3.4 Perceived Advantage of Social Media

Perceived advantage is defined as the degree to which an innovation is perceived better than the ideas it supersedes [28]. Singh et al. [48] discovered that the time critical consumers consider the always on functionality is the most essential feature that attracts them to use mobile banking. This could be of special importance here as the consumers who are using social media are always logged on to the particular platform, compared to a mobile banking application where a consumer may log-in only when required.

H3: There is a relationship between Perceived Advantage (PA) and Attitude Towards Using Social Media (ATUSM)

3.5 Perceived Ease of Use and Perceived Usefulness of Social Media

Perceived ease of use is defined as the degree to which a person has confidence in the fact that using a particular technology will be free of effort and Perceived usefulness is defined as the degree to which an individual considers that using a specific technology will enhance his or her job performance [34]. A research conducted among University students in the United States has revealed that higher perceived ease of use leads to higher perceived usefulness and ultimately greater intensity of use of the social networking media. A research done among 2556 social media users from their workspaces covering Australia, UK, Canada, India and US in January 2013, has revealed that perceived usefulness and Perceived ease of use has a positive effect on the intention to use social media [40].

H4: There is relationship between Perceived Ease of Use (PEOU) and Attitude Towards Using Social Media (ATUSM)
H5: There is relationship between Perceived Usefulness (PU) and Attitude Towards Using Social Media (ATUSM)

3.6 Attitude Towards Using Social Media and Social Media Adoption

Attitude towards using is defined as a user's perception about the system's usefulness and ease of use result in behavioural intention to use the system or not to use the system [34]. Sri Lanka has a fixed phone tele-density of 14 compared to over 100 for mobile tele-density [49]. This disparity may be due to many reasons such as increased functionality, productivity improvements and entertainment value.

A research done in Republic of South Africa covering mobile banking applications reveals that consumer attitude has a significant relationship in adoption of the new technology [50].

H6: There is a relationship between Attitude Towards Using Social Media (ATUSM) and Social Media Adoption (SMA)

3.7 Demographic Characteristics: Knowledge and Age

Demographic characteristics have been used by researchers to further explain how consumer's age and knowledge contributes to the adoption of new technologies. Grabner- and Breitenecker [51] revealed that on average online banking users are younger and have a higher educational level.

H7: There is a relationship between Knowledge (K) and Social Media Adoption (SMA)
H8: There is a relationship between Age (A) and Social Media Adoption (SMA)

Based on the previous research carried out by scholars, a conceptual framework was developed as depicted in Fig. 2.

4 Methodology

The proposed research is of quantitative. The questionnaire will be formulated based on the existing literature and existing survey instruments. The questionnaire will contain domains covering Perceived Risk [34, 39], Perceived Cost [28, 42], Perceived Advantage [28, 35], Perceived Ease of Use [34, 40], Perceived Usefulness [40], Behavioural Intention to use Social Media [29, 30, 36], Social Media Usage [34–36, 43] and demographic information. Once the research questionnaire is finalized, it will be pilot tested to ascertain whether the constructs fulfil both validity and reliability requirements.

This is basically a hypothesis testing study, and hypothesis will be tested using SPSS. The population of the study is the people who are already using social media and who are keen on using social media for consuming banking services. The sample for the study will be selected on a random basis.

5 Discussion

Social media adoption among the banking sector remains a relatively new concept in Sri Lanka with limited studies about the topic in the local context [52]. Most social media related research has been conducted in western countries, thus overlooking the mediating effects on the intention to adopt new technologies. However, with the Sri Lankan government's new initiative titled "Internet Connectivity, a citizen's right" it is expected to cover the Sri Lanka with 1000 free Wi-Fi access points by June 2015 [6]. This will no doubt increase the social media users, and banks will have to innovate to stay relevant and competitive. This research will identify the causal factors affecting the consumer adoption of social media for banking services while, analysing the impact of attitude towards using social media and social media usage. Further, the research will also look at whether Knowledge and Age plays a mediating role among attitude towards using social media and social media adoption. Knowing these causal factors, banks can introduce different features in to their software or could launch awareness campaigns to address other consumer concerns such as privacy and information security to attract more consumers to banks social media platform.

The findings of this study will provide an insight into knowledge, age of the consumers and their expectations. This will help Sri Lankan banks in adopting social media to prioritize their projects. Further, banks can use findings from this research to fine tune their marketing strategies. Thus, this research will contribute to country's economic growth.

6 Expected Benefits

Bankers should look beyond the economic growth and consider on the future customer base as well [53]. The future customer base entails two segments, namely the augmented middle class (resulting due to the economic growth) and the "Generation Y" or millennials. The generation of people who were born after the 1980s and

the early 1990s are known as Generation Y (or Gen Y) or millennials [54]. People from generation Y are harder to satisfy and much closer to the Technology, Internet and Social Media [55].

Deloitte [56] refers to Gen Y as 'catalysts of change', and KPMG [57] predicts that they will be tomorrow's accumulators of wealth and Aite [58] has termed them as the generation that banks cannot afford to ignore. According to a survey done by Oracle Financial Services [59] "They (Gen Y) are a sociable generation and their interest in building and maintaining relationships is shown in how they blog, text-message, upload photos and videos, tweet about their activities, post their thoughts and opinions and look for updates on recent developments." Sri Lanka has approximately 3.5 million Gen Y's (16.66 % of the population) who are technological savvy, wanting to be seen as modern and trendy, better educated in comparison to others and far more optimistic, while also focus on savings for their future needs [60]. In contrast, global Gen Y believes in "spending now and saving later" [59]. In contrast, a survey done by KPMG [61] revealed that 57 percent of the Gen-Y population spends half their salaries on social purchases like holidays and technology, while 52 % of respondents claim that they don't actively save salary each month. Further, 67 % primary source of financial information is web, while 46 % trust the news from the web most - equal to the trust they have on their family members [61].

In order to serve the Gen Y effectively and efficiently, banks need to modernize themselves by adopting appropriate technology or perish [53]. Both the financial sector and social media represents mutually supportive forces which could be harnessed for mutually supportive outcomes.

Appendix

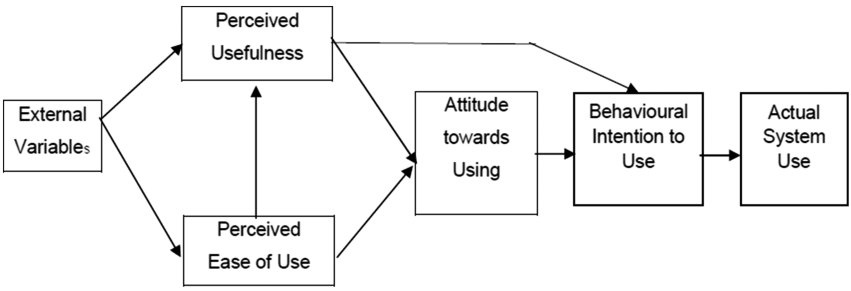

Fig. 1. Technology acceptance model [34]

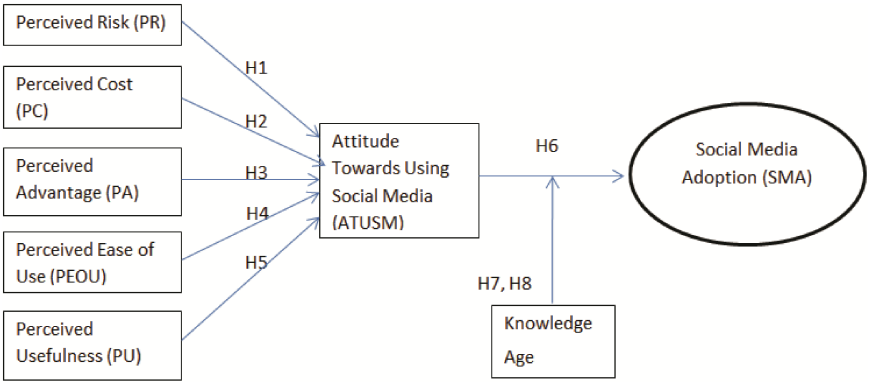

Fig. 2. Conceptual framework

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Visualising Actor Network for Cooperative Systems in Marine Technology

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Abstract. Awareness is a concept familiar to specialists within the field of Computer Supported Cooperative Work (CSCW). It is superior for analysing and describing some of the *ad hoc* work activities that unfold in cooperation. Such informal activities are outside the scope of engineers' formal models, which are created to tackle challenges concerning human activities and their social interactions with regards to safety concerns in operation. This paper draws on fieldwork conducted in a marine setting of offshore operations. It presents an attempt to visualise the importance of cooperative work activities that shape computer systems. The aim, thus, is to portray cooperative work in a way that can be valuable for engineers implementing marine technology. We do so by way of presenting a transferring technique (2T) using insights from the CSCW field and Actor Network Theory (ANT).

Keywords: CSCW · Awareness · ANT · Offshore operations

1 Background

Cooperative system design is descriptive based [1], meaning that "ethnography provides a picture of the social reality of work and interaction, one which may reveal a great deal not covered by more formal analytics procedures [2]". Cooperative systems design aims at promoting better use of technology [3] in given environments by focusing on technology, humans and social aspects of work practices. Engineers, however, find it difficult to transfer such (design) knowledge and implement it in engineering processes [4]. This increases safety challenges for offshore operations, such as ship bridge, subsea, and remotely operated underwater vehicle operations [5]. For example, as we will show in this article, marine operators want to have safety operations strengthened by using marine technology to monitor operations processes to be continually aware of on-going group activities. Yet, marine technology may not address such concerns since the primary focus of engineers is mechanical computing, with an emphasis on functionalities, rather than on social aspects, such as e.g., cooperation. We believe that automation

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of marine technology is their goal. CSCW designers are concerned about cooperative work and how it is supported by technology; however, a few studies and the existing descriptive approaches in marine context are hard understood by engineers [4]. Also, the voices of operators in the processes of systems design are omitted somehow [6].

This motivates us to explore a way of integrating both marine operators and social and material interactions into systems design for marine engineers. Awareness is a way that can further our understanding of how operators integrate their activities and abilities in a particular environment [7]. With this, CSCW designers focus on how awareness is continually established in interactions and activities an effort to complete work [8]. In response to this concern, we have created a transferring technique (2T) based on the utilisation of awareness in an actor network [9] to help both CSCW designers and engineers understand each other. 2T is a technique aiming at helping CSCW designers visualise actors and their enacted actor network. Further, it should as well help CSCW designers offer a readable map to engineers enabling them to understand how to recognise and implement cooperative work when programing for cooperative systems.

2 Challenges of Awareness and ANT in Design

2.1 Awareness in Design

"Awareness is 'ongoingly' achieved in collaboration with others" in the immediate environment [8]. Individuals monitor and perceive information that is available from their colleagues and from their surrounding environment [10]. We advocate for pursuing such understanding, rather than using the original one from the ergonomics community, in which a mental model is used for acquiring information [11]. That is, awareness in CSCW focuses on how (as the case of the present study) operators acquire related activities and make sense of them, with the result that they are able to coherent their activities in relation to the activities of others. This has been identified and described in studies on the underground control [12] and in air traffic control [13].

Awareness is about observing and listening [6]. Operators display actions that may be of relevance to their colleagues with two signals: (1) I am aware of a special work that I am doing. (2) This is my activity; will you please customise your own effort accordingly to facilitate our joint work? Recently, researchers have expanded these two categorises to I-awareness and We-awareness, thereby supporting the awareness of underlying processes of shared intention, expressed through activity, which is critical for cooperation in a group [14]. This definition extends our understanding of the need to design supportive human interactions in marine technology.

We propose that awareness in marine technology is about processing known evidence. Marine operators know how to align their activities with colleagues and the artefacts on the vessel. They know how to 'perceive' their awareness and make their activities public in a material environment [15] to ensure cooperation. As Schmidt [7] states, the challenge of awareness lies in designing cooperative systems: "How do the actors determine what is relevant to their own efforts? How do the actors manage to sort out and pick up what is relevant? How do actors, in modulating their activities so as to make relevant aspects thereof accessible to colleagues, determine what is relevant for the others?

Even though CSCW designers are able to inform design, we must expand these questions to the activities of practical design for engineers. We believe that there should no boundary between CSCW design and engineering in the early phase of the product life cycle. If we aim to create a better marine technology, it must include the experience of operators [16]. It means that, no matter whether we are CSCW designers or engineers, it is central to outline any pre-given information processing activity in a material environment where operators' activities are relevant to their own efforts. We ask how such activities can be visualised and made apparent to the operators through the use of awareness? To our knowledge, awareness in designing cooperative systems mostly involves assumptions about acquiring information such as designing situational awareness in advanced systems [17]. Even though it is about advanced systems, cooperation between and among operators, systems, and other applicable materials, are not the main topics of such research. Awareness, as we address it, is cooperating actions and interactions in a given and meaningful environment [7].

2.2 ANT in Design

ANT advances a rational materiality, the material extension of semiotics, which presupposes that all entities achieve significance in relation to others. Thus, ANT highlights actors and their networks. Against this understanding, several areas of research (such as e.g., health informatics in surgery [18], the hospital environment [19], a general discussion of ANT and information systems [20]) report on design of cooperative work environments in a descriptive way. These researchers have contributed deploying ANT theoretically within CSCW.

The CSCW community has been considering how to visualise actors. Researchers have experimented with an industrial innovation aimed at helping manufacturers in France to develop the electric car market [21]. In that study, researchers highlighted specific actors in order to visualise the breakdowns in the network, and how the network functions under those conditions of breakdown, for example drivers who have to get their car to a charging terminal when they have left the car, with no power, in an area that is far away from any charging terminal [21]. Schoffelen et al. [22] suggest that there are three aspects to readability for designers when visualising an actor network: engagement, sense making, and reflection to inform design. By means of visualising things [22], actors who engage in a network can utilise their knowledge to make sense of their activities and then adjust their reactions properly to reflect the benefits of the visualisation in order to make the design more readable.

These two cases point towards how to design actor networks [23] or the interactive relations between and among actors in an actor network. Still, it is a challenge [23]. Making actors visible [21] is possible if researchers are able to draw maps [25] to give voice to the collective annotations [23] of the actors who are actively engaged in the work process of 'drawing things cooperatively' [22]. Storni [23] argues that "it is difficult to know if mapping the design process more explicitly and making it more public via maps would have helped the stakeholders to confront their perspectives and better inform design". We agree, yet we acknowledge that mapping the design process might be difficult. Mapping the work procedure may be less of a challenge in terms of mapping

actors and their activities. A possible approach could be to customise a type of map that represents the actors in a network and their activities, which can then be used as a tool to inform design. Moreover, this would be an approach to be used when designing a cooperative system for marine technology. It is a way to depict the difference between design and engineering in marine technology; furthermore, it would lighten the approach to the relationships between the operators, the machine, and the systems from a socio-technical standpoint in order to ensure safety operations.

2.3 Awareness in Actor Network

In this article, we are not using the concept of ANT as information infrastructure to understand design. Also, we are not aiming at pinpointing how ANT theoretically can help CSCW designers. ANT is more than simple conceptualizations of actors and networks. However, ANT can assist drawing relations in/of networks [24], who participates, and what type of support that is needed. This is the fundamental basis for engineers to communicate with CSCW designers. Hence, we aim at utilising awareness in an actor network (of marine operations) to create a common language that can serve both design work and marine engineers. To conclude this brief overview of awareness and ANT in design, we present the shared challenge of awareness and ANT: in order to visualise actors functioning in an actor network for designers and engineers, we need a concept that helps us to elaborate on what is the basis on which we visualise something [21]. What is the important thing [21] in networks and their relationships, including the actors in their network-based activities? We believe that by answering the questions we conceptually contribute to providing a mediate support between CSCW design work and engineering by borrowing the understanding of ANT to inform the design of cooperative systems through the visualisation of actors and their associated actor network.

3 A Marine Example

Empirical fieldwork on offshore operations at a sea-based oilfield has been conducted. Each trip on sea ranged from 7 to 14 days in the year of 2015. The first author stayed on board observing and interviewing marine operators. Permissions for fieldwork was obtained from the national research authority. In addition, informal consent forms were signed during field studies. Among several marine examples, we choose dynamic positioning (DP) operation since such marine technology is extensively used on all offshore vessels. We believe it is central for future marine research on designing for new marine and petroleum simulators.

A DP operation is used during pre-operations to enable an offshore vessel to position itself in a proper location at sea. The DP system consists of artefacts, including the DP system, a DP checklist, and a telescope (see Fig. 1). Two operators on the offshore vessel (chief and first officer) interact with the displays and operate levers that are integrated with two operational chairs in the marine operational area. The marine operational area of an offshore vessel is different when under navigation. The marine operational area is designed for offshore operations at sea.

Fig. 1. Marine operational area on an offshore vessel.

The first officer follows the plan received from the oil company to prepare to position the vessel under platform A at ocean Norskehavet. On the vessel, he fills in the checklist (See Fig. 2) for DP preparation by reading the compass to record the vessel's current position and the time. He then walks to a computer (see Fig. 3), which is not a part of the marine operational area to check the weather, sea wave and wind direction from Meteorologisk, which is the Norwegian weather forecast provider. He checks the plan from the oil company against his marine journal log, and writes down necessary notes in order to remember what type of services are needed for platform A. He then completes the checklist. It is important to notice that the checklist is paper-based. Moreover, it too is not a part of the marine operational area.

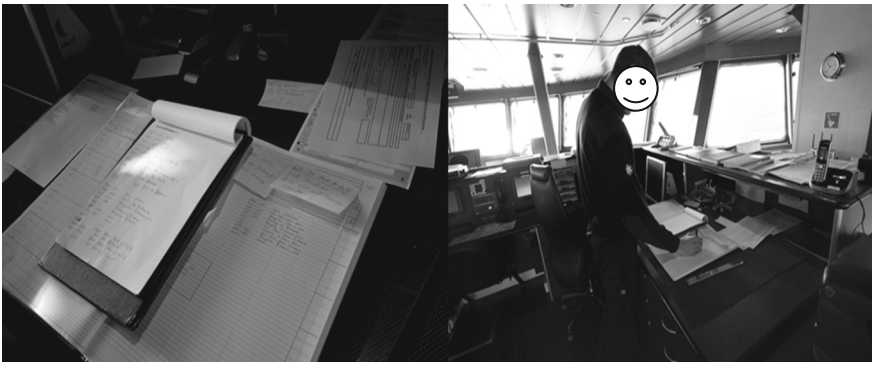

Fig. 2. Checklist for DP preparation

Fig. 3. Computer area on the offshore vessel.

The first officer does not immediately sit down to start his work. Instead, he picks up a communication device and dials a number to call the engine room. He asks the engine room about the engine status because he needs to be aware whether the vessel is in the proper condition for his operation.

The engine room repeats his questions and double confirms the operational conditions, including the weather conditions with both the first and chief officer. The engine room is also aware of the safety operation requirements because the DP operation must be done according to strict requirements for sea wave and wind. Then the first officer marks the engine status in the margin of the checklist and starts to position the vessel.

The first officer moves the vessel slowly and stops again. He passes the operation to the chief officer, picks a telescope and says: 'Could you please help me to hold my operation? I need to check where the rig is. I cannot see it because the roof of the ship's bridge is blocking my line of vision'. The chief officer stops his work checking the service plan from the oil company and holds the DP operation. The first officer walks to the window of the ship's bridge in the marine operational area and uses the telescope to look for the platform's rig (see Fig. 4). He puts down the telescope and guides the chief officer orally to move the vessel gradually. Simultaneously, he talks with platform A to ensure his guidance is correct. Platform A needs to confirm that the vessel is in an apt position for working on the offshore operation, e.g., for loading cargo from the platform to the vessel.

4 Transferring Technique (2T)

From the marine example, and within the optic of ANT we can see that the first officer, the computer, the checklist, the chief officer, the engine room, platform A, and the DP system are connected as actors networked to ensure the safety of the DP operation. We add the concept of awareness in the actor network to visualise these activities – 'the actors and their relationships'– in a specific DP operation at sea. The first phenomena

is the self-awareness [14]: the first officer fills in the checklist but he does not need to check the engine status in relation to the process manual for DP operations. However, he is aware of the engine and that it may obstruct his work if it suddenly stops or works incorrectly, raising the possibility of unsafe events. Therefore, he calls the engine room and marks the status in the margin of the checklist. We illuminate it: I am an actor in the network and I care about information that is important to my work. I need such information to inform myself that my work is taking place under conditions of safety.

Fig. 4. The first officer looks for the rig and guides the positioning of the vessel.

Thus, if we visualise an activity and its relationship with other activities, we must account for self-awareness of the actor doing the network. Self-awareness is the local interest of an actor who carries it out on his own and through this generates a goal for the whole actor network – here a network of safety. Hence, the current DP systems should consist of three components as a part of the function of the marine operational area: the checklist, the engine status, and the weather conditions. However, adding these functions is not about simply adding them to the current DP system. For the purpose of visualisation, we need to consider how such reshaped functions are associated with other activities in actor network.

Since the first officer cannot check the engine status directly, he calls to the engine room for help. The engine room answers his inquiry. Additionally, he double-checks the weather conditions with both officers. It seems that the weather condition is common information for both sides – the operational area and the engine room. This can be understood as We-awareness [14]. The engine room double-checks the weather because it is also concerned about safety. The engine room needs to confirm with the officers that their operations are within those allowed under the weather conditions. Hence, the DP system changes, developing from one visualised actor to the relationships between actors who share the same interests in an actor network. Figures 5 and 6 visualise such dynamic characteristics by using case studies [26] to detail the necessary visualisations.

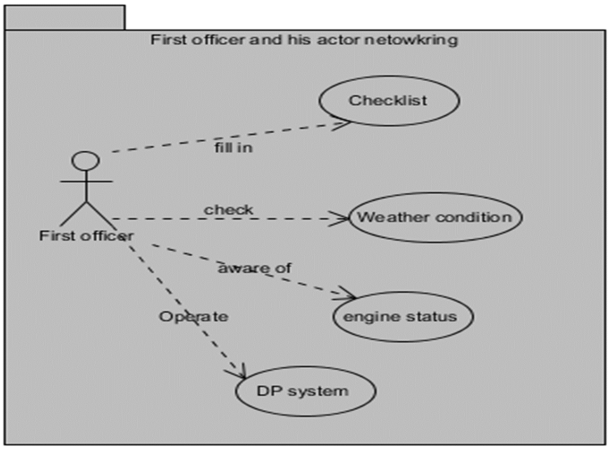

Fig. 5. First officer, self-awareness and the actor network of activities

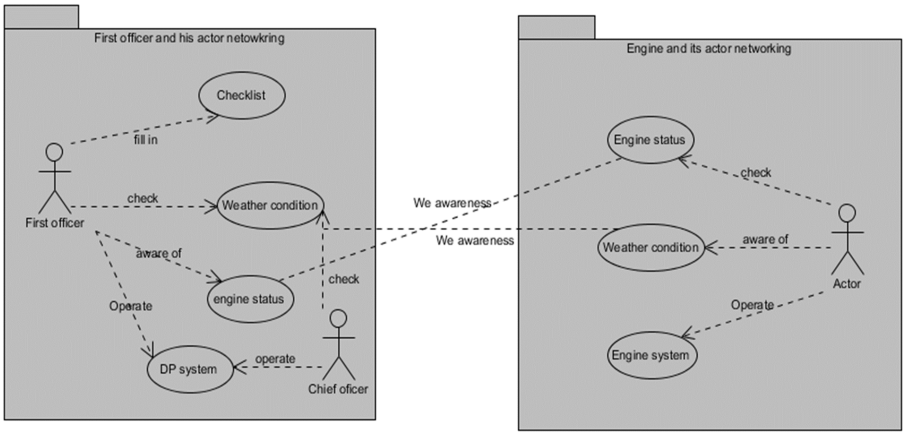

Fig. 6. We-awareness, first officer, engine and their combined actor network

After the first officer has processed the information, he works cooperatively with the engine room; he then needs to hand over his job to the chief officer in order to find the rig to assist the vessel into its proper position. In the meanwhile, platform A also engages in the network by communicating with the chief officer. As this is happening in the actor network, each actor's interest in safety and his activities are associated with several areas of we-awareness. For example, the first officer cares whether he can successfully find the rig and helps to guide the chief officer in positioning the vessel correctly. The chief officer is aware that his ability to position the vessel depends on the oral guidance received from the first officer. Platform A needs to be aware that both officers are involved in positioning the vessel at the right point under the rig so the continuous communication between platform A and the first officer does not end until the vessel is in the right place. The common interest behind all these activities is safety, which is

allied to the we- awareness occurring from time to time during the DP operation between the first officer and platform A, the first officer and the chief officer, the chief officer and platform A. Hence, we define allied we-awareness as group awareness.

If we expand our understanding of such dynamic changes of alliance in we- awareness, it is not difficult to describe the relationship between the DP system and the other systems on vessels. Regarding the relationship between different types of awareness, we assert that system functions based on group awareness shape the actor networks. By subscribing [23] to and from different networks of actors, the functions of marine technology are reshaped relative to the current marine systems. Through this approach, we believe actors and their interactions in actor networks can be visualised based on the systematisation of different types of awareness. Figure 7 demonstrates the visualising of interactive relations for a cooperative system. Petroski [26] states that "design is to explore everyday artefacts and sophisticated networks about the way engineers think about problems". Hence, we believe that with 2T marine engineers could follow their regular practice in dividing system problems into their constituent pieces [27] and further, exercise the use of software models [28]. 2T helps to include the operators and their interactive relationships with marine technology to create an engineering approach to system development.

5 2T-Supported Marine Technology

2T-supported marine technology makes a twofold contribution to CSCW design for marine technology. 2T supports the design community in offering a readable visualisation [22] of actor network. With a particular emphasis on Latour's observation about making things public [29], it improves readability [22] and allows both designers and engineers to sit at the same table in understanding cooperative systems through a visualisation platform (actor network). We claim that each side of the table could make sense of the perspective made available regarding what cooperative work means. If there is no detailed explanation, the engineers will probably understand the network in terms of system requirements, as a network of the system's functionalities. Hence, it is easy for them to assemble all pieces of functionality as cooperative systems. Then, we assume that there is a tendency, from the engineering side, to believe that every piece of the cooperative system has a hierarchical structure. Therefore, the operators, their interactive relationships and the sense-making that evolves from their combinations are readily dismissed [28, 30].

On the contrary, cooperative systems conflict with such ideas in providing structure for the functions of the marine technology. Operators can tell rich stories about the operations in their living and working environment via their language, behaviour, and their reflections on their daily work. CSCW researchers engage in situated environments to learn from operators. Furthermore, such understanding from designers must be delivered to engineers. 2T provides CSCW designers possibilities to do so by integrating social activities that outside the functionalities of marine technology. Additionally, 2T enlightens engineers a way to re-engineering functions of marine systems to support cooperative work. Such way contributes in helping engineers to understand that the work

procedures of the operators are shaped and reshaped based on a given material environment – the marine operational area. Moreover, such way contributes to highlight actors in actor network with specific supported functions for different offshore

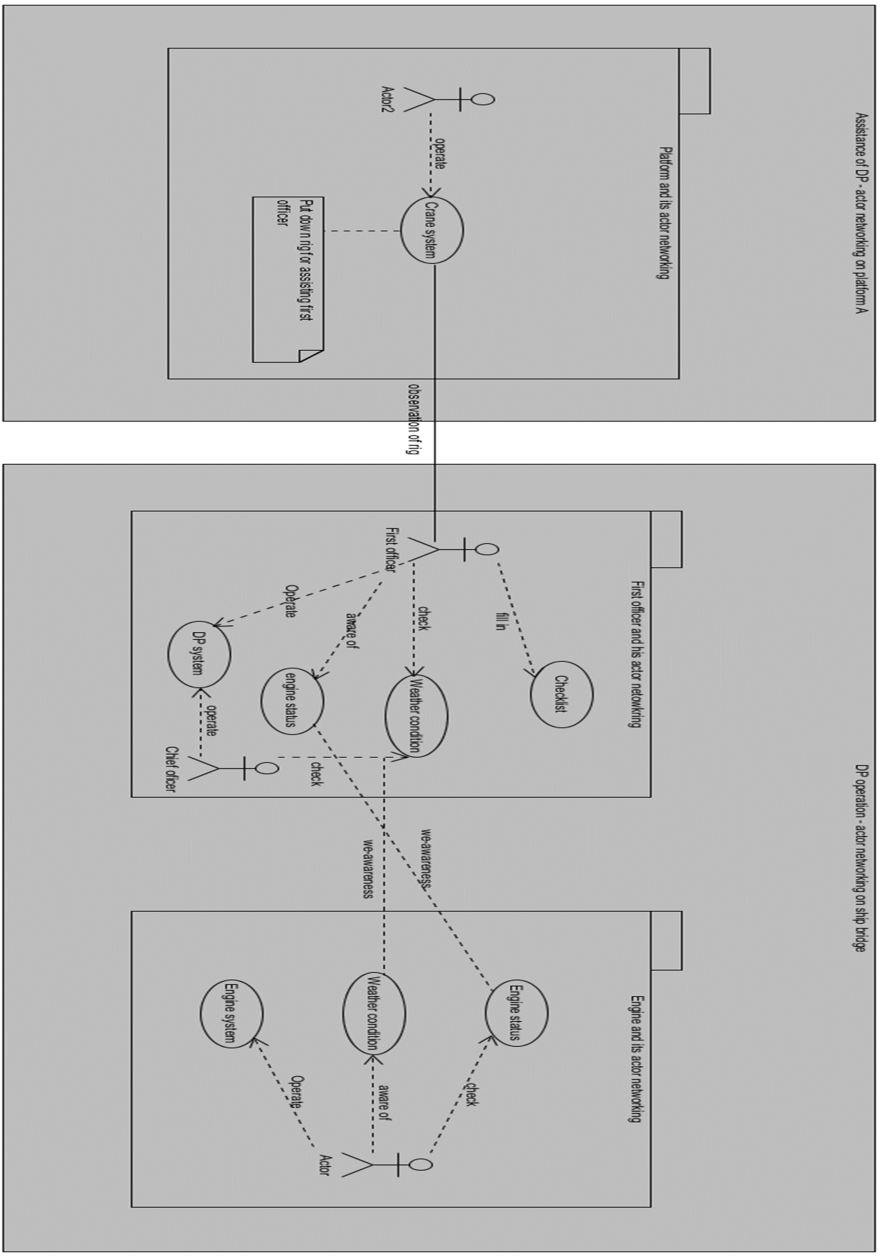

Fig. 7. Actors, group-awareness and combined actor network

operations. In this way, engineers could understand operators regulate their activities by combining both material and places with regard to their common interest in actor network – the safety operation through the existing diagramming techniques, i.e., UML. To some extent, such activities enforce the safety attributes of the offshore operations, and of course challenging the structure of current DP systems. For cooperative systems, to consider the complexity of the system from a single perspective only is not enough. Noticeably, the non-functionality of cooperative systems, such as human operators and their influence on the work in a particular setting, may result in a great impact on the system's structure.

Sørgaard [31] suggests that cooperative work is non-hierarchical; that is, cooperation "is to work or act together for a shared purpose. The work is done in an informal, normally flat organisation". We acknowledge this reference and reflect on the visualisation of actors. From time to time, actors engage in actor networks with an awareness of their own role in shaping and reshaping work procedures and therefore the ability to cause dynamic changes in the network. Network happens in a flat organisation. It is not only about the systems' ability to help the operators to complete their marine tasks, but it also identifies who is in the network, doing what, with whom, using which part of the system, and to what purpose. In this case, the operator is aware of his own work and conducts his activity publically [8]. Awareness in actor network frames the relationships between and among the network as self-, we- and group- awareness. This phenomenon enables us to understand cooperative systems from the designers' perspective, and what the system development may need to improve. It is not a way of moving simply from requirement to programming and engineering design. Instead, 2T is a technique by which designers can validate requirements by logically following the visualised actors and their associated network. Hence, the functionalities in cooperative systems are organised to assist the visualised network rather than as standalones to realise the basic functions.

2T allows designers to communicate with engineers via a visualisation method. 2T permits designers to explain and visualise network to engineers. In marine technology, safety is an important factor in every kind of product and usage [16]. 2T is developed based on awareness in actor network. All types of awareness are geared towards safety as the goal. We believe 2T could serve as a technique for enhancing marine technology by engaging design knowledge in the engineering field. Storni [23] suggests that visualising the network could provide a method for design that allows the actors themselves to indicate their concerns. For marine engineers, the actors' concerns are represented as system requirements. Thus, a common understanding between the designers and engineers is essential.

Also, it should be noted that 2T does not deny mechanical computing with an emphasis on functionalities. 2T could serve as an alternative that takes into accounts operators' actual work situation. In its present form, mechanical computing has little potential for take care of the human factors [32], including an inability to understand the influence of cooperative work and its supporting systems in real life. 2T offers an opportunity to bridge the distance between design and engineering by allowing design knowledge to support engineers in realising the functions of cooperative systems. By following the actor network provided by CSCW designers, engineers can detail and realise functions that will support each of the actors and their interactive relationships.

We believe this could provide the operator with a better experience when using the marine operational area and feeling safe in their daily activities.

6 Concluding Remarks

Safety concerns in offshore operations are essential. We have used awareness and ANT to visualise an actor network on an offshore vessel in an effort to capture activities and their social interactions in a material environment (involving humans, marine technologies, and material employed by humans) to help dealing with such safety concerns in system development. By doing so, we illuminate 2T for engineers designing marine technology by visualising the importance of cooperative work activities that shape computer systems on an offshore vessel. It is our aim that 2T can assist in enhancing mechanical computing by including socio- and material activities, rather than leaving them out in formal models. In this way, we aim at supporting engineers to implement cooperative system to scope operators' activities and their social interactions.

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"To Listen, Share, and to Be Relevant" - Learning Netiquette by Reflective Practice

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Abstract. Over the years, organization researchers have researched use of Social Network Sites (SNSs) in organizations. Organizational research on use of SNSs in public organizations is a growing research field. To expand the latter research stream, this paper explores a trend in the Norwegian public sector, the creation of so-called "betas", competence groups in social media. This trend illustrates how public employees have started to work professionally with social media. The paper examines a case showing how the members of a beta group affiliated to a municipality, developed a social media strategy to master the unwritten rules of communicating on social media. The paper exemplifies this by analyzing how the beta group members interacted on various SNSs to learn netiquette and used this user experience to provide municipal employees a moral compass to interact online, which had to be created by performing processes of *reflection-on-action*. Their social media strategy was expressed under the self-designed catchphrase – "to listen, share, and to be relevant".

Keywords: Norway · Snss · Public organizations · User behavior

1 Introduction

Since the end of the 2000s, Norwegian public organizations have started to work professionally with social media. As part of this development, we find a franchising of social media competence groups, so-called "betas", in various municipalities and state-owned companies. The betas are few, but have formed as the result of local bottom-up initiatives or are the creation of top-management priorities. Normally, the betas consist of employees with university education in media and communication studies and are affiliated to IT or Communication Departments. The betas specialize in a wide range of matters, but they have foremost worked with approaching and creating legitimacy for use of social media in organizational life. For example, they have authored local social media guidelines fitted for use in public organizations and acted as instructors for colleagues who wish to learn more about social media.

In this way, the betas have set social media on the agenda, but this can come with a catch. Adopting social media strategies in organizational life can be a challenge,

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especially when there are few frameworks around that can be implemented by a top-management initiative. And when that is reality, public employees working with social media have been compelled to create social media strategies *themselves* through bottom-up initiatives, which has involved reflecting on their own social media behaviors and practices that they perform as ordinary users. This online engagement seldom takes place in a contextual vacuum; it is socially negotiated by exploring cultural impulses in the social media landscape and by looking to how colleagues in neighboring public organizations approach social media, approaches that play an important role in how local social media policies are eventually expressed in the end.

In this regard, the focus of this paper is to exemplify such a case through a beta's work, called the Beta Group (BG). The BG is affiliated to a Norwegian municipality, named the Echo Organization. The paper pays attention to the ways the BG members engaged on three different SNSs to learn netiquette. Netiquette can be seen as the unwritten rules for good user behavior or role performance and are a "recipe" to manage online identity and create online community awareness on social media. Online engagement helped the BG members to formulate a local social media strategy and enacted as a moral compass for colleagues who were unfamiliar with using social media, which was expressed under the catchphrase, "to listen, share, and to be relevant".

To explore the above case, this is covered over the following sections. The next part takes in hand relevant theory and research horizon. Thereafter, the methods used to complete the paper are outlined, before data analysis is addressed. The final part concludes the data analysis.

2 Relevant Theory and Research Horizon

In organizational research on social media, one has not adequately framed how practitioners in organizations are challenged to make sense of social media by personal *retrospection*; moreover, what role personal retrospection plays in creating local social media strategies. Instead, other research themes are given emphasis. For example, organization researchers focus on suggesting frameworks, technical definitions, describing technical features, and the potential ways that SNSs can bring benefits and changes to organizational life. Here, McAfee's [1] Enterprise 2.0 and Tapscott and Williams's Wikinomics [2] are influential contributions.

Therefore, one needs to develop a research lens by using a *reflective practitioner perspective*, which can be illustrated by the work of Schön. Schön [3] introduced the concepts *reflection-in-action* and *reflection-on-action*. *Reflection-in-action* can be described as the ability of a practitioner to reflect on feelings, emotions and prior experiences to attend to a situation more directly, while reflection-on-action is a "post-reflection-situation", where the practitioners analyze their reaction to the situation and explores the reasons around them and the consequences of their actions. Reflective practice is a practice-based professional learning where persons learn from learning from professional experiences, than merely reproducing knowledge from formal learning and knowledge transfer. The framework emphasizes that learning is part of an ongoing cyclic pattern of experience and the conscious application of lessons learned from personal

experience, where the end-goal is to reach a higher level of understanding. And in this way, reflective practice is an experimental learning where self-organizing and auto-didactic features are central elements.

There can be good reasons why organization researchers could take advantage of the above approach. For example, social media tends to manifest as *ambiguous* and requires ongoing sense-making in order to be managed. Here, reflection can help in understanding the processes that influence how social media policies are created.

But organization researchers have approached SNSs differently. Much organization research appear to be inspired by a social capital framework and many studies are making initial findings on how SNSs are used in organizations.

For example, a body of studies have mapped how SNSs are used internally in large IT companies. Hewlett-Packard designed an enterprise SNS, which was tested on employees, being part of a larger R&D project. Here, IBM's Beehive project is ground-breaking work, reporting successes [4] and interesting research papers. Characteristically, one can read about how Beehive has been implemented and tested on employees, where researchers have documented basic SNS user behavior on detailed levels. Research focuses on an entire SNS [5] or particular features, like tagging systems [6] and user profiles [7]. Many Beehive research papers somehow use a social capital perspective [8], as the links between SNS use and connecting strategies figure as a recurring theme. Researchers record that IBM employees use Beehive as a platform to expand their professional networks; they use it to communicate with colleagues across organizational levels [9]. IBM employees carry out a range of search and retrieving practices [10] and use Beehive as a knowledge repository [11].

Another body of studies gives insights on how employees use SNSs to streamline their online behavior to work practices and organizational affiliation [12]. For example, if an employee uses Twitter, one is cautious on what information is shared to an external audience [13]. Researchers have examined the challenges in adopting organizational SNSs. It is not uncommon to come across findings showing how employees still prefer communicating on e-mail and chat software and silently monitor SNS streams [14]. Hence, we find the usual user pattern; that a core group adopts SNSs and maintains network activities, while a larger user group uses "older" ICTs.

A research literature studying the ways SNSs are used in public organizations is growing among researchers, the e-government field. Research suggests frameworks on how public organizations should adopt SNSs [15–17]. Studies establish that public organizations adopt SNSs in attempts to create dialogue with citizens [18], but are predominantly creating an online presence [19]. Bonsón et al. [20] examined Western European local governments' Facebook pages, only to find that much of the published content did not seem to be relevant for citizens. Reddick and Jaramillo [21] found that Canadian citizens use SNSs and had high service expectations, demanding timely updates of information and responses to private inquiries. Reddick and Norris [22] showed that a public organization used SNSs as a one-way communication channel, although aiming at creating a public dialogue. This is also confirmed by Mossberger and Crawford [23] and Saulles [24], where the latter one found that English local government agencies used SNSs to perform a "push-out-information" communicative strategy. Cumbie and Kar [25] conducted a survey of local government's use, but results

illustrated that many public organizations merely register and had an online presence. Joseph [26] documents the same tendency among US government agencies, a finding consistent with studies of how Norwegian municipalities adopt Facebook [27].

To conclude, public organizations use SNSs as bulletin boards and interact with citizens by using formal communicative strategies. This is not far from the ways one communicates with government agencies on phone or e-mail.

3 Methods

The paper is based on a field study in the Echo Organization's IT Department, carried out from October 2011 to June 2012. There, I followed the work of the BG members. I used ethnographic methods, consisting of qualitative interviews, participative observation, and collecting of written and digital items.

The paper makes use of interview data from three informants, the head of the BG and two members. The data analysis is based on six individual interviews. The BG Head was interviewed four times, while two interviews were conducted with the other members. The interviews lasted from one to three hours and were recorded on a digital recorder. The interviews were semi-structured. An interview guide was used.

After interviewing, the interviews were transcribed and patterns established. The data was first coded into smaller topics and then grouped into larger themes, showing different approaches to what role reflective practice plays in use of SNS and learning netiquette. To complete this task, the sociological data analysis technique constant comparative method was used [28].

4 Data Analysis

The data analysis section takes in hand three themes, showing how the BG members used a reflective practice to learn netiquette and to formulate their social media strategy, "to listen, share, and to be relevant". Each theme explores how the BG members used a particular SNS, which in turned shaped a particular user experience they used to express their local social media strategy. The first part tells how the BG members tested the SNS Elgg in the Echo Organization, which reflects a "*discovery approach*" to SNS use and conditions for implementing SNS for internal communications in organizations. The second part examines how the BG members used Twitter as public employees. This user experience mirrors an "*awareness*" theme, where the BG members attained a greater understanding on how one communicates externally on a new SNS where online community rules are not yet set. The third theme displays how Facebook use reflects a "*streamlining*" theme, showing that public organization imprint its formality on SNS use, as a way to accept a technology into its governing apparatus.

4.1 Background of the Beta Group

The BG was formed in 2008 as a grassroots initiative in the Echo Organization. Today, it is a permanent social media competence group. The members are early adopters of

technologies. The BG consists of four persons, two males from the IT Department and one male and one female from the Communication Department. The members are in their 30 s and all have master's degrees in media studies. The BG is not a full-time assignment. The members spend about 30–50 percent of their work time on it. An overview of the informants' backgrounds is displayed in Table 1.

Table 1. The BG's current crew.

NO.	GEN	DEP	POS.	EDU	ITLE
1.	M	IT	Leader	Master	Consultant
2.	M	IT	Member	Master	Training Consultant
3.	F	Communication	Member	Master	Adviser
4.	M	Communication	Member	Master	Adviser

4.2 Theme 1: Discovering Netiquette by Using Elgg

The BG members' first experience with SNS started in 2009 with Elgg, an open source SNS often used for educational purposes. At the time, the BG members had little knowledge of SNSs. Social media in general surfaced as ambiguous too, including the ways you engage on social technologies. But they had to start somewhere; as the Echo Organization is a large purchaser of IT systems, the BG members approached their subcontractors to find out if they offered relevant technologies and frameworks:

I-1: We have IT subcontractors that operate all the software for us here in the municipality. But we found out that we had to do it by ourselves. Our IT subcontractors didn't work with social media at all, but only sold large packages and big software programs.

This represented a discovery, and later, a challenge, as they encountered a "theory-practice-gap" in their field. This gap is not dissimilar from how teachers experience the value of their education – that formal competences provided by education systems do not always match practice. In the BG's case, this applied to that the resources the Echo Organization normally use to stay updated on changes in the technology landscape – the services offered by IT companies, which their subcontractors also use to maintain IT services – did not provide clues to how to use SNSs in organizational life.

The approach to problem-solve this, was to start using the SNSs themselves. This consisted of conducting a "trial-and-error" practice, which first followed a test environment approach of new technologies. Here, the BG decided to implement Elgg themselves. Elgg had features that could meet organizational requirements, as it had microblogging features and tagging systems. But to test Elgg themselves, the BG in a contradictory position. They had no technical training or experience from computer science. They specialized in strategy and organizing. In so doing, they had to learn Elgg from scratch and struggled with getting it technically configured first. Afterwards, they recruited some colleague to test Elgg, who they saw as super-users:

I-1: We made a story about it and published it on our intranet. We said that we were a testing of an internal SNS, a kind of "Facebook at work". We asked if anyone was

interested in getting involved and have their say. We wanted 20 test subjects or so. They were people from different parts of the organization.

The BG acquired several "learning outcomes" from testing Elgg. It taught them a great deal on the challenges about internal communication in organizations:

I-1: We noticed quickly that getting 20 different persons from the Echo organization together was not the best move. Different people from different areas worked with different things, so it came very apparent that people from the City Archive were talking about things that were not [relevant] to those working at the Education Department (Fig. 1).

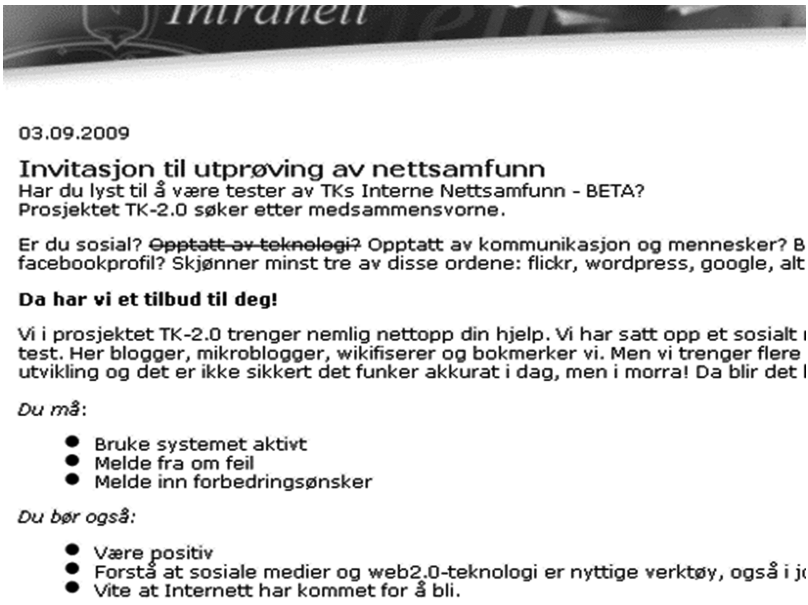

Fig. 1. Ad used to recruit users to testing of Elgg.

The BG also acquired other user experiences. For example, the super-users had different motivations for using Elgg. Some participated because they had one thing in common, new technologies. They were not motivated by that Elgg could be used to exchange professional experiences on an ongoing project or find competences.

Instead, the testing of Elgg brought organizational boundaries to the forefront, reflecting that different user groups have different technology beliefs. These manifested around key words introduced by the test-subjects who did not share a passion for new technologies, the "Elgg quitters". They argued that Elgg was "not relevant" and represented a "distortion".

This experience gave ideas to understand the dynamics of netiquette and how to include reluctant employees to become SNS users. Now, the BG members had insights on how to start working on creating arguments, which played on emphasizing the

benefits of using SNSs. A SNS is not only a platform, a *technology*, but offers access to *social resources*, meaning that embedded in network technologies are ties. Here, SNSs can be used as a stage to reduce internal departmental boundaries and get coworkers with dissimilar backgrounds to connect with each other. To work on this level, required a different approach. The BG had to become advocators to show that online socializing can bring out distinct profits in strong or weak ties. Having an online social network is advantageous, which skeptical users seldom think of first. This meant that the BG members had to labor positive arguments, which stressed the value of bonding with colleagues across organizational levels, either informally and formally. In other words, it does indeed have a value to share something on a "Facebook at work".

4.3 Theme 2: Awareness of Netiquette by Engaging on Twitter

The BG members' engagement on Twitter shows a different path and use of personal reflection to learn SNS user behavior. Their learning experience differs as it dealt with mastering the intricacies of external communication in organizations, which is characterized by an *awareness* mode. This started in 2009, when the BG members created personal and official municipal Twitter accounts for the Echo Organization.

The BG members describe their first user experience as starting with an explorative approach in the private sphere, to be reshaped to a professional use. They started using Twitter because it was "natural" and other social media professionals used it.

On the onset, Twitter users tweeted anonymously and were few in numbers:

I-1: The culture was that everyone followed each other. It was important to have many followers. If someone followed me, I followed them back. English was the main language, as there were not that many Norwegians on Twitter. There has been a change as we started to tweet in our mother-tongue.

This period is experienced as positive. The online atmosphere was "friendly", governed by a digital small talk code. Central to the Twitter netiquette was *informality*, which sometimes was seen as too "overenthusiastic":

I-4: There is a netiquette on how to communicate on Twitter. In the beginning, it was a very cozy and informal. You had a lot of, "thank, you for that!", "absolutely fantastic!", "you are so nice!", "thank you very much for retweeting me!", "fantastic!", tweets like that.
R: Very enthusiastic?
I-4: Yes, a bit "circule jerk", as they call it on reddit.com. Whatever you say, you get positive feedback, no matter how silly it is.
R: Does it appear genuine?
I-4: Slightly pompous and excessive.

This gave insights on how user behavior establishes itself in online communities. Twitter users *shared* and seldom enforced self-censorship on themselves, but participated in a dialogue. But when new actors enter the stage, the conditions change. New community norms are introduced, which carve in boundaries, setting premise for

inclusion and exclusion. The new Twitter users established distinctions between "work" and "private"; they addressed each other directly by use of @replies and mentions; the former friendly irony and humor changed into a rare commodity; users tweeted under full names, resulting in that Twitter users instead became cautious on how they interacted:

I-1: In the beginning, my Twitter stream consisted of people interested in Web 2.0. It was a small group. There is another word for it, "early adopters". But now, that group has managed to get other people to use Twitter, like "social media experts" and journalists. That brings changes.

Another member explains:

I-4: Now, it's harsher. They use Twitter as a discussion forum, although it's not suited for that. Twitter users have to be more expressive, since you only have 140 characters to state your opinion. Tweets develop into strong statements and you get polarized discussions.

Hence, the BG members saw the Twitter stream as an extension of the public debate. This contributes to learn about how the apparatus of an organization adopts a communication platform designed for individuals and short messages – which can be seen as poles a part. This brings up contradictions. As a public organization, the Echo Organization can meet negative criticism, which citizens air on Twitter. Because of this, the BG's coworkers are reluctant in adopting Twitter. They fear that they will be overwhelmed with negative criticism and inquires. But underneath the administering of official municipal Twitter accounts – which has become part of work practice and is under the BG's control – another reality surfaces:

R: During a workweek, how much work does Twitter monitoring involve?
I-4: Very little, maximum a tweet a day.
R: That's not much?
I-4: It's very little. We don't talk about using major resources.
R: It's almost like responding to a chat message or an email a day.
I-4: Yes. Often there are tweets about the Echo Organization, which I have to redirect to other departments. That's not much work either. The thing that's time consuming are things that I don't know the answer to. And I don't know who knows what. For that, I have to use Yammer and do internal enquiries. And often I get response from a colleague.

Administering official Twitter accounts is seen as a "digital switchboard", a new front desk function, because citizens contact them about topics that are the responsibility of a department. This can be enquiries about formal admission routines to a kindergarten, for example, meaning that negative criticism is rare. Twitter monitoring thus brings up the question on whether an employee should be passive and answerer all tweets or pursue a proactive role and engage with citizens:

I-4: We were inspired by a social media professional who visited us the other day. She talked a lot about listening. First, you have to join the conversation. We understood that part and that you should be relevant. You should share things that give a benefit to our citizens. We didn't manage doing that when we first joined Twitter. How do we know what if it's relevant? It's about listening. You must find out what interests the citizens and those who follow you on Twitter. What are they talking about? And then it's about being proactive. Let's take snow plowing, for example, which is a hot topic these days and is easily exposed for criticism. Why haven't there been plowed for snow here and there, why haven't the municipality salted the roads? Instead of just receiving criticism, one can be proactive and engage with the matter in advance. Not only be reactive and respond to tweets. We have no resources, they argue in the Echo Organization. We can't use our manpower on it, because there is a debate on a discussion forum somewhere. They talk a lot about that here, that we don't stand up. Public claims against the Echo Organization are neither denied or confirmed in that regard and somehow allowed to flourish. It's the same on Twitter, if there is some outspoken criticism we have to deal with it.

4.4 Theme 3: Streamlining Netiquette to Formality on Facebook

The third theme demonstrates a different approach, which foremost reflect a *streamlining* of netiquette to fit the formality associated with a public organization. In other words, to help public employees who interact with citizens to uphold a certain common code of conduct, public organizations normally write guidelines. The same has been done for Facebook use. Although the Echo Organization has general guidelines for administering of official social media accounts and how employees should interact on social media, there are separate Facebook guidelines, which the BG members have contributed to make. These state that:

When creating a FB page, one should think through and implement the following:

FB is a channel of communication with the inhabitants of the municipality.
FB is a supplement to other channels, and not a replacement. All information should be publicly placed primarily on the municipality's official website. On FB, we can publish links to these sites.

We want to achieve increased availability:

as we reach more groups of users
as we are present in more channels

and increase the possibility to have dialogue with citizens:

we can quickly provide answers to questions
we can get better insight into the population's needs and point of view

and effective dissemination of information:

we use multiple channels
users spread information to their friends

The Facebook guidelines have many communicative strategies. For example, when an employee creates municipal Facebook page, there follows a defined set of responsibilities. An employee must identify a target group; there are defined roles and responsibilities in administering a page; department managers are content owners and legally responsible; any page requires ongoing monitoring and inquiries from users have to be redirected to the responsible in which an query concerns; all online inquiries have to be answered; there is a defined response time for when an inquiry needs to be answered, which is set "as soon as possible and within the next work day"; administrators should set up alert notifications to their email, so that they are aware when a new post is published and that one always has an overview of what's going on a Facebook page. The guidelines contain recommendations on how to deal with criticism and Internet trolls. Public criticism directed on employees should be deleted immediately, but general criticism should be replied to, and be done so by answering factually to correct errors.

In contrast, the Facebook guidelines have a practical side and are an outline of a new job description. This means that creating a Facebook page is a call for organizing work. Facebook pages need monitoring and updating, meaning that someone has to perform that task. This work falls on those who take the initiative in creating a Facebook page. This brings up contradictions. For example, the BG members aim at creating a dialogue with the citizens, but Facebook pages often turns into an information repository:

I-3: We want our Facebook pages to be a collaborative platform, but they are bulletin boards. We seldom get any online interaction there. Perhaps it's the way we write our updates, what we allow, what people are willing to share. There are not so many users who enter our pages and interact there. We want to achieve that goal, but we're not there yet.

This means that administering Facebook pages is a front-desk management task, as we saw with the BG members' experience with Twitter. Faceworking is an office clerk duty, similar to working at a customer call service center, a digital switchboard:

I-3: Often we don't know the immediate answers to the many inquiries on our two Facebook pages. There are questions that concern the whole Echo Organization. That's what the switch board operator knows best, because they get questions all the time. They can connect a citizen's inquiry to the right person. They probably use about 10 s on what we spend half an hour doing, because we do not know who has the answer right away. So we have to do a lot of detective work, to find out where we should redirect inquiries.

The BG members get perhaps one or two inquires each week, meaning that the work is minute. Public criticism is scarce too. The main conundrum is to create conditions for online participation, something that is demanding as Facebook users limit their online sharing to "likes". This means that one is confronted with the challenge to become a creative content producers that can spark interaction:

I-3: I login on Facebook each morning. I see if anything has happened. Nothing. Then I do other things. Later in the day, I take a look if anything has happened. Nothing.

I do some other things I have to do. It's a quiet the day, I go onto the website and see if there's anything that might be of interest that we can publish. Do we have it, I put it out right away. We want to publish more, we want to add more. I try to figure out something that we can publish. I work with it. If there's a question, I usually don't' know the immediate answer. I write a question on Yammer, so that everybody in can see it. I then get answers that help me to respond on Facebook. It doesn't take much time and administrating on my part is little, really.

5 Conclusion

The main goal of this paper has been to suggest new insights on how SNSs are used in organizations, a growing research stream in organization science. Although research is making initial findings on how SNSs are used in organizations, the paper has argued for a case where practitioners use personal reflection to create communicative strategies for use of social media in organizational life, a knowledge path that has not been adequately explored by organization researchers. This brings to the forefront considerations on how frameworks for use of social media in organizational life are eventually implemented or created. In adoption and implementation processes of social media strategies in organizations, we have to acknowledge that process of reflection-on-action have greater meaning that we like to believe, although many would agree on this is important. The reflective practice approach gives away small details on the benefits and disadvantages with social media. The case teaches us that particular contexts and platforms shape different user experiences and give various ideas on how to present your online identity. Finally, the analysis reveals that SNSs tend to still take on the role as bulletin boards and represent a new "phone line" or front desk function, requiring continuous management and maintenance by someone.

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The Embodiment of Relationships of Adult Facebookers

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Abstract. In the last decade we have seen a rise of social media. Within this landscape of online services Facebook plays an immense role in facilitating and creating bonds between people. In this paper we enter a qualitative study conducted with a small group of adult Facebookers over 58. We do so in an effort to understand what kind of relationships one can have through this digital media. The theoretical lens used is Phenomenology, which we find fruitful for more carefully looking into relationships between humans and technology.

Keywords: Facebookers · Older adults · Embodiment

1 Introduction

In the last decade we have seen the rise of so-called social media, which are websites that allow members to connect to one another and share information about themselves, as well as photos and video [1]. The most popular of such sites can be argued to be Facebook where 67 % of online adults are reported to be members in late 2012 [2]. In addition, Facebook reports that it has 1.55 billion monthly users as of 30th September 2015 [3]. Although people over 50 use social media less frequently than other demographics [1, 2, 4], their numbers are increasing fast. Madden [5] reports that the number of people over 50 who use social media doubled between 2009 and 2010.

Studying humans and their relation to technology is interesting in general, since, as Verbeek [6] says, we would not be the beings we are if we didn't use the technologies we use, with writing being a prime example. Here we draw on such comprehension and want to study more carefully the relation between humans and technology; i.e. the relation between a small group of users aged 58–73 (these people we refer to as Facebookers) and their varied engagements on Facebook. We do so with reference to this year's call for papers, which is concerned with technology and intimacy, and whether our relationship with technology is by choice or coercion. We address this call using phenomenology as the theoretical approach to study the embodiment of relationships of these Facebookers.

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In using relationship we equate it with intimacy. That is, according to Dictionary.com [7], intimacy is "a close, familiar, and usually affectionate or loving personal relationship with another person or group". Thus, when we look at this group of Facebookers and their online activities we are interested in the embodiment of such relationships. We draw on phenomenology, herein the postphenomenologist Don Ihde who coins embodiment as: "*Embodiment* is, in practice, the way in which we engage our environment or "world", and while we may not often explicitly attend to it, many of these actions *incorporate the use of artifacts or technologies*. […] what I call *embodiment relations*, relations that incorporate material technologies or artifacts that we *experience as taken into our very bodily experience*." [8] (original emphasis). Thus, according to Ihde (also cited in [6, 9]), an "embodiment relationship" is one where we experience the world through an artifact, which is transparent to us and has become an extension of our body.

Whether a digital service like Facebook belongs to the category of "material technologies" we will leave out from the discussion here and rather focus our interest on understanding how, by using Facebook, our relationship with it can become an embodied relationship that leads to more intimate relationships between people. The reason we chose to study Facebookers over 58 is because this age group is less likely to use social media, even though they form a significant and growing proportion of Western population [10]. We therefore believe that it is interesting to study questions of technology and human relationships (intimacy) from the point of view of these people, who are often reluctant users.

The article has the following structure: First we briefly review related literature. We then describe the empirical setting and the methods used. This is followed by a description of the phenomenological concepts used. Next we meet eight Facebookers and enter an analysis about their varied engagements on Facebook. We then conclude the paper by advocating for analyzing varied engagements in an effort to learn about embodied relationships of adult Facebookers.

2 Literature Review

Different studies have been reported concerning Facebook and its usage. We begin this review with delineating studies concerned with social media and adults over 58, which are related to themes presented in this article. We then continue with studies about social media and types of relationships, social bonding, and intimacy.

Keeping in touch with friends and family was found to be a common motivation for using social media both by the general population [11] and by adults over 58 [5, 12]. It was also cited among the benefits of social media use [4, 5, 12, 13]. One of the barriers (for adults over 58) to joining and/or fully exploiting social media was found to be technical problems [14, 15], while some were hesitant to join because they viewed social media as cold and narcissistic and not fulfilling their idea of friendship [10, 14], and preferred face-to-face or email [14, 16].

Grieve et al. [17] found that social connectedness derived from Facebook is distinct but related to offline social connectedness; however, social disconnection can exist both

in offline and online environments. Research shows that people tend to use social media more to keep in touch with people they already know offline, rather than meet new people [18–20]. In this, most add people they know offline [19]. There was an overlap between people's online and offline networks, but this was not perfect; some of their closest friends online were different from their closest friends offline [19]. In general, it seems that social network sites (SNS) play a supplemental role by providing another channel through which to maintain relationships [13, 21].

Using Facebook and MySpace as an extension of face-to-face interaction may strengthen existing relationships [4, 18] and broaden connections users would otherwise not have [18]. Gossip and small talk can serve as a form of social grooming for humans; SNSs can be used in that capacity [11]. According to Vitak, Ellison & Steinfeld [21], Facebook use can have a positive effect not only on bridging social capital (weak ties), but also on bonding social capital (strong ties) when engaging in certain behaviors (commenting on a post rather than simply disclosing information). It can also be used, according to Ellison et al. [20], to solidify relationships that would otherwise be ephemeral, by converting latent ties into weak ties. Finally, Facebook may be useful for social bonding where face-to-face bonding is not possible, for example, in cases of people with high social anxiety [17], people who have difficulty forming both strong and weak ties [20], or when strong ties become geographically dispersed [20, 21].

Some people have expressed concerns about this new mediated life where face-to-face communications tend to disappear or be replaced by mediated communications. This transformation has an impact on e.g. friendship, intimacy, and being in communities. Due to that, Deresiewicz (in [22]) argues, we have a sense of communities, rather than being in communities. In a similar way, Turkle[1] [22] asks whether we, as a consequence of our use of social media services, have "moved from empathy to a *sense* of empathy? From friendship to a *sense* of friendship?". In line with this, we have previously mentioned a similar concern located in many adults over 58 [10, 14]. However, in Subrahmanyam et al.'s study [19], participants didn't think using SNSs affected their relationships. Vallor [23], examining what Aristotle named *complete* friendship of virtue, found that its four dimensions (reciprocity, empathy, self-knowledge and the shared life) are supported in some way by social media. Nevertheless, reflecting more deeply on the meaning of the shared life for Aristotle casts doubts about the capacity of online social media to support such friendships in the contemporary world, not only because of structural deficiencies of social media, but also of the modern world's values and priorities [23]. Van Manen [24] also states that although SNSs allow people to overcome physical distance and feel close while separated by time and space, such interaction does not necessarily result in more intimacy. He writes: "Digital intimacy may offer the sensibility of one-to-one closeness, but the one-to-one may be 'real' or illusory. […] digital intimacy can be polygamous intimacy"[2]. On the other hand, Evans [25] comments that the idea of an imagined community is not new; during the Renaissance, a community of intellectuals was maintained via correspondence. He argues that

[1] [22, p. 173] (original emphasis).
[2] [24, p. 6].

"human experience has always been virtual to some extent"[3], and states that for participants in virtual environments, the relationships are as authentic as those in the physical world.

3 Methodology

This article is based on material gathered during spring 2015 for the first author's phenomenological thesis work, whose purpose was to examine how and why adults in the age group 58–73 use Facebook, and what their experiences with Facebook are [26]. Eight people participated in the study, chosen from among the author's Facebook friends (see Table 1)[4]. The study was conducted using semi-structured interviews and observations of the participants' Facebook page and posts for a period of three weeks from 26/3/2015 to 16/4/2015.

Table 1. The participating Facebookers

Name	Age	Country of origin	Work status	Posting frequency	User since	Other info
Sophia	58	Greece	Retired	Low	2010	
Jim	59	England	Retired	Medium	2009	
Lotus	60	England (born in Malaysia)	Retired	Medium	2009	Married to Jim
Dimitris	61	Greece	Working	Low	Oct. 2014	
Joe	62	Australia (born in England)	Working	Medium	2012	
Sam	65	Australia	Retired	High	2007	
Mary	65	USA	Working	Medium	2012 (approx.)	
Tom	73	USA	Working	Medium	2008	Married to Mary

Here we meet all of these Facebookers; however, for the purpose of this article we have analysed the (interview) data anew from a perspective of embodiment and intimacy. Thus, in conjunction with writing this article, the participants were given a new consent form, which stated their agreement to using the data gathered in 2015 for scientific publication. When informed consent was originally obtained March 2015, they were also given a consent form along with a statement to post on their Facebook Timeline, which informed their friends about the study and provided contact information to the first author. The statement was posted in an effort to obtain consent of any friends who might interact with the participants on Facebook and therefore would be involved in the activities observed by the first author.

[3] [25], p. 518].
[4] Names have been changed to protect privacy.

4 Theory

According to Schütz (in [27]), the contemporaneous lifeworld can be divided into two realms. The first is the realm of consociates, where people share a community of both time and space and their "worlds within reach" coincide (they meet "face-to-face"). Through constant interaction in this realm people become intimate friends. The second realm is that of contemporaries, where people share neither a community of time nor of space. Their "worlds within reach" do not coincide and the only interaction they have is through a mediator, following prescribed rules. They are considered anonymous strangers [27].

Zhao [27, 28] suggests that with the advent of the Internet, we can gain mutual knowledge with strangers online, communicating in a "face-to-device" context. We can have people who share a community of time, but not a community of space, whose "worlds within reach" do not coincide but whose "worlds within *mediated* reach" do. These people he calls *consociated contemporaries*, who can also be characterized as intimate strangers or anonymous friends. The Internet can also be used to extend relationships in the *consociates* realm (friends and family) or the *contemporaries* realm (online business transactions).

Embodiment and disembodiment are also issues of phenomenology that are interesting to examine in relation to cyberspace. Ajana [29] contrasts Descartes belief in the supremacy of logical reason over illogical nature with Merleau-Ponty's belief in the body as the medium *par excellence* for being-in-the-world. Merleau-Ponty believed that it is through the body that we perceive and experience the world and that even in the case of transcendental disembodiment, the body is the point of departure, the point of return and the point of being. Therefore, Ajana [29] says, even in the virtuality of cyberspace, the construction of identity, subjectivity and self is based on bodily perceptions, resulting in a "pseudo-disembodiment". Rather than being free from bodily limitations, Ajana [29] notes how people carry their old baggage with them: women, for example, are still underrepresented and subject to harassment. Ajana [29] views cyberspace as "a symbiotic synthesis of technology and corporeal phenomena", likening virtual tools to a blind man's stick, which acts as an extension of his senses. He describes cyberspace as a case of being "embodied in one's disembodiment".

According to Dreyfus [30], the body's capacity to act is central to Merleau-Ponty's account of embodiment. Our embodied skills determine what actions we can take, and our relation to the world is transformed as we acquire new skills. Svanæs [31] adds to this that human interaction with digital technology is embodied. He refers to Heidegger, who said that for a skilled user, a tool is transparent in its use and "ready-to-hand"; it is an extension of the user's body. This embodied interaction increases in relevance with the increase of proximity between the tool and the human body, where proximity means the tightness of coupling between the two. When a tool breaks down, this embodiedness also breaks and the tool ceases to be a tool and emerges as an object in the world.

5 Facebookers and the Embodiment of Relationships

5.1 Becoming a Facebooker

Joe, Sophia, and Sam joined Facebook in order to communicate and share things with other people. They share in common a positive experience using this online service.

Dimitris, on the other hand, had been more hesitant in joining; he had been receiving and ignoring friend invitations for years, before finally becoming convinced to join in order to be part of a group with his old school friends and cousins from his hometown. While before joining he had been terribly worried about privacy, he states that this has now radically changed. He repeatedly states how he really likes it, and how reading his friends' news in the group "makes [his] day".

Mary started using Facebook as part of her current job at a tour company, which does monthly tours and creates a Facebook page for each month's tour where people can post pictures and updates. Before working there she hadn't wanted to join Facebook because, as she says during an interview, it would take up too much of her time. Now she uses it not only as part of her job, but also to keep in touch with relatives and stay up-to-date with various clubs she and Tom belong to. Her view of Facebook is mainly positive; she says:

> "I think it's wonderful, what [our boss] has done with Facebook in terms of R- Tours"
> and
> "It really is a wonderful mechanism to keep a big number of people informed about the schedules, the upcoming events, statuses and things like that"
> (Interview with Mary, 23/3/2015, [Skype])

However, she does stress that one needs to be cautious while using it, referencing cyber-bullying and Facebook posts damaging people's hiring prospects. When asked what motivates her use of Facebook, she answers that it is both work and keeping in touch with people. In this way, we could say, Mary became a Facebooker because her job demanded it, but she now finds it useful in many other areas of her life; her intimacy with Facebook increased as she used it and, in this way, has become part of her embodiment of relationships.

Tom, on the other hand, joined much earlier, because he was curious and "it was the thing to do". However, he didn't like Facebook emotionally because he is a loner and it pushed him into contact with many people. This, combined with a fear of hacking and account misuse, led him to become disenchanted with Facebook. Now he keeps his accounts for work (he works at the same tour company as Mary), but his use consists mainly of monitoring through the email updates Facebook sends users. He only goes on Facebook occasionally, when something piques his interest or if Mary tells him about something interesting. So here we have an example of a "break down" (Heidegger in [31]) that decreases online relationship building and/or maintenance. Further, Tom expresses a preference for email, where he feels he can be more sure of his privacy and he can better control who sees what. So although he doesn't feel very intimate with Facebook, he feels more intimate with another, older technology (email).

Finally, Jim and Lotus joined and use Facebook, but they have certain reservations. Their main reason for joining was to be able to keep in touch with people while travelling,

after they retired. In addition, Lotus wants to be able to keep in touch with their children. Jim says he really dislikes how Facebook uses people's data to make money and has considered quitting the platform because of this, but he continues to use it since it enables communication and because, compared to the 7 billion people on the planet, he isn't that important. Lotus feels the same way; she shares Jim's privacy concerns and has some negative perceptions about Facebook, but she finds the communication part nice. She says she wouldn't miss Facebook if she quit, but she would miss getting news about her friends.

Lotus, like Tom, expresses a preference for email, and also for using the telephone or meeting face-to-face. Interestingly, she says:

> "[T]hey're just like the machines control your life, and I don't like that, I shouldn't like that. Old question of dialing up the telephone, talking to them…"
> (Interview with Lotus, 21/3/2015, [Skype])

Within this analysis we can say that Lotus forgets that the telephone is also a technology, albeit one that has existed for longer and to which we are more used. As with Tom, we can see a pattern of feeling greater intimacy with older technologies, to the point of (in the case of the telephone) not really considering them machines at all. The longer a technology has been around, the more intimate people become with it and the more akin to it they feel. This follows along the lines of Lloyd [9], who states that there was a time when telephones were rare and the word "phony" was coined to describe the mistrust of a disembodied voice on the other side of the phone. Now phones are ubiquitous, and we accept disembodied thoughts as reality [9].

5.2 Embodied Relationships and Intimacy on Facebook

While all participants (with the exception of Tom) mention that communication is an important part of Facebook use for them, Joe and Dimitris stand out as examples where Facebook helps preserve and increase feelings of closeness with family and friends.

For Joe, who is originally from England, but has lived in Australia for the past 40 years, it is keeping in contact with family back in England and other parts of Australia that is main reason for joining in the first place. She describes how Facebook has enabled her to come in contact with nieces and nephews she has never met, as well as their children, and also re-establish contact with cousins she had met when she was much younger. She says:

> "This morning I had a bit of a conversation with two of my nieces in Melbourne […] it's just a good way to start the day."
> (Interview with Joe, 22/3/2015, [Skype])

Dimitris also describes how he communicates with old friends and relatives, people he had grown up with, and how, as soon as he joined Facebook, he found himself talking with people whom he hadn't talked with for a long time. He repeatedly says how it "makes [his] day", and how he, on occasion, has become emotionally moved at seeing old photos being shared. He tells that some of these friends got together offline and posted photos of this meeting in the group; this has inspired him to think about organizing his own offline meeting, for friends that are in the same city as he is, and posting about

it in the group. So this can be seen as an example of Facebook strengthening offline bonds and potentially prompting offline meetings, a contradiction of concerns about online relationships leading to fewer offline meetings.

With regards to the types of relationships described by Schütz[5] and Zhao [27, 28], examples of both the *consociates* and the *consociated contemporaries* can be seen among the participants. More specifically, all the participants except Tom mention using Facebook as an extension of the *consociates* relationship; to keep in touch with friends and family. There is also one example of *consociated contemporaries* relationships: Sam mentions that he also uses Facebook to meet new people who share common interests. Thus we see a confirmation of previous literature that Facebook is used mostly to maintain and strengthen offline relationships. However, there are some relationships that don't seem to fit either description. Joe, Lotus, and Sam all mention keeping in touch with people they met while travelling, while Tom and Mary use it to keep in touch with people that go on the tours they guide. Joe also came in contact, through Facebook, with family from England she has never met in person, or cousins she had met when she was much younger. These relationships cannot be described as *consociates* (intimate friends), but neither are they pure *consociated contemporaries* (intimate strangers or anonymous friends), because they know each other. We propose that this should be seen in one of two ways: either as an example of people who started a tentative *consociates* relationship when they met, which due to the short amount of time they spent together did not become a full *consociates* relationship, but which may become one as these people continue to interact and get to know each other through Facebook; or as a variation of the *consociated contemporaries* relationship, where people know each other slightly in real life and whom Facebook enables to become more intimate through their online interactions. Incidentally, these are also examples of Facebook helping transform latent, ephemeral ties into weak ties [20].

We see, thus, how Facebook affects intimacy for this group of Facebookers. That is, when they use it in order to extend *consociates* relationships, Facebook serves to maintain and increase an already established intimacy between them, their family and friends; when they use it to form *consociated contemporaries* relationships (or variations of this), Facebook helps transform lack of acquaintance (in the pure *consociated contemporaries* case) or mere acquaintance (in the modified case) into a greater degree of intimacy.

While Facebook lacks the physical cues of face-to-face communication, we believe it is very useful in cases where face-to-face is impossible, such as people separated by great distance. Without Facebook, these people could not see or talk to each other regularly; Facebook enables them to talk, becoming an extension of people's corporeal ability to communicate, as Ajana [29] said. Joe comments that Facebook "seems to have made the world a smaller place", which shows how one's lifeworld can expand thanks to Facebook from the "world within reach" to the "world within mediated reach" [27, 28]. These people can also "see" each other through posted photographs, or use Facebook's voice calls and video chat. In this study, Joe says that when she was on holiday, she posted photos regularly which enabled her children to share the experience with her, and Dimitris reports the posting of many photos, both past and present, in his Facebook

[5] cited in [27, p. 93].

group. Jim and Lotus also post family photos occasionally, and Sam posts photos of events he organizes. Thus technology helps these relationships become more embodied and more intimate.

In this way we can say, with reference to [6], that the artifact (here by example of an online service) and intimacy cannot be separated.

6 Conclusion

Verbeek [6] states that technology makes us who we are. Lloyd [9] adds that just like we have constructed the Internet, so has it constructed us.

In this article we have looked at different kinds of relationships, which a small group of adult Facebookers engage in using this online social service. We have shown how Facebook can be used to extend face-to-face ("consociates") relationships over long distance, facilitating them to become more intimate and embodied. It can also be used to increase intimacy between strangers ("consociated contemporaries") or between people who know each other very little in real life (what we term a variation of the "consociated contemporaries" relationship). Indeed, many of these relationships are *intimately* related to the online service forming an embodiment of relationships for the participating adult Facebookers..

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Manifestations of Users' Privacy Concerns in a Formative Usability Test of Social Networking Site

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Abstract. Social media and social network sites (SNS) need to preserve users' privacy, in order to achieve full acceptance and to succeed in the application markets. Thus, SNS developers need to understand and take into account users' privacy concerns as early as possible in the development. It is difficult, however, to foresee how the system fulfills users' privacy expectations until the system is in actual use. Different user-centered techniques applied during the development can offer insights for developers into users' privacy expectations and concerns. In this paper, we empirically show what kinds of privacy concerns users spontaneously brought forth in a formative usability test of a social networking site and how these were attributable to different features of the application and related coping mechanisms. The identified manifestations of privacy concerns help SNS designers and evaluators to pay attention early to privacy issues as a natural part of user centered development.

Keywords: Privacy · Social networking site · Usability testing

1 Introduction

Many people perform their daily activities through different social online applications, ubiquitous services and social networking (and network) sites (SNS). In order to be useful and usable, these systems require us to share and disclose personal information. For example the personal tracking, monitoring and surveillance capabilities of new technologies may bring many useful applications to everyday life, be it about personal sports or targeted ads based on personal online consuming behavior. Despite their interest in the benefits, people are more and more concerned about what other people can see and how their personal information is used in the future, and by whom. In the era of popularity of social media and SNSs, privacy issues have become one of our major daily concerns, which are seemingly complex to manage in practice.[1]

From the system developer point of view, it is noteworthy that the users' privacy concerns and trust towards the system affects its future acceptance and adaptation [1].

[1] For example, numerous web pages exist to instruct SNS users for managing their privacy.

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While some of the systems are only a channel for communication and some have become an "institutionalized" norm (such as Facebook), people as consumers and citizens do have the possibility to select which service, platform and SNS application they take into use. Systems that do not meet our expectations concerning security and privacy are most likely not the ones we want to use in the future and take into use in the first place. Thus, privacy becomes also one of the determinants for the success of social media applications in the consumer markets that businesses and developers need to be aware of and be prepared to design for.

However, it is often difficult to evaluate the effects of a certain technology on privacy [1]. One of the challenges for developers is to identify the evolving norms and values of users before they can take the application into use [2, 3]. For example, the expanded use of Facebook has certainly shaped public opinion about privacy and created personal mechanisms for preserving it, which may have been difficult to foresee before launching such system. On the other hand, users' privacy concerns may be at their peak in the beginning of the use, but decrease over time [1]. One of the ongoing problems is that the privacy design toolbox for developers is rather technology-oriented and data protection centric. Developers may focus for instance on user authentication, user account settings and security of program code when designing privacy for their systems. Yet, with social networking sites and services, people have many strategies to preserve their privacy, other than the dedicated settings and features the system offers [4]. Thus, when designing these systems we need to understand people's personal privacy preferences i.e. how they construct and manage privacy in socio-technical interactions [5]. The lack of a clear link between privacy and design currently hampers this work. For example, the workshop of the latest popular HCI conference welcomes research that seeks to translate academic privacy insights into a set of guidelines and practices useful to design practitioners [6]. There is a need for privacy-centric design principles and effective methods for exploring people's privacy preferences [1, 2, 5, 7].

During the software development process, the designers gather information about the target audience of the system and their specific needs and preferences. Usability and user experience evaluation methods are widely applied for these purposes. We believe that these common methods introduce a promising base for privacy inclusion in the design practice. A vast amount of privacy research in the field of HCI already shows a tight interconnection of privacy and usability concepts (e.g. [1, 7]). Like usability, privacy is a holistic property and a pervasive feature of interactive systems that cannot be an afterthought in the design process [1, 3]. In consequence, addressing privacy and usability problems during the system development with similar methods is worth studying in detail. The question is: How do these privacy concerns manifest themselves in a usability test and what kind of privacy issues such a classical method can reveal. In this paper, we conduct an analysis of what kinds of privacy concerns users naturally and spontaneously bring forward in a usability test of a social networking prototype, which aims at sharing content around real life events. By manifestation of privacy concern, we mean users' verbal and non-verbal behavioral indicators during the system use that could determine opportunities for encountering loss of privacy in the future. Our perspective is on those users' privacy concerns at time of use that trigger potential coping mechanisms unless directly supported by the technology. The previous research has mostly

studied the actual coping mechanisms after excessive use period (cf. [8, 9]). Thus, originality of this research lays apart from scrutinizing usability testing as a method for revealing potential privacy issues, also in studying privacy concerns of first-time users with a short-term user intervention during the system development phase. We list the different privacy manifestations observed in the test. This helps SNS developers and evaluators to pay attention to privacy in a more elaborate way during similar design phases and eventually design their SNS for users' desired levels of privacy.

2 Privacy Concerns in Designing Social Networking Sites

The boundaries of social online network sites are somewhat blurred. Most sites share the core feature of a public or semi-public user profile that others can traverse and peruse with different intentions such as contacting, friending or dating [10, 11]. However, the user profile may not be in the essence of the SNS usage, but the feed of shared content, mutual activities and communication in the extended social network. Social media, a close concept to SNS, can be defined through seven functional blocks as identity, presence, relationships, reputation, groups, conversations and sharing [12], or simply as being "all about sharing content with a community" [8].

A definition of privacy by Altman [13] states, that privacy is a process that paces and regulates our interactions with others. In social environments, people try to maintain an appropriate level of access they give of themselves to others. Altman's processual and dynamic view draws a sharp distinction between how much privacy users want and what they attain during the system use [7, 14]. The fit between the desired and the attained level of privacy is not only sound, but also may enhance individual's social relationships and benefits of SNS [9].

Definitions of privacy concern vary from "a loss of control over their personal information" [15] to ones that cover a broader range of human behaviors depending on the view on privacy. In Altman's view, privacy concerns can cover broadly any interpersonal action that serves regulation of one's social interactions [9]. For example, privacy concerns can be studied as individuals' concerns of suppressing their true identity (anonymity), losing control of unwanted information (intrusion) and control of distribution of personal information (autonomy), or being exposed to monitoring and tracking by others (surveillance) [16]. Following Altman's view, privacy concerns have been decomposed into three basic elements [7, 14]: (1) regulating social interactions, (2) giving access to and disclosing information about oneself and (3) managing own identity and self-presentation over time. Each can introduce a personal privacy risk when the boundaries of privacy are negotiated with the environment and in collaborative discourse with others (privacy as a discourse see e.g. [3]). The extent of the privacy risk can be determined by rationally evaluating our personal coping capabilities in this potentially difficult task or situation (privacy as an economic rationality, see e.g. [3]). In using SNS, usability of the system features and user interfaces will inevitably affect how people perceive their personal coping capabilities, i.e. determine their self-efficacy, and thus further affects how concerned they are about their privacy [17]. People who feel confident about their survival capabilities over a potential risk (e.g. they have some privacy

control mechanisms) experience less anxiety towards the system. Enabling every user to achieve their desired level of privacy should be in interest of SNS developers as well [9].

Different user strategies and coping mechanisms exist to preserve interpersonal privacy boundaries in social networking sites [4, 8]. These strategies can be distinguished between mechanisms supported by the user interfaces of SNSs and "coping mechanisms which are an individual's response outside of these confines to mitigate potential boundary interpersonal violations." [4]. Coping mechanisms can be divided into mental and behavioral, preventive and corrective, and further into collaborative and individuals' actions [8]. Users apply corrective coping mechanisms after a privacy risk has realized and preventive mechanisms before. For example, individuals apply a corrective mechanism when they are untagging a photo whereas when they ask approval before tagging a photo from the persons involved they apply a preventive collaborative mechanism. Karr-Wisniewski et al. [18] identified five types of boundaries that people regulate with different mechanisms, in order to achieve the desired privacy level in SNSs: network, territorial, disclosure, relationship and interactional boundaries[2]. For example, turning off the wall on Facebook is about controlling the interactional boundary, whereas removing someone's distracting comment from the personal wall is about controlling the territorial boundary [18, 19]. In practice, these mechanisms need controlling actions by users such as filtering, ignoring, and blocking connections, withdrawal from sharing content, aggression, compliance and compromise [4].

Because not all of these identified coping mechanisms are implemented in current SNSs, understanding the privacy mechanisms people use within SNSs can help in pinpointing areas where personal privacy management can be supported by improving user interface design [4]. For instance, SNSs could implement more sophisticated filtering functions for generating relationships, support collaborative negotiation for co-owned content (e.g. about photos where one is tagged) and facilitate reconciling conflicts and motivations behind different actions e.g. due to unfriending [4]. Moreover, photo tagging features of SNSs could be redesigned with customized permissions, untagging and negotiation features [20] and online video media spaces could need for instance more fine-grained content control [7].

In this paper, we are mainly interested in coping mechanisms that technology does not support, in accordance with the aim of the classical usability test: to identify different usability problems of the system that need fixing. Our approach is both evaluative and constructive. Evaluative approach on privacy examines the users' preferred and achieved levels of privacy, whereas the constructive approach offers design solutions and principles [9]. In our study, this meant that privacy concerns expressed by the users were traced back to the specific features and functions of the system so that practical design solutions could be suggested.

[2] We refer to these mechanisms by Karr-Wisniewski et al. [18] and Wisniewski et al. [19] throughout the results section and identify which mechanisms emerge in a usability test.

3 Research Method

3.1 Introducing the Social Networking Site

We tested usability of a new social networking application developed by a global IT company. The idea of the application was to collect users' photos and videos taken in the same event to a single site. The situations where the application was deemed useful were family get-togethers, celebrations, large public concerts and sports events where every attendant could contribute to the shared content by taking and sharing photos and videos of that event. Depending on the privacy settings of the event in the application, the other application users could see the content. The disruptive innovation here was to replace photo sharing with USB sticks, provide a public or private space for photo sharing and allow each member to contribute and access to content.

We conducted one to one usability test sessions for 7 test participants in April, two weeks after the developer launched the beta version for public. The application was under continuous development and during the test only the main use case, creating an event and inviting friends, joining an event and publishing photos in it, was implemented. The application was downloadable free for all major mobile platforms as well as accessible free as a desktop version for computer use.

The application is used in practice as follows: A user creates a shared space for a certain event with the application, acts as the founder of the event and invites people to join the event. The event founder sets also other parameters, like the publicity, location, duration and the name of the event. The founder sends invitations by email or SMS as the current application version did not implement a list of friends attached to a user profile. Users could search events by the name or spot these in the location map as well as access published public ones. The users who had joined the event could download and 'like' photos and videos of the event. The feature that allowed commenting the content was under development during the time of the test, the developers planned integrating it with Facebook comments.

The application implemented characteristics of a social network site due to embedding a user profile, allowing connections with others through joined events, and aiming at sharing photos and videos with the connections. However, at the time of the study, the user profile feature was practically empty and contained only a profile picture, username, and a URL address for viewing events hosted and joined by the user (not accessible from mobile). Thus, a list of friends was not implemented in isolation from the events, and "a wall" feature attached to one's profile contained only events and was accessible only by following the given link with a browser. The application was closer to a social "networking" than a "network" site [11], because one's articulated network was missing and the connections to others were more temporary and indirect. On the other hand, the application would appear even more different from SNSs, if we took the event and the shared content as the unit of analysis (e.g. as a crowdsourcing application to collect photos from the event). Of the building blocks of social media [12], the application did not explicitly reveal the presence of other users although this is implicitly inherent within events that last a limited time (i.e. users could assume that attendees are present in the application and in the real life event). Nor did it support written

conversations, which were to be implemented. The application, however, did embed characteristics of the rest of the building blocks. As it has been found that photo tagging in SNSs caused users to lose their control over information disclosure and identity [20], it was important to identify such features that could be sources of users' privacy concerns and might prevent the desired level of privacy early in the design process.

3.2 Usability Testing Procedure

The usability test was the first usability test with real users for the application and it took place in laboratory premises. The test objectives were set in the two-hour discussions with the development manager. The test aimed at evaluating the usability of installation procedure (mobile app) and the usage flow of the main use case. The main use case was defined as creating an event and inviting friends, joining an event and publishing photos in it. Installing the application included registering and downloading the app from the particular app store into a mobile phone. The number of test participants, seven, was judged to be adequate for the purposes of this evaluation. In general, it is enough to find the majority of critical usability problems.

The usability test was incorporated into a real event marketed by the company. The event was the celebration of the 1st of May and targeted at university student associations who could compete against each other of the price of "the best event". We used this real event as a reference scenario for usability test tasks. Usability test included 13 test tasks, which covered almost all application functions (create event, search events, my events-functions). Short versions of the tasks were as follows: (1) Install the application into your mobile phone (2) Create your own event (3) Invite your friends to your event (4) Add a photo to your event (5) Add a video (6) Search an event nearby you and view its photos (7) View photos of the X event (8) Select the best photo (9) Send the best photo to your friend (10) Join to the Y event (11) Add a photo to the Y event (12) Save a photo (13) Delete your own event.

All the seven test sessions were video and audio recorded and analyzed later based on the recordings. The test participants were all university students, three females and four males, 20–39 years old recruited randomly. The basic information about the participants was collected with pre-test questionnaire including: Age, gender, mobile phone information, trials and continuous usage of different SNSs, photo sharing practices in the SNSs and regarding some specific events, and earlier use experience of the tested application. Two of the test participants had already downloaded the application and tried it once.

The testing procedure was an informal think aloud where the test administrator had an active role, which means that we exceeded the classical "keep talking" style [21] and took more interactive and relaxed communication style [22]. This meant that the administrator not only handed the tasks, but also asked actively what participants are trying to do and what they think of particular way of operating the system. The communication with the participants was not limited to test tasks, but continued during the post-test questionnaire, which included, for example, the following open questions and the questions answered in Likert-scale: How fluent was adding photos to your event? How satisfied you are with the following features of the application?

What was the best/worst in the application use? In what situation would you use the application in the future? Despite the active role of the test administrator any direct questions about privacy issues were not raised and those were not asked in the pre- and post-questionnaires. We emphasize that the test was of classical and standard nature where privacy concerns were not included in the objectives and targets of data collection. The case study presented in this paper exploits a retrospective data analysis, which, in contrast, had its target on privacy and its manifestations in a usability test. Data analysis was performed bottom-up with the final test report, related documents, notes, test recordings and transcriptions, iteratively building understanding about different types of privacy concern manifestations.

4 Results

The idea and the purpose of the application got very warm reception among the test participants. For example, one participant told that: "Personally I have had need for this kind of service for a long time."[3] (P1) The participants operated very fluently through the main use case, i.e. all the test tasks from installing the application to creating an event and sharing some content in it. The main use case was a logically flowing procedure and well understood by the users. No major usability problems were observed in the operation and, thus, the system usability was considered rather excellent in that regard.

However, the observations indicated that participants were more concerned of application use before and after the actual event took place. Largely, these were concerns of personal privacy, intimacy and security that were attributable to certain features and functions of the application. Before the event, the participants were mainly concerned of administrative rights of the founder of the event. The participants did not easily perceive their rights and responsibilities before creating and sharing the event to others. After the event and as a member of the specific event, the participants were mainly concerned of what rights and possibilities they have in downloading and deleting, possibly embarrassing, photos shared in the event. Such privacy concerns and related conceptual design directions were introduced as the main results of the test for the developers and discussed next in detail.

First, some of the privacy concerns were manifested explicitly, because the participants could identify and express a privacy problem in detail. For example, the majority of the participants spontaneously remarked that the event founder has a possibility to change the name of the event after people had already joined it. Others considered renaming a compulsory feature that should not redesigned, while the rest pointed out its problems if the founders misused the feature and the application did not inform the attendees about the name change. Although the participants' opinions were polarized, they all identified and acknowledged the privacy risk attached with the feature. Renaming is possible also in other SNSs that allow creating groups and shared spaces (e.g. Facebook), which may be the reason for the sensitivity and awareness of the

[3] Participants' comments are translated from the original to English language. P1 refers to test participant 1.

participants for this privacy concern. The studied SNS did not support users' need to regulate their territorial outward-facing boundaries, which means for example withdrawing from obscene content posted on user's wall[4]. As with other SNS, the participants needed to select a corrective coping mechanism with the risk (e.g. unjoin the event), because no other solutions were implemented or preventive coping mechanisms available.

Second, and in contrast to clear identification of the risks in advance, the participants were totally unaware of some of the privacy risks and consequences of features used. In particular, they had problems in understanding how the duration of the event affected on its visibility and accessibility (i.e. publicity). For example, one participant assumed that after the event reaches its end duration it will be not visible in the public map and accessible through the search functions of the application i.e. eventually it "becomes private" (P3). Instead of restricting public discovery, another participant interpreted that the duration only closes the possibility to upload more photos to the event. Privacy concerns then varied between disabling and blocking interactional boundaries (i.e. giving access to oneself) to regulating territorial inward-facing content (i.e. what appears in a "news feed"). Both assumptions about the functioning above seem to be justified, although wrong, interpretations about the feature: The duration only restricted new joining the event i.e. controlled network-discovery boundaries (i.e. access to network) and relationship boundaries, which regulate whom one lets be part of network. This example further shows how users can be unaware of or misinterpret privacy related consequences when they are not exactly sure about the meaning of a functionality. Moreover, such features may not be related to built-in "privacy settings" at all. Nevertheless, the participants seemed to naturally relate the use of these features of the SNS to privacy issues and made them part of their personal privacy management. The utmost problem of this type of concerns is that users may not identify and apply any coping mechanisms at all, as the privacy problem itself stays hidden in the first place. This kind of a situation leads users inevitably to corrective mechanisms after the risk has realized, although the effectiveness of the chosen mechanism may vary by case. Similar, unintended privacy violations were common in the context of P2P file sharing due to misunderstood logic and functions of the application [23]. For the developers, these types of privacy concerns indicate a need for clarifying the meaning of the feature in a way that decreases misunderstandings by the users and gives them all the potential to evaluate the threat to their privacy. In this case, the application could have implemented a simple text explaining the meaning of the event duration.

Third, a type of privacy manifestations became apparent when the participants had a clear expectation about how something should be working and a vision of to-be state of the system regarding the privacy issue. In this type of manifestation, they not only expressed and identified their potential privacy concern, but they were astonished about certain functions (i.e. they expect something else to happen) and/or had alternative (technical) solutions directly in their mind. For example, the participants raised a highly negative concern of someone uploading inappropriate photos to the service and, in the

[4] Privacy boundaries and coping mechanisms are discussed based on Karr-Wisniewski et al. [18] and Wisniewski et al. [19].

first place noted, about their inability to remove these photos. "If someone takes a photo of me vomiting and I cannot do anything for it without contacting the application developer, it is very sad. Ok, the same problem appears in other applications, also in Facebook […] but here I feel it is a bigger problem because this application has a different kind of character." (P6) According the participants, an inappropriate photo of oneself – or even a photo where ones "hair is not washed or set correctly" (P7) – should be possible to delete. These privacy concerns relate to missing corrective mechanisms for regulating confidant-disclosure boundary, which occurs when someone publishes personal information about someone else. Deleting the uploaded content was possible only for the founder of the event. The event represents its founder's "wall", where the system supports both territorial outward-facing and confident-disclosure controls only for the founder. Because one's own photos were not removable either, this privacy concern is also about controlling the boundary of self-disclosure, which considers what personal information one discloses in the network.

Another example about third type of privacy manifestation became during inviting people to the event. In the role of the founder of the event, the participants made an instant assumption that if they create a private event, they will know who have been invited in the event and that they can moderate invitations i.e. control who will get the invitation. The assumption was however false, because the invitations were sent with a code in an email or in a SMS message that could be shared further by the receivers. The situation weakens users' trust towards the applications features and their own capabilities to preserve privacy of the photos and overall intimacy of the event: "If there is an option to create either a public or a private event, I suppose I should be able to monitor and moderate that private event… it is quite unpleasant situation if anybody can invite any friend, and at that stage, my trust is not very high that my shared photos will remain private… that can be a serious problem to someone." (P7). Thus, regulating one's relationship boundaries within the event in a preventive way was poorly supported. On the other hand, the participants found that the event founder could select and remove specific individuals from the event. However, the participants did not discuss this corrective mechanism as a solution to the initial controlling problem probably because the damage had been already done: The mechanism came too late (i.e. corrective) and was not effective for the initial problem that needed mechanisms that are more preventive. Now the participants implicitly employed a collaborative mechanism not to share the code with third parties.

Fourth, a type of privacy manifestation was related to use situations where the participants felt unconfident and uncertain about the actions they had taken and their effects within the application (e.g. what just happened?) or in some other way expressed distrust towards the system. For example, the application did not give any feedback whether the invitation message was delivered or not: "I suppose the message was sent" (P6), "You get a feeling that you should send the message again" (P5). The subsequent privacy related problem the participants experienced was that the founder did not know how many and to whom invitations were already sent, thus jeopardizing again their control of relationship-connection boundaries. The problems related to the technical infrastructure, in this case mostly the slow speed of the mobile internet connection, introduced more these type of privacy concerns among participants. A common

denominator is that these took place by accident. For example, five out of seven participants used their own smart phones in the test, which meant that their phones were of different quality and speed in internet connection during the test. Quite many suffered from poor quality of the touch screen (P7), slowness of the phone and the internet connection (P5, P6, P7), or slowness of the service response on the server side (P5), and dismissed point of touch (P1). These became privacy concerns, because participants were uncertain if and when something was touched, downloaded and uploaded and so forth: "I am always about to press twice because this does not show the download symbol…[waiting]…now it shows that it is going somewhere." (P6). For example, one participant meant to scroll the screen by wiping, but notified few minutes later that he had accidentally joined an event (i.e. pressed the join-button instead wiping). This raised a user requirement for the application to confirm whether "you really want to join?"(P5). With the dialog, users could better control their identity and self-presentation (see [7]). Adding photos and videos to the event introduced another accidental privacy threat that was due to inconsistent interface design and slowness, which similarly made participants feel unsure whether some action were already processing. Adding a photo from the photo gallery did not have any confirmation dialog (as when using the camera application) and users needed to pick the photo without viewing it in a full screen. That increased the risk of uploading a wrong photo: "Pretty odd that it did not ask if I want to share this photo but it directly shared it. What if I had touched the wrong photo?" (P3) Another participant (P5) uploaded two times the same video, because of the missing confirmation dialog and the slow internet connection, which prevented him noticing the ongoing video uploading. The fourth type of privacy manifestations tended to end up in users' distrust or in inventing preventive technical mechanisms. Confirmation dialogs for both photo uploading and joining the event, as well as system status feedback introduce simple preventive solutions for regulating self-disclosure when the corrective ones were not supported (e.g. deleting own photos).

5 Conclusions

Usability testing as a method for the evaluation of SNS prototypes seems to invoke spontaneous privacy concerns among test participants. The behavioral patterns of how privacy concerns emerged in the formative usability test of the application were of four distinct types (Table 1). Users either *expect* a certain system behavior, *identify* a privacy risk directly, *feel* unconfident about system behavior, or *are unaware and assume* potential privacy risks to be present. The types are not exclusive, but rather related and represent a continuum from users being ignorant or slightly worried to expressions that involve more detailed risk identification and suggestions for improvement. For example, when people have strong expectations about the desired level of privacy regarding some functionality and suggest some improvement, they presumably also can identify the risk in detail. Based on the case findings, we emphasize that users do not necessarily express any explicit concern. They can be unaware of the meaning and functioning of some specific feature, which eventually will affect their achieved and experienced level of privacy. Thus, a privacy risk itself may stay hidden during use and require interpretation by the evaluators, in order to become exposed and eliminated by redesign – as is the

common case with usability problems analysis in general. This work is complicated by the wide range of system features that have an effect on privacy, but that are not part of official privacy settings at all. Most likely, these "hidden" features are in the majority and lead to users' false assumptions or stay unrecognized during the first-time use. For example, "often participants did not know that private information was being shared at all and blamed the site"[5] and did not exploit interface controls available for information disclosure. Respectively, users may explicitly express a privacy concern related to some feature when it actually does not have an effect on their privacy. However, there are no false positives when experiencing something: The desired level of privacy is based on personal experiences and satisfaction, and it is important to collect these experiences and fix the misunderstandings caused by the design.

Table 1. Types of manifestations of users' privacy concerns during a formative usability test

Types of privacy manifestations	How manifests in a usability test?	Example in the case study	Unsupported mechanisms[a]
Users *expect* a certain system behavior	Users require corrective and preventive functions	Removing own and others' photos of oneself; disseminating invitations to strangers	Confidant-disclosure; Relationship-connection
Users *identify* a privacy risk directly	Users point out how a feature can be misused	Obscene renaming of the event by the founder	Territorial outward-facing
Users *feel* unconfident and express distrust	Users wish for preventive functions, more control and consistency of features	Confirmation dialogs for joining the event and uploading content; technical infrastructure problems	Relationship-connection; Self-disclosure
Users *are unaware* of risks or assume potential	Users misunderstand a meaning of a feature	Setting the duration of the event	(Experienced by the users:) Territorial inward-facing; Interactional disabling and blocking

[a]Coping mechanisms that the studied SNS did not support (see [19]).

The procedure of the usability testing applied in the case study was very classical in nature. The industry and practitioners employ widely this kind of formative usability testing for the systems and prototypes under development. The interactive and relaxed think-aloud protocol applied in the study is the most used protocol in usability testing

[5] [18] p.5.

[21]. The chosen think-aloud protocol affects very little on the number and type of usability problems found [24]. Therefore, we must emphasize that, in this setting, the test participants brought up the privacy issues naturally and spontaneously in discussion about system features and usability. This natural approach for privacy exploration, the lack of explicit privacy questions and exploring concerns of first-time users is different from research settings found in literature. For example, Sadeh et al. [25] deliberately designed their study for understanding people's attitudes and behaviors towards privacy when they interact with an application. That kind of predefined and experimental approach to study privacy would naturally be the most beneficial in improving the match between the preferred and implemented levels of privacy during the system development. On the other hand, this is not always possible and a need arises to observe privacy related concerns and behavior as a natural part of user-centered methods, in which this paper has contributed. Spontaneity of privacy concerns drives us to note that usability is a privacy issue, equally as it has shown to be a security issue [26]. Users can desire some level of privacy only to the extent they are conscious of such state. Achieving a certain level of privacy depends on the usage skills of the user as well as on what the system offers. In that regard, the users' both privacy states, desired and attained, are phenomena that traditional usability testing can help to explore. The coping mechanisms presented by [8], and [18, 19] help us in understanding the nature and causes of the issues unearthed in testing as well as in making more adequate suggestions for system redesign.

In our case, we could especially observe situations where the users experienced too low privacy levels [9]. This is because usability testing is a problem-centric technique that does not strive for positive findings i.e. it is not targeted at identifying situations where the system exceeds all the expectations of the users. Moreover, the users' concerns and coping mechanisms in the test were not real behavioral adaptations in the long term, but their intentions and conceptions due to the first time and short-term use situation. Originality of this research lays, apart from scrutinizing usability testing as a method for revealing potential privacy issues, also in studying privacy concerns of first-time users with a short-term user intervention during the system development phase. Users' intuitive and instant opinions about system privacy have definitely practical value in systems development, but may also offer analytical insights into how privacy concerns change over time; what kind of system features are involved in these considerations; and how SNSs can provide new controls and support mechanisms in the future. These are also interesting new research areas.

The types of privacy concern manifestations presented here are to help design practitioners pay attention to privacy as a natural part of practicing user-centered design methods. The found types do not represent a complete set of all possible user behaviors, nor are all technological and interpersonal coping mechanisms found in the literature present and applicable in the context of this research (cf. [18, 19]). Our analysis leans on one usability test only. The studied application was very simple system compared to features and purposes of the most popular SNSs. Built around real-life events, without a list of friends to traverse or interpersonal relations as its primary focus, the application could only involve few mechanisms for regulating personal privacy. The method used here could be used to discover different privacy coping mechanisms applied within different kinds of more complex SNSs in the future.

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Denial of Choice: Group Level Disclosure of Private Information

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Abstract. While online social networks (OSNs) allow users to selectively share content as well as limit access to information within users' own virtual spaces, unfortunately there is little or no control on other-generated content. The full study explores an interdependent privacy regarding other-generated disclosures on OSNs from insiders' perspectives (the 'discloser' and the 'disclosed'), based upon their lived experiences. An online survey was used to recruit suitable participants who meet the purposive sampling criteria. This paper presents some preliminary findings from a current study, based on an online survey. The online survey result reveals a likelihood of activities associated with other-generated disclosure. This study makes a contribution to the scant literature on OSN interdependent privacy as well as draws attention to tackle these privacy issues in order to discover effective detection mechanisms towards practical solutions in the future.

Keywords: Online social networks · Information privacy · Users' privacy · Disclosure

1 Introduction

Online privacy is not only a global problem becoming difficult to ignore but also one of the most significant debates in law and moral philosophy, particularly in an era of ubiquitous computing and online social networks (OSNs). One of major privacy issues on OSNs is information disclosures by either users themselves or others during interaction or activities, especially tagging and re-sharing. While managing information we share ourselves is difficult, how to manage information that others share about us is more complicated and challenging. Of particular concern is that there is little or no control on other-generated disclosures, particularly outside users' profiles. For instance, if a user posts a comment in a friend's space, the friend cannot specify which users can view the comment. In another case, when a user uploads a photo and tags friends who appear in the photo, the tagged friends cannot restrict who can see this photo.

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Other-generated disclosures lead to privacy issues such as privacy breaches, privacy invasions, privacy violation, privacy infringement, privacy threats, or privacy risks despite existing lengthy privacy policies as well as fine-grained privacy settings. In advanced societies, media have repetitively reported other-generated disclosures on news stories, court cases, and allegations. Some cases of other-generated disclosures can be claimed for legal protection whereas other cases are still under a shadow of the law, which varies differently among countries. A lack of sufficient privacy control and absolute legal protection highlight a need to better understand a privacy interdependence in OSNs and to effectively manage this privacy at a group level.

Although there is considerable research on OSN privacy [1–6], the majority tend to view privacy as independent, mostly focus on self-disclosures [3, 4, 7–9]. So far only a few studies has highlighted a concept of privacy interdependence on OSNs [10–12]. Nonetheless, the interdependent privacy regarding other-generated disclosures has yet been unexplored, particularly within the scope of this present study that is based on both insiders' viewpoints and lived experiences. In addition to an attempt to fill the gap in existing literature, this study aims to provide an in-depth understanding of these phenomena in multi-dimensional aspects together with inter-dependent privacy. This present study is valuable and makes contribution to OSN communities, service providers, organisations, and users. The OSN service providers can gain benefits from this study in terms of technical or operational designs, collaborative privacy management and control among users, as well as privacy policies. In addition, business, organisations, and communities would gain insights into users' privacy concern, influences of other-generated disclosures, and awareness of interdependent privacy to apply those insights in terms of marketing campaign as well as preserving customers' privacy. This study also increases users' awareness and suggests strategies to mitigate risks of these phenomena.

This article presents preliminary findings from a current study on other-generated disclosures and interdependent privacy on Facebook. The next phase in the work, not described in this article, is to gain deeper understanding of these phenomena through a qualitative study, based upon users' lived experiences, from both engaging parties – the 'discloser' and the 'disclosed'. To the best of our knowledge, this is the first study of its kind that explores an interdependent privacy on OSNs in multi-dimensional aspects ranging from motivations, perceptions, types of disclosed contents, actions as well as effects on both online and offline relationships.

The remainder of the paper is organised as follows: Sect. 2 presents an overview and the key concepts associated with privacy and disclosures on OSNs, along with related literature. Section 3 presents the methodology and Sect. 4 describes the findings, limitations and future directions of the study. Finally, conclusions are drawn in Sect. 5.

2 Background and Literature

Boyd and Ellison [13] initially defined the term "social network sites" as web-based services that allow users to (1) create a public or semi-public profile, (2) articulate the list of connected users, (3) view and traverse lists of connection within the system.

Nonetheless, a variety of terms are used interchangeably in public such as social networking sites, online social networks (OSNs), social media, and social webs. However, Boyd and Ellison [13] argued that the term "social networking sites" is improper for OSNs' emphasis and scope.

OSNs like Facebook, Google+, Twitter, and Instagram have attracted billions of users worldwide and become increasingly embedded in daily life activities, especially in the evolution of smartphones. So far, Facebook is the largest and the most popular SNSs of 1.04 billion daily active users worldwide whereas 934 million mobile daily active users on average for December 2015, where a majority of our daily active users (83.6 %) are outside the US and Canada [39].

An upsurge in OSN users and its popularity is owing to OSN distinction in multi-functional all-in-one platforms offering users with abilities to generate, publish, comment, share, or distribute rich content as well as interact to a large audiences worldwide with free-of-charge. Accordingly, OSNs have become a large resource of free information that can be easily accessed, leaped, crawled, inferred, or misused at any time. This results in crafting a big hole in privacy and security.

Online privacy is a challenging issue of great interest across communities including OSN service providers, users, and scholars. Privacy has been dealt with in many contexts, including how to technically achieve it [14], breaches of information privacy [15], how users value privacy in online contexts [16, 17], and how to define professional responses that cater to all stakeholders, including to their respective privacy requirements [43–46]. To date, privacy on OSNs has been studied extensively not only from technical aspects [6, 11, 18–21] such as privacy-by-design, privacy management, and privacy control, but also from social aspects [3, 5, 12, 22] such as users' behaviors, privacy concerns, and privacy attitudes. Several studies also point out a flaw in existing privacy policies as well as privacy settings [23–27]. Despite restrictive privacy settings, privacy conflicts can still arise when there is a difference in privacy practices or privacy management, especially in interconnected and dependent environments like OSNs.

Furthermore, OSNs have continuously updated privacy policies, often changed privacy settings, consistently developed and implemented new features, as well as accepted third-party applications. These on-going changes lead to other privacy-related issues and increase in privacy concerns. Alternatively, many works have denoted users' privacy concern [5, 12, 28, 29] and discussed privacy-related issues [21, 30–32]. New privacy challenges are inevitable with the growth of ever-changing OSNs, which privacy is interdependent.

2.1 Privacy Interdependence

In such interconnected environments like OSNs, privacy is a complicated matter than just an individual importance. Privacy of individual users is bounded to activities by others and their behaviors, rather than just each user. This privacy interdependence affects not only users but also non-users. The term "interdependent privacy" was first coined in the study of Facebook gaming permission by Biczók and Chia [10]. Other contexts of interdependent privacy are associated with as third-party applications, re-sharing content, tagging, or joining groups.

Interdependent privacy is not relatively new and has been inherent in OSNs. However, extensive studies have considered OSN privacy as independent, concerning at an individual level [3, 4, 7–9] whereas interdependent privacy is required more attention. To date, relatively limited research on interdependent privacy exists [6, 10, 33], particularly focus on third-party applications. For example, Wang et al. [34] pointed out that installing a third-party application on Facebook like calendar would violate user's global privacy settings and friends' privacy. In similar line, Ahmadinejad and Fong [19] revealed that third-party applications can jeopardize a large number of users through Application Programming Interface (API) attacks with high success rate. The attacks can reveal information on users' profiles as well as infer other information. Likewise, Heatherly et al. [6] reported that both political and religious affiliation could be inferred from others' information available on OSNs, even when users are unwilling to disclose such information. Moreover, Ryu et al. [35] demonstrated that analysing link structures can extract the hidden attributes and reveal sensitive information. They also proposed three algorithms to detect privacy breaches from attribute inference, based on friendship links and group memberships.

Our work is different from those mentioned above as we has focused on another context of interdependent privacy. Despite users' purposes and intentions, users may disclose not only their own information but also information about others through their online activities. Disclosures of information pose both information privacy and personal privacy at risks. While self-disclosures can be inhibited, disclosing information by others is beyond individual control.

2.2 Other-Generated Disclosure

Other-generated disclosures, which reveal about others without consent, are not uncommon on OSN wall posts, comments, videos, links, and photos. These phenomena can be seen in forms of sharing on-behalf, sharing co-owned content, sharing multiple-owned content, re-sharing content, distributing content, or tagging. The most trending other-generated disclosures deal with photo sharing on OSNs; for example, parents post or share photos of their children.

Other-generated disclosures can occur not only in one-hop relationships or multi-hop relationships, but also within same or different platforms. 'Disclosers' is users who disclose content such as friends, friend-of-friends, friend-of-friend-of-friends, or strangers whereas 'Disclosed' can be users or non-users.

Some cases of other-generated disclosure can be claimed for legal protection or compensation under privacy laws, depending on counties. For instance, Mr Madill downloaded 83 pictures of a nine-year-old girl from his friend's Facebook and then re-posted those pictures to a Russian child porn web site [40].

Unfortunately, not all privacy-related issues respecting other-generated disclosures can be legally protected. Some cases are still beyond current scopes of legislation or in shadow of existing regulations such as "digital kidnapping".

Digital kidnapping is a pervasive privacy issue in the era of OSNs as well as a recent trending phenomenon, widely reported since 2014. As of 4 August 2015, news reported that hashtags involving digital kidnapping (#babyrp, #babyrpl, #adoptionrp, or

#orphanrp) had yielded 57,000 results on Instagram [41]. This new phenomenon of "baby role play" [42] occurs when someone steals a child's photo available on OSNs, then posts that stolen photo on other websites for role-playing. In general, female digital kidnappers use the stolen photo to show others as if the child belongs to them. Nevertheless, some cases of digital kidnapping are much disturbing in communities when digital kidnappers use the stolen photos in sexual and abusive role-playing. Digital kidnapping is not a crime although it can lead to kidnapping in the real world where the worst case scenarios may cause harm to a child's life.

So far, research examining other-generated disclosures has been under-represented in the OSN privacy literature. Yet, no work has addressed an interdependent privacy with regards to other-generated disclosures in the similar context of this present study. The scope of this study is considered within current privacy management and existing tools at the stage of this study.

Not only can other-generated disclosures cause privacy turbulence, but it also affects impression formation as well as desired self-image. Face threats refer to "an incident or behavior that could create an impression inconsistent with one's desired self-image"[1], making people vulnerable and leading to awkwardness, embarrassment, or relationship breakdown. Recently, relatively few studies have focused on face-threatening from other-generated disclosures [36, 38]. While Litt et al. [38] focused on users' experiences and feelings towards face threats, Wohn and Spottwoods [36] were interested in users' strategies in response to face threats. In this case, Litt et al. [38] explored what Facebook users considered be other-generated face threats as well as how Facebook and Internet skills impacts these threats. Based on the survey of 150 Facebook users [38], the result reveals that face threats result from users' neglecting and misunderstanding a target's audience or self-presentation. Furthermore, Wohn and Spottwoods [36] presented four reactive strategies that users used in response to other-generated face threats on Facebook even though some of those strategies can deteriorate relationship between victims and offenders. Along similar line, Litt and Hargittai [37] report that 33.3 % of students (online survey sample: N = 547) experienced turbulence online whereas those with higher Internet skills are less likely to experience it. In comparison with our study, the similarity lie in an emphasis on other-generated disclosures, a platform of interest (Facebook), and a method (an online survey). However, our study is different in terms of subjects of interest (adult users), a method (using semi-structured in-depth interviews in addition to an online survey), and objectives. Our study investigates both engaging parties ('discloser' and 'disclosed') in diverse aspects such as motivations, perceptions, contents, strategies, as well as online and offline impacts, as opposed to only strategies.

3 Methodology

This qualitative study is underpinned upon the interpretivist philosophy and designed using a phenomenology methodology. The purpose of this phenomenological research is to explore other-generated disclosures from users' lived experiences as well as to

[1] [36, p. 187].

better understand the essence of the phenomena. To gain insiders' perspectives of the phenomena, the purposive sampling is most appropriate in recruiting suitable participants as per sampling criteria through an online survey.

This present study consists of two phases as shown in Fig. 1. Phase I used an online survey to recruit at least 300 qualified respondents according to the purposive sampling criteria as well as to categorize suitable respondents into two groups – the 'discloser' and the 'disclosed'. The preliminary online survey was launched on SurveyMonkey.com in December 2015. The invitation for an online preliminary survey was advertised on several OSNs including Facebook, LinkedIn, and Twitter. This online survey consists 31 questions, which take approximately 10 min to complete. By taking this online survey, there is no obligation for respondents to further participate in the next phase of this study. At this stage, our study is in Phase I.

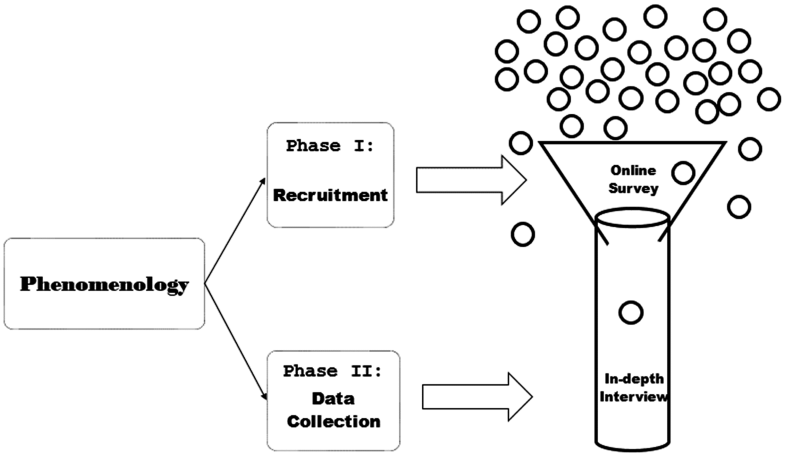

Fig. 1. Overview of research design

Phase II uses a semi-structured, in-depth interview to extensively examine multidimensional aspects of other-generated disclosures ranging from motivations, perceptions, types of disclosed contents, actions, and impacts on both online and offline relationships. The chief investigator will send an interview invitation, a consent form, and information package via e-mail to suitable respondents according to e-mail given at the end of the online survey (Phase I).

3.1 Sampling Criteria and Participants' Characteristics

This phenomenological study examines an OSN interdependent privacy, using Facebook as platform of interest because of its long existing popularity and influences. This present study focuses on adult users, rather than teenagers in many existing studies. The suitable participants must be active Facebook users (age 25–60 years old) for at least two years, have at least 100 Facebook friends, use Facebook (more than twice per week),

upload and share photos regularly (at least once a week), make comments (at least once a week), post content (at least once per fortnight).

In the next phase of this current study (Phase II), the chief investigator will send an e-mail to invite qualified survey respondents for each semi-structured in-depth interview. Then data from in-depth interviews will be analysed according to the phenomenological analysis. The results from this phase will reveal multi-dimensional aspects of other-generated disclosure and its privacy, ranging from motivations, perceptions, types of content, actions as well as impacts on users in physical and virtual world.

4 Results and Discussion

At the time of writing, the survey is still being administered and hence only preliminary results are reported here. Currently, there are a total of 166 respondents consisting of Facebook users with a variety of ages and backgrounds. The majority of respondents (92.1 %, N = 166) are adult Facebook users who are older than 25 years (a group of interest) whereas the minority of respondents (7.83 %) are under 25 years old.

There is a growing tendency towards more female (70.73 %) than male (29.27 %) respondents. A large proportion of respondents reside in Australia (51.2 %) and Indonesia (33.73 %) whereas the minority live in United States, United Kingdom, China, Brazil, Finland, India, Italy, and Pakistan. Location of respondents revealed: metropolitan (53.61 %), rural (34.34 %) and remote areas (12.05 %).

The majority of respondents are working professionals (67.88 %), which meets the sampling criteria for this study. Others are students (24.24 %) and 'others' (7.88 %), who described themselves as either stay-at-home parents or job seekers. Most respondents (89.02 %) have Facebook accounts more than three years whereas some have Facebook accounts between 2–3 years (3.66 %) and less than 2 years (7.32 %). Accordingly, the first two groups are suitable participants for further in-depth interviews in Phase II as per the sampling criteria. The number of friends that respondents have vary such as 100–200 (16.88 %), 201–300 (15.63 %), 300 or more (50.63 %); subsequently, these three groups are met a sampling criteria in terms of number of friends.

There is more problematic in tags, photos, posts, and comments, rather than videos and links. Respondents often deal with photos and tags on Facebook; 30.1 % of respondents asked a Facebook friend to delete a group photo that includes them whereas 79.56 % of respondents have tagged photos. While the majority of respondents (99.26 %) were tagged on Facebook, 26.47 % asked others to remove tags and 25.74 % asked others to remove photos (Table 1). In contrast, 16.65 % were asked by other users to remove tags.

Besides tagging, re-sharing is another most popular activity of other-generated disclosures on Facebook. A description of a term "re-share" is noted on the question that "it means passing on content which is generated by others and shared with you". The majority of respondents re-share other-generated content (Table 2). While the number of respondents re-sharing posts (84.78 %) are almost equal to the number of respondents re-sharing links (85.5 %), the remainders re-share photos (75.36 %) and video (69.56 %).

Table 1. Number of respondents asked others to remove or delete the following content from others' profile.

Content	Yes	No	Total
Posts	19.85 % 27	80.15 % 109	136
Comments	19.12 % 26	80.88 % 110	136
Tags	26.47 % 36	73.53 % 100	136
Photos	25.74 % 35	74.26 % 101	136
Videos	15.44 % 21	84.56 % 115	136

Table 2. Users' re-sharing activities

Re-share	Yes	No
Posts	117	21
Photos	104	34
Video	96	42
Links	118	20

Other-generated disclosure is beyond individual control when it occurs in another user's profile, rather than own profiles. In this case, users generally have to deal with this phenomenon offline by asking the 'discloser' to remove or delete those content. The number of respondents who have removed or deleted photos (23.53 %) are relatively same as the number of respondents who have removed or deleted tags (23.13 %), due to a friend's request. Similarly, the number of respondents who have removed or deleted posts (17.78 %) are slightly different from the number of respondents who have removed or deleted comments (16.30 %), due to a friend's request.

Users have involved in an argument on friends' profiles (34.81 %), closed groups (28.89 %), and public groups (25.74 %) (Fig. 2).

The reports from preliminary survey presented here have some limitations. First, the majority of respondents were female, professionals (63.16 %), and adult Facebook users. This is expected to diminish as the sample sizes grow. Despite our attempt to have a balance of gender in the final survey results and two groups from purposive sampling, there is a possibility that the derivatives of this purposive sample may yield a disproportion between male and female population. Second, the data sets obtained from this survey were not a complete representation of the general human population, since the ages of participants from both groups are in between 25–60 years. Third, this preliminary online questionnaire involved self-reporting.

The final survey result of this project will engage larger sample size. In the next phase, the qualitative findings from a semi-structured in-depth interview will reveal multi-dimensional aspects of the phenomena from insiders' perspective based upon their lived experiences.

This area of research could also expand beyond behaviors of Facebook users to that of other OSNs such as Twitter, Instagram and Snapchat. So far little attention has focused on other-generated disclosures on OSNs such as Instagram, WhatApps, and Xing.

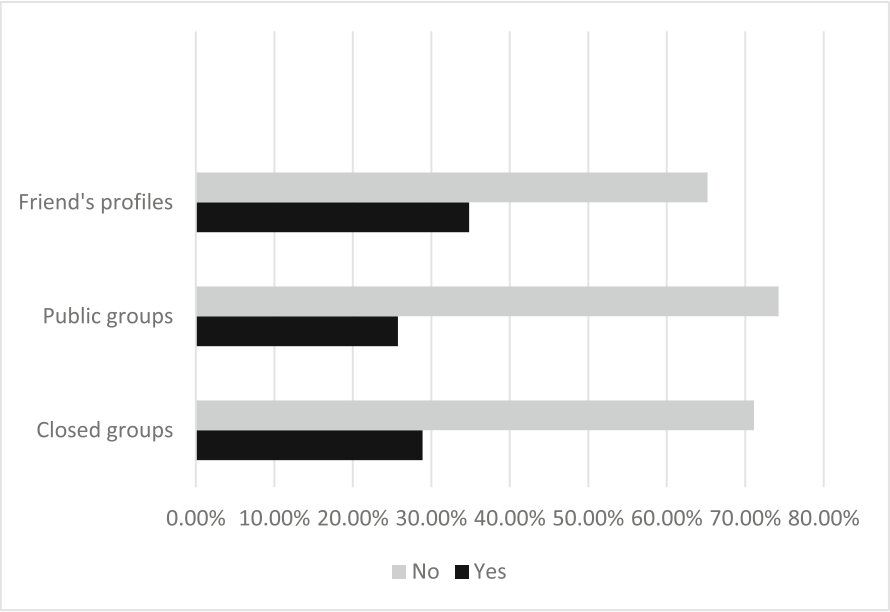

Fig. 2. Number of respondents engage in an argument

5 Conclusion

Interdependent privacy on OSNs regarding other-generated disclosures is beyond individual control and in need more attention. As of this writing, no work has yet explored an interdependent privacy regarding other-generated disclosures in the multi-dimensional aspects from OSN insiders' perspectives (the 'discloser' and the 'disclosed'). This paper presents a preliminary results based upon an online survey, which is Phase I in this current study.

Other-generated disclosures on OSNs is an inevitable phenomena, which can occur to either users or non-users. To date, existing studies on privacy management cannot fully resolve these problems as well as current tools are inadequate to mitigate this privacy related issues. New designs of privacy management and policy are in need to protect personal and information privacy. In addition, future detection mechanisms or tools would be helpful to mitigate privacy risks. The preliminary survey findings will increase users' awareness as well as call for scholars' attention to tackle these privacy challenges in the right direction.

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From Caravaggio to Braque: Digital Technology and the Illusion of Augmented Responsibility

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Abstract. According to the Situational Context Theory, the recent accelerated evolution of digital technology (IoT, Microchips) reinforces the trend of progressive reduction of the physical distances between an 'Augmented individual' (technology-empowered subjects playing their daily life decision-making processes based on multidimensional choice-sets) and technology. Technology becomes further more *competent* than the subject in dialoguing with the situational environment, both in the area of information building (search engines) and of location-based dialogue with the daily environment (IoT, NFC, VR). Because of reduced physical distances and the growth in competence of technology, the free-choice based subject's responsibility, which initially appeared 'augmented', in reality decreases and becomes an illusion, quite as the cubism illusionism of Braque and Picasso painting. Indeed, in this frame of work, responsibility appears to shift from the augmented individual to organisations and institutions managing technology with competence, within a frame of a digital technology Corporate Social Responsibility.

Keywords: Multidimensionality · Digital technology ecosystem · Augmented responsibility · Choice-sets · Situational Context Theory (SIT) · Cubism · Digital technology · Corporate Social Responsibility

The first part of the following study (Sects. 1–5) aims to explain under an interdisciplinary perspective how the Internet Age society is a complex multidimensional ecosystem: the notion of Internet Age ties to the development of Information and Communication Technology (ICT), that is, to the phenomenon of connectivity, complexity and unpredictability [1–5]. The second part (Sects. 6–8) tackles the concept of the subject's decision-making process within the digital eco-system to design an innovative concept of 'Augmented responsibility'.

1 Complexity

Economics, Physics, Information Theory and Biology contribute to shed light on how the Rational Choice Theory linear approach appears to be unable to comprehend a complex system. Logic patterns operate on linear sequential steps, one related to the

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other by a cause-effect process. Instead, complex systems accelerated by technology are multidimensional complex ecosystems of digital-physical subsystems.

In October 2008, at a hearing at the American Congress, the former Federal Reserve Chairman Alan Greenspan admitted he had failed to anticipate the self-destructive power of subprime mortgages causing the 2008 financial crisis [6]. The hearing represented an historical step towards the disruption of mainstream neoliberal thought stigmatized by the monetarist econometric models [7]. Indeed, behind the Rational Choice Theory principles [8] inspiring monetarism, mainstream rational linear models appeared to fail the task to provide explanations of the economic, social and political complex techno-system [9]. If a linear model is characterized by only one dimension [10], a complex system is composed by a number of interconnected sub-networks characterized by many dimensions and multiple variables [11]. Statistical Physics, Information Theory and non-linear dynamics study different features of complex systems as the relationships between its parts, the collective behaviors arising by its internal interactions and ultimately the feedforward and feedback relationships with its environment [12]. Depending upon these environmental exchanges, in Thermodynamics, systems are classified as open or closed. An open system exchanges matter and energy with the environment, while a closed system exchanges energy [13]. An example of open eco-system composed of subsystems is provided by the biologist Konrad Lorenz in his book 'King Salomon's Ring'. Lorenz argues that "The aquarium is a world; for, as in a natural pond or lake, indeed as all over our whole planet, animal and vegetable beings live together in biological equilibrium" [14]: plants, animals and decomposers play different roles within the complex eco-system, interacting to make available the great cycle of life. Likewise, the sociologist Luhmann maintains that society is a complex system composed of interrelated parts: it exists within an environment with which it exchanges information or energy under different forms; it is a dynamic system, that is, it implies feedback and feedforward processes with the external environment; it is intelligent at different levels based on its ability to act and reach for a balance with the outside [15]. Society, on the web, is a multidimensional eco-system in interaction with the offline environment, acting like a human organism, dynamically selecting, creating and evolving to satisfy emerging social needs. In the organizational sector, a case in point is Topcoder [16], an online crowdsourcing community with more than 900,000 developers, designers, and data scientists. Topcoder's crowdsourcing marketplace connects designers, developers, and data scientists from around the world with major companies, including IBM, Amazon and NASA to enter challenges and earning prizes. The community-based crowdsourcing business model follows the format of an 'organic cell': it is osmotic to the environment (exchanging ideas with the environment – the community), dynamically selecting, creating and evolving via challenges (hackathons and contests) to satisfy both profit objectives and emerging social needs. This means that it embraces creativity, innovation, and the next big ideaembraces creativity and innovation, rewarding and recognizing the best designers, developers and data scientists for honing and proving their skills. Topcoder is an example of a revolutionary complex business model based on exchange and collaboration.

2 Unpredictability

Sociology and Economics indicate that the loss of order originated by the complexity of the Internet eco-system brings a disruption of power and control systems leading to uncertainty and risk. Individuals have more freedom, less control and more responsibility on their subjective decision-taking processes.

In the Internet multidimensional complex system, predictability appears not to be viable any more. Zygmunt Bauman argues that postmodern global society, because of the processes of fragmentation and individualization, has produced a 'new global disorder'[1]. In pre-modernity, order entailed the idea of predictability, allowing persons to safely predict the consequences of their actions. In the Modern Age, the rational linear patterns of the Rational Choice Theory interpreted reality under the theoretical approach of a perfect information and social order. In a complex digital social environment, instead, there is an absence of comprehension, in the Latin meaning of cum-prehendere, that is, to embrace all aspects, grasping all rational and irrational sides of subjective action. This view reflects into the concept of a society of uncertainty as predicted by Bauman [18] or, in economics, as predicted by Galbraith [19]. Related to the concept of uncertainty, the father of the theory of risk Beck [20] maintains that society itself founds on risk.

In this general condition of disorder and uncertainty, individuals do not act in accordance with the requirements of social roles and have to be responsible for their own actions. In fact, they are not protected nor controlled any longer by the traditional model of community of the Pre-Industrial Age [21]. Indeed, pre-established patterns of social relationship appear to have dissolved (decline of church, political parties and associations, leading to a decline in identity, loss of social civicness, and a general decline in power by institutions [22]), shifting to an Internet-Age model of society, characterized by multidimensionality, more freedom, less control, but more responsibility for one's self decision-making process. This phenomenon reflects into the need of protagonism on the web as a tendency to biographic narrations – as the proliferation of blogs or personal diaries on social networks- and an obsessive search for original performances and contents [2, 20, 23]. Under an organizational and business perspective, unpredictability translates into a general disruption of the mainstream make-or-buy models and increasing difficulties in vision-building, including the loss of meaning of long term planning given the fast pace of environmental change; uncertainty also leads to risks in reputation, given the viral connectivity of the web-, higher volatility in investments and a strong need to focus on customers' needs, reflecting in a general shift of power from the brand to the stakeholder [24].

Finally, unpredictability within the relationship between humans and technology is mainly based on the sense of risk (issues of security and privacy) and a lack of trust in technology which may occur when technology fails [25].

[1] [17, p. 49].

3 Connectivity

Thermodynamics, Neurology, Physics, Network Analysis contribute to illustrate how in the Internet the speed of change follows a viral non-linear pattern. Virality develops on networks of connected knots, where space and time are the coordinates of multiple directions. Connectivity and virality appear to be the multidimensional paradigm governing change.

In Thermodynamics, chaotic systems are an extreme example of instable systems, as trajectories of initial conditions diverge over time following an exponential and non-linear ratio[2]. Correspondingly, scientists adopt the 'Hockey stick model' to describe the exponential growth of Internet users along time.

In Neurology [27] as in Quantum Physics [28], space and time are the two variables governing the phenomenon of connectivity. Likewise, in Network Analysis, the connection between nodes defines a portion of space and it occurs in a determined lapse of time, generating a relationship between speed and space. In the Internet, the speed of change by growing at geometric progression follows a non-linear viral pattern: one bank collapses, then other fifty follow; a computer is attacked by a virus, the speed of contagion is impressive; a virus infects a person, the contamination spreads all over the world. Virality appears to be the multidimensional paradigm governing the evolution of the change. Malcolm Gladwell evidences how epidemiology explains the three agents of virality[3]:

a. first, contagion. A contagious behavior transmits to other persons in similar contexts. The web space is made of interactions, so contacts are possible among a huge number of persons and contagious behavior spreads.
b. Second, small changes have big effects. Contagion starts from a small amount of infected units.
c. Third, speed: change happens not gradually but suddenly.

These three aspects shed light on the issue to govern information given the speed of change, following viral not linear, multidimensional patterns. This pattern may be related to chaos theory [30], where early weak signals, almost indistinguishable, may become suddenly uncontrollable tsunamis at global level. A case in point is company governance and reputation crises sparkled within the digital environment [31] or a video suddenly going viral on YouTube social network.

4 Multidimensionality

In painting, as in in multiple domains of human expression we can observe a shift from the monodimensionality and unity of the Modern age to the multidimensionality of the Internet Age.

[2] [26, p. 31].
[3] [29, p. 7].

Thermodynamics defines systems as open or closed in relation to the interaction with the external environment. This classification sheds light on the key role of the context or 'environment' to the comprehension of eco-systems dynamics.

In 1914 Gertrude Stein was walking along Boulevard Raspail with her friend Pablo Picasso. When they saw for the first time a military convoy of mimetic tanks passing by, Picasso uttered: 'We created this. This is cubism!'. It was the beginning of a different way of looking to life, of perceiving reality, it was a multidimensional cubist vision [32].

Cubist painting is a high expression of multidimensionality and an ideal ground to analyse the shift from mono to multidimensionality occurred from Modernity to Post-modernity.

If we analyse by comparison the well-known 1600 Caravaggio's picture 'Basket of fruit' with an assimilable subject of the early twentieth century, authored by Braque, several differences emerge (Fig. 1). Caravaggio's paint is an exact, meticulous reproduction; reality is represented with absolute fidelity; it is definitely static; it is three dimensions; it requires an exterior analysis from the viewer; it is an extremely objective definition of reality: anyone sees the picture in the same way given its definition. It is monodimensional, in this sense. As opposite, Braque's fruit dish appears almost undistinguishable, as any viewer may subjectively give his or her own interpretation, focusing on one element or on another; reality appears in a subjective way; the object is dynamic, many planes intersect one with the other in multiple dimensions allowing different visions; it is a deconstruction of reality, allowing the spectator to re-construct it in a personal way; Braque's cubist approach asks for a deep analysis, a process of research to provide a personal interpretation to a complex representation of an object. Finally, in the Caravaggio's picture the focus is in the picture itself: Caravaggio wants the spectator to look at the basket as the painter wishes. In Braque's fruit basket, instead, the focus is within the subject standing in front of the painting, that is, outside the picture. In other words, there is an exchange between the external environment (the viewer and his or her context) and the inside (the painting), to reach for a balance of comprehension, a negotiation of meanings. The viewer is free to assign a meaning to the picture.

Caravaggio 'Basket of fruit', 1599
('Canestra di frutta')

Braque 'Fruit Dish', 1908
('Plat de fruits')

Fig. 1. Caravaggio and Braque comparative analysis

This example aims to explain how, in painting, the representation of a fragmented, chaotic, and complex reality need to evolve from an objective to a subjective, multidimensional pattern.

The same process has taken place in many other artistic expressions like Frank Gehry or Daniel Libeskind's architecture, called 'liquid architecture'.

The relevant perspective is that the shift from monodimensionality and unity to multidimensionality takes place in multiple domains of our social life. This process indicates how the global environment has transformed into a complex multidimensional and relational system.

According to Edgar Morin, individuals organize their knowledge into four domains: cultural (humanistic and scientific), social, economic, and political[4].

During the last decade, in these domains we have witnessed an evolutionary process following a multidimensional pattern. This course has involved many sectors of human action performing as subsystems of a unique wider global system. Domains and subdomains such as economics, sociology, technology, welfare, politics, science, art, business appear to have followed this process. Some examples for each domain follow (see Fig. 2).

From Unity and Unidimentionality	To Multidimentionality and Relationships
One-dimention Economic Indicators	GNP, Social Capital, other indexes
Individualistic Social Models	Sociological relational paradigm
Mono-directiona technological communication devices	Connectivity
Top-down government models	Bottom-up models
Mono-dimentional science theories	Multi-dimentional science theories
Unity of the artistic élites	Free and open artwork-sharing
Vertical bureaucratic organisations	Global networked and hive-net organisations

Fig. 2. The shift of paradigm

In economics, besides GNP[5], new indicators such as Social Capital or Indexes of well-being measure wealth. Economists such as Stiglitz, Sen, Fitoussi or enlightened scientists as Coleman [34] and Putnam [35] have introduced Social Capital as a global economic parameter. In addition, multidimensional indexes of well-being[6] are becoming progressively accepted parameter to express the multidimensionality and relativity of the perception of wealth by a population. These evolutions in the measurement of wealth evidence the growing complexity of the set of variables required to explain an environment.

[4] [33, p. 19].

[5] Gross national product (GNP) is the total market value of the final goods and services produced by a nation's economy during a specific period of time (usually a year). Available at http://www.britannica.com.

[6] Better Life Index by OECD, available at http://www.oecdbetterlifeindex.org.

In human sciences, sociologists are moving from holistic and individualistic models towards 'relational models' able to provide an understanding of the postmodern society. Sociology of Relation [36] is a representative new branch of sociology.

In communication technology, the Internet has recreated a new online society governed by relations: from traditional offline mass-communication technology as television or radio to peer-to-peer, one-to-one communication, the Internet has allowed the spread of digital relationships.

In welfare politics, the role of governments is moreover giving space to bottom-up forces, as forms of open-government or wikicracy [37]. Many other examples show how e-government solutions, as participative platforms, create highly effective relationship-building programs between institutions and citizens.

In science, theoretical studies are examining the possibility that quantum mechanics may be applicable not only to subatomic particles, but also on a larger scale: this would mean that the microscopic and macroscopic realms interact, evidencing a relational pattern that upset the classical assumptions of Physics, and opening the doors to parallel universes.

In art, ideas once shared among a chosen few belonging to élites, today are constantly produced and shared among a vast public, at zero cost. Pictures, images, videos, pieces of literature are forms of art shared with the vast Internet audience (Instagram, Snapchat, Flickr, Pinterest just to mention some of them).

In the organizational sector, companies are showing how their boundaries are progressively fading, moving towards global hive-net, horizontal, knowledge-oriented structures, by processes of externalization. This shift of focus performs from the centre outward and from unity to multidimensionality. The first, subverts the traditional vertical bureaucratic organizational model; the second, refers to the richness of diversity inside the organisations.

All these elements illustrate the general shift of paradigms from unity and monodimensionality (as one-dimensional economic indicators or individualistic social models) to multidimensionality and relationships (as social capital and connectivity).

This shift affects the relationship between human choice and responsibility in a digital technology context. Below, an introduction to the next section highlights the three conceptual steps tackling this topic:

1. When the device acts as a filter between individuals and situational contexts, multidimensionality affects the subject's decision-making process by enlarging the span of choice-sets (see Sect. 5). An example is the process of creation of a 'wishlist' compared to a traditional offline purchasing act inside a shop (show-cases are Sephora, Gucci and McDonald, focused on wishlists building[7]).
2. Multidimensionality leads to a hyper and self-centred subject, the ideal type of which appears to be a '*Homo Augmentatus*' ('Augmented Individual', see Sect. 6), willing to express herself or himself in original and unique, personalised ways and looking for personalisation. Companies have understood this social priority and respond with

[7] See the following videos at: https://www.youtube.com/watch?v=PhfVFuVprMc for the Gucci showcase; https://www.youtube.com/watch?v=EsT04Uopl7o for the MacDonald showcase; https://www.youtube.com/watch?v=UfIz0PYyucw for the Sephora showcase.

customized products. Cases in point are Coke's personalized bottles or the customized Fiat 500, providing customers with a product configurator to design one's own car. Personalisation is also provided by companies through the adoption of evolved business models as the Long Tail allowing an 'endless choice creating an unlimited demand' [38]. A case in point is the iTunes personalised playlist or any mobile's set of apps, personalized according to tastes and needs. Brand marketing adapts to this change by tracking Customer Journeys on the web to understand personal behaviours and provide unique customer experiences; search engines track individuals' search behaviours to provide aligned information or to market data and information to companies indispensable to personalize processes. Offers, products, promotions are in real time aligned to the individual's tastes and experiences.

3. Importantly, the resulting higher grade of freedom of choice and opportunities of the Internet Age leads to an evolution of the concept of the subject's responsibility into an 'Augmented Responsibility' (Sect. 7), where digital technology plays the role of 'augmentator' (enhancer) of human subjectivity.
4. However, as digital technology is showing a definitely superior grade of competency than the human in filtering environmental data and information, the critical appraisal of the augmented individual and augmented responsibility appears to be an illusion. Indeed, technology itself, and organisations behind technology, by selecting, filtering and packaging information show to be taking a great deal of the burden of responsibility. This opens the doors to a new concept of Digital Corporate Social Responsibility.

5 Physical Distance

The accelerated evolution of digital technology reduces the physical distances between Human and Technology. The more distance gaps reduce, the more the digital device is able to participate to the situational contexts of the individual and provides the subject with growing sets of information and of choice.

According to the Situational Context Theory (SCT) [39] the concept of physical distance allows meanings to be exchanged in an environment where interaction takes place in a particular time and place. The 'context' is the situation within which something exists or happens, and that can help explain it [40]. In this conceptual frame, it may be assumed that technology plays the role of interface between the subject and the situational contexts, allowing the exchange of meanings via interaction. Importantly, interaction occurs both with the device and via the device (technological medium). In this section we analyse interaction via the device, thus studying how distance plays a role between the human and the device. In Sect. 7 we will tackle the interaction with the device.

In Fig. 3, the evolution of digital technology from PC to Laptop to Ipad to Nearables and Wearables to Implantables evidences a progressive reduction of the physical distance between the human body and the technological device (H-T Distance) and a

growing interaction of the device with situational contexts, also thanks to the introduction of the Internet of things (IoT). This gap reduction relates to the following variables, which we will call 'Distance-Frequency variables':

1. Correspondence of the mobility of the device to the individual's mobility (PC is suited to work on a desktop – a cellphone concept is focused on 'mobile'[8]);
2. Body-device physical distance and Frequency of contact: a PC lays on a desktop at about three spans distance from the body (not mobile, low frequency), while a mobile is by definition a handheld[9] (mobile, high frequency); a wearable smart device follows the rule of the wristwatch and its corresponding frequency of wearing is intended to be higher than a mobile phone [41].
3. Individual-device interaction with situational contexts.

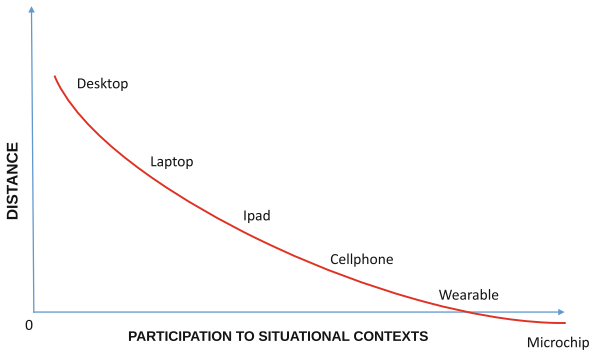

Fig. 3. Devices-distances-situational contexts graph

The graph evidences how the more distance reduces the more the device participates to situational contexts and provides information to the user. According to the SCT assumptions, it means that the device plays the role of medium as an interface to exchange meanings with the environment, allowing exchange of information and providing the subject with multiple choice-sets in his or her decision-making process.

The concept of mobility in terms of 'user experience' (UX) is about making content available when and where users want it, as efficiently as possible [42]. Based on the graph analysis and because of the direct relationship between information and choice-sets, we may use the syllogism according to which the more distance reduces, the more choice-sets are available to the device user.

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[8] A research by UXmatters has being carried on a random sample via ethnographic methodology. For two months, ending on January 8, 2013, a team of researchers made 1,333 observations of people using mobile devices on the street, in airports, at bus stops, in cafes, on trains and busses. Of these people, 780 were touching the screen to scroll or to type, tap, or use other gestures to enter data. The rest were just listening to, looking at, or talking on their mobile devices. - See more at: http://www.uxmatters.com/mt/archives/2013/02/how-do-users-really-hold-mobile-devices.php#sthash.ViEsijqL.dpuf.

[9] See note 5.

In this explanatory mainframe, we have to exclude Desktops because of their participation to situational contexts restricted to a fixed location and Implantables because of their inability to provide information directly to the bearer, excluding any mindful involvement of the individual.[10] In fact, a basic requirement of a free and responsible choice is the subject free will and awareness key to interact rationally with the device, i.e. to retrieve information on a specific issue. A heart by-pass participates 24 h to the individual's situational contexts but the subject cannot interact consciously with the implanted device. Other cases of irrational behaviours as simply looking at the device or touching it[11] are excluded, as we are focusing on technology as a mean and not as an end.

6 Augmented Individuals

In a Multidimensional environment where Human-Digital Technology distance reduces, 'augmented individuals' are technology-empowered subjects enabled to access multidimensional choice-sets in their daily-life.

The void of institutional power entailed by globalization has determined a crisis of the meaning of existence, the disruption of strong references safely determining identity.[12]

According to sociological [43], cognitive [44], behavioural theories [45] connecting the macro with the micro-level, multidimensionality at the macro-level of the complex internet system affects the individual in two opposite directions: the first, in terms of a lack of comprehension of the complex social environment [20, 46, 66] and a perception of risk [47, 20]; the second, in terms of providing a sense of freedom, given the absence of predetermination in social action [48], an impressive access to information and freedom to subjectively make decisions among a growing number of choice-sets. To refer to the Caravaggio-Braque analysis, we are far from the holistic [49] approach of Caravaggio's objective pattern. Along the same direction, we may say that the Internet Age individual is far from the Homo Sociologicus[13] of Dahrendorf, qualified by social roles, characterized by a pre-determined action, a limited field of experience and a lack of subjective responsibility in relation to a scarce presence of free expression[14]; The Internet Age individual appears also to overcome the Homo

[10] Instead, specific cases of implantables in the health sector connected to mobiles to provide behavioural lines to the patient during daytime, i.e. for diabetis, are included.

[11] Other cases of irrational behaviours as simply looking at the device or touching it are excluded, as we are focusing on technology as a mean and not as an end. See note 5.

[12] Throughout the historical phases of pre-modernity, modernity and postmodernity the relationship between the individual and society has been characterised by a progressive disruption of the unitary principles: in Illuminism, rationality; in Idealism, spirit; in Marxism, materialist laws of reality. This process led to a progressive loss of certainty reflected in a loss of power of political authorities, of moral laws, of religious structures. Globalization, by accelerating the processes of fragmentation and de-institutionalisation, has disrupted the State-Nation-Society concurrence [66–70].

[13] [50, p. 51].

[14] [51, p. 139].

Oeconomicus of Hirshman, qualified by personal interest [48] and acting along the mean-end pattern of the costs-benefits comparison (Rational Choice Theory). In fact, the Homo Oeconomicus played its role in the context of the social order of the Modern Age where social positions where distributed and coordinated. Instead, in the multidimensional Internet Age, by lacking those role expectations connected to social positions, the individual ideal type appears to be a 'Homo Augmentatus' ('Augmented Individual'). That is, a hyper-subject, self-centred in the three meanings of: a. Protagora's 'antropos metron', where the human itself is the measure for any human expression; b. under the phenomenological perspective, as opposition to objectivity, c. under the Weberian concept of space of meanings of actions [52].

7 Augmented Responsibility

The resulting higher grade of freedom of choice of the Internet Age leads to an evolution of the concept of the subject's responsibility into an 'Augmented Responsibility' or a complex-multidimensional construct, where freedom of the act of choice is exerted by hyper-subjective norms and values.

In Sect. 6, within the definition of physical distance, technology played the role of medium, or mean of interface between the human and the environment. Instead, within the concept of the hyper-subjective Homo Augmentatus, technology is tackled under the relationship with the human. In this perspective of physical interaction with the user, digital technology plays the role of 'augmentator' (enhancer) of human subjectivity. As subjectivity emerges as a process of building the meaning of one's own life leveraging exclusively one's own resources[15] [53], the intimate relationship established between the subject and the technological device [54] lets the device play the role of an empowerer of human cognition by increasing the individual set of resources (choice-sets). Resources provided by the IT to the connected ('always on') Augmented individual allow accessing a remarkable amount of information and choosing various alternatives of navigation to explore the web landscape (platforms, media, channels), designing constantly changing journeys.

The individual will select resources in a conscious, free-will pattern (we will see how this perception in reality is an illusion). Free-will relates to that subjective component of the person represented by reflexivity, autonomy of choosing and originality[16]. Reflexivity is a disposition of cognitive nature occurring when "what is relevant to us is the adoption of the standpoint of the first person"[17]. In other words, the 'Augmented individual' experiences an 'Augmented responsibility', being the autonomy of choice a disposition of free-will enabling the person to take choices in a relatively independent way. In synthesis, 'Augmented responsibility' refers to an 'augmented individual', centred on himself or herself as a subject, conscious, in a position of wide freedom and empowered by technology to make a choice by applying hyper-subjective norms and values. An example is the process of acquisition of information to purchase an item: the

[15] [52, p. 31].
[16] [55, p. 70].
[17] [56, p. 171].

possibilities provided by the web are infinite, considering the opportunities provided by creating forums, or chats, or surveying, or accessing websites, social networks and communities or rankings.

8 The Illusion

As a paradox, in contrast with the notion of 'augmented responsibility', digital technology is progressively taking over part of the individual's decision-making processes of information selection. Being more competent than the subject in dialoguing with the situational environment, it provides focused and selected information, thus limiting choice-sets and generating bounds to the subject's free-will. This reduces the critical appraisal of the augmented individual and subjugates their responsibility making augmented responsibility an illusion. Responsibility, indeed, appears to shift from the augmented individual to organisations and institutions managing technology with competence, calling for a new concept of digital technology Corporate Social Responsibility entailing trust.

Aristotle was the first philosopher introducing the concept of *téchne* (technology). At that age there was no separation between the two components of the concept: knowledge and know-how (*téchne* and *praxis*). Knowledge was a unitary concept, corresponding to the concept of 'art' to Romans, which included different crafts and expertise. Art implied managing knowledge and know-how. Indeed, in the digital contemporary life, it appears that technology has taken over the know-how and is progressively taking over also knowledge, in many fields as in daily-life issues.

In terms of *know-how*, it is a reality how much we are unaware of how simple daily-life objects work. We do not know materials and mechanics of a toaster, a cellphone, a PC, a TV. Technology, instead, has full competence in this. Being competent, knowing the 'whys' and having power and control over the know-how, it determines a subtraction of responsible free-will to the 'augmented individual'.

In terms of *knowledge*, reality tells us we are delegating much of our knowledge to digital technology: search engines, by leveraging their position of power are competent in filtering the Internet information, releasing it by personalised tracks of past researches. This represents a limitation of the individual's freedom to rationally and emotionally select a choice. It is a progressive reduction of choice-sets, bounding freedom and responsibility and generating a dangerous illusion on 'augmented responsibility'. If this represents a simplification of reality [57] and a positive lift from the cognitive burden of choosing (in some cases, large choice set sizes discourage individuals from making a choice [58]), it has severe ethical consequences. In fact, this process, while providing search engines with more and more focused profiles of the Internet users to be marketed to companies, it dissolves the primitive value of the Internet: the democratic preservation and valuing of different standpoints, to favour a rich diversity [59].

Against a perception of an 'Augmented individual' with 'Augmented responsibility' this other side of the matter appears to be deeply de-responsabilising as it generates a bounded-information. Indeed, bounds are not created by human cognitive and information limitations as in Herbert Simon's economic theory [60]. In our analysis, search

engines, via their power and control put bounds to human knowledge, ending up in a possible control of perceived reality. SEO techniques are a case in point, as search engines enjoy a unique position in ranking websites based on variables defined by them. Not questioning the modalities of how algorithms variables are identified and the fact that individuals are to decide which Google page to visit, it is undiscussed that this is a delicate position. Moreover, the fact that that an oligopoly of search engines define the boundaries of knowledge (the total number of page results related to a search term) is a complex and 'sensitive' matter. A search result indicates that an entity has selected information in place of a human, often in sensitive matters, i.e. religion issues, culture, politics, values. The single individual mostly interested in a specific information ranked as the least relevant for Pagerank, for instance, is virtually excluded to accessing that information.

This scenario of illusion of technological empowerment is moreover relevant as technology by increasing competence via progressively reducing H-T distances (Sect. 6), collects, owns and manages information providing more and more the subject with already packaged, elaborated information and focused to the specific situational need. Examples of location-based dialogue with the daily environment are IoT-based wearables and smart devices, NFC (Near Field Communication, as beacons) and Virtual Reality devices skilled in dialoguing with the environment. IoT is highly competent in collecting information from the human-environment interaction in many sectors as health research[18], investing, insurance.[19]

In synthesis, these evolved forms of digital technology transmit an idea of empowerment and improvement of human choice, of efficiency, effectiveness, security and safety. However, this disruption of human bonds, in reality, hides a deep illusion: the illusion of freedom and empowerment of a 'Homo Augmentatus' with an 'Augmented responsibility'. The increasing trend of closing the human-technology gap reinforces the illusion of a 'technology providing a perfect service', like the illusion of a 'perfect information' of the Modern Age Rational Choice Theory. In the Internet Age, instead, the human issue is a lack of comprehension of the full context given the complexity of the online-offline environment (Sect. 1). As in the Cubist Braque's and Picasso's illusion, where abstraction and reality are in conflict, in a Multidimensional reality, the illusion of an 'Augmented Responsibility' clashes with the bounds to human freedom imposed by digital technology.

This concept opens the doors to a new opportunity for technology owners within the Digital Corporate Social Responsibility, with the aim of reaching a sustainable relationship with stakeholders. In the health sector, for example, many are the examples of technology addressing issues in research (health data collected via mobiles [61]), or, in developing countries, in medicine distribution (via drones [62]), helping the community of health workers [63] or providing basic healthcare information in India (via search

[18] MyHeart Counts' wristbands project collects data to be sent to health research centers via advanced gyroscopes, accelerometers, barometers and other sensors. Available at https://med.stanford.edu/myheartcounts.html.

[19] In the Insurance industry, wearables, by tracking customers' activity, allow insurers to keep policy pay-outs down to a minimum.

engines [64]). In this frame, Digital Corporate Social Responsibility has to stay at the core of the strategic process of technology owners to build a *trustworthy* relationship between humans and 'competent' technology. However, competence is only one of the five components of trust. The other four, in fact, are: Integrity, Benevolence, Transparency, Congruence of value [65]. Only if organisations behind technology address all the five concepts, a trustworthy relationship with the humans will be built, probably addressing many issues in privacy and security.

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Examining User Experience in an Augmented Reality Adventure Game: Case Luostarinmäki Handicrafts Museum

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Abstract. In this paper we examine the user experience test results of Augmented Reality Adventure Game designed to Finnish Cultural Heritage Site Luostarinmäki Handicrafts Museum in Turku and discuss about the possible and preferable content, development and economic decisions and guidelines for augmented reality applications for museum and Cultural heritage sites.

Keywords: Augmented reality · Mixed reality · Gaming · User experience · Museum

1 Introduction

Augmented Reality (AR) is the art and technology in which traditional field of real world view is augmented with additional information. This can be computer-generated 2D and 3D images or information superimposed on the real-world view captured from the camera of smartphone, computer or other device [1]. Augmented image appears to its users like virtual and real objects coexisted in the same space. In other words, AR immerses its users in virtually enhanced real world [2].

Augmentation of reality has been used in different medias and systems for decades, e.g. head-up displays in fighter planes, scoreboards in sportscasts. Due to the computerisation and rapid emergence and development of mobile technology, AR is now available for common users in their mobile devices and possibly soonish with AR-glass technology.

The interest towards the emerging AR technology has been rapidly growing among the museums and cultural heritage sites around the world. However, the acceptance of AR applications can vary in different populations. Lee et al. made a cultural comparison between South Korea and Ireland, both having high smartphone penetration rates

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but different cultural profiles, and noticed that aesthetics of AR have the strongest influence on perceived enjoyment. Also, as expected, South Korea, having high collectivism and high uncertainty avoidance culture, displayed stronger dependence on social influence and hedonic characteristics of AR [3].

Smartphone or tablet device meets the main requirements posed by AR since it has a camera and capability of rendering and displaying the augmented graphics. [4] Hence, with explosive growth of penetration rates of smartphone, application-based AR has been more accessible to users. Especially, cultural heritage tourism is one of the most important areas served by mobile AR app [5, 6] which provides digitally restored artifacts, thereby preventing degradation of cultural heritage sites aggravated by frequent access by tourists and let them perceive fun and usefulness [7]. A number of cultural heritage institutions around the world, such as the Louvre Museum in Paris and British Museum in London, have developed and provided with their mobile AR apps[1].

As this study is – as far as we know – the among the first studies about AR-games which involves end-users, the research questions reflect the overall requirement for these kinds of solutions and thus our research questions are as follows:

(1) Is there a demand potential for AR adventures in cultural travel?
(2) Does AR adventure generate added value to the museum experience?
(3) Is an AR adventure suitable for museum and cultural travel atmosphere?
(4) Are the customers willing to pay for it?

In this paper an Augmented Reality Adventure User Experience (UX) research results done in Finnish cultural heritage site *Luostarinmäki Handicrafts Museum* in Turku are introduced and discussed. The research team has been developing AR and Mixed Reality (MR) mobile applications (apps) for Finnish cultural and especially museum field to research this emerging technology's possibilities in presenting historically accurate and entertaining experiences to audiences. The paper is organized as first introducing the AR technology and our prototype, then our research design and results, followed by discussion and conclusions.

2 Reality… Augmented?

> "What is real? How do you define 'real'? If you're talking about what you can feel, what you can smell, what you can taste and see, then 'real' is simply electrical signals interpreted by your brain."
>
> – Morpheus, The Matrix [8].

2.1 What Is AR?

Whereas the more known virtual reality experiences attempt to recreate all of these signals, augmented reality only attempts to complement the natural ones with some

[1] See e.g. http://www.museum-id.com/idea-detail.asp?id=336, https://www.qualcomm.com/news/spark/2012/04/20/museums-modernize-self-guided-tour.

artificial flavor. It thus sits somewhere in between the physical reality and completely simulated virtual reality, as seen in the famous Virtual Reality Continuum in Fig. 1 [9].

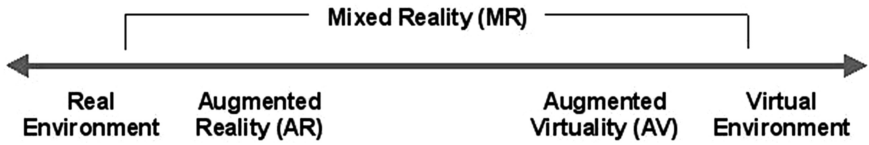

Fig. 1. Levels of mixed reality.

Whereas virtual reality (VR) can deviate greatly from the real world, augmented reality productions however must fit into the physical context in order to achieve an immersive and believable experience. At the minimum a good AR application should (1) seamlessly combine the physical and virtual pieces of content, (2) be highly interactive in real-time and (3) allow users to experience the content with free movement in the real world 3D space. [10] The first condition is not to set limitations to artistic freedom in any sense, but to highlight the fact that at least the virtual content should in fact react to as many changes and parts of the real world as possible. The second condition separates for example pre-rendered movie productions from augmented reality, as even if the contemporary film productions feature highly believable computer generated imagery, they do not represent a real-time simulation of reality from the end-users point of view. The third condition then emphasizes how important it is to the end users not be limited in the ways they can "live" in the augmented space: they must be able to move freely and explore the content from any angle and location they like. The virtual content must always be fixed tightly in its place in the real world while the user moves about.

Augmented reality can be experienced via various types of devices. Currently the most used device platform is the mobile devices segment most consumers carry with them in their everyday life: mobile phones and tablets. The image from the rear camera of the device is displayed on the screen and the virtual content is drawn on top of it to create the seamless viewing experience. While traditional mobile devices allow widespread adoption of AR experiences, they can at most provide a window-type of experience into the augmented world. The next phase, currently taking its initial steps will be in form of wearable eyewear: with see-through displays both the real world and the virtual elements can in the future be overlaid on top of the whole field of vision (FOV). Such devices, but with limited FOV are being prepared for consumer grade release by several international corporations, such as Google, Microsoft and Sony and many others have announced intentions of going into the market [11–13].

The first wave of augmented reality applications for mobile devices used purely geolocation based solutions for aligning, registering, the content with the real world. With the user's geolocation and the device's orientation read from magnetometer and other sensors it is possible to do only very rough registering: the content might be meters away from the actual desired location and it usually also reacts to user's

movements sluggishly and with imperfect results. Mostly the first applications were thus about displaying information about distant enough points of interest around the user, such as showing the restaurants in radius of 5 km as seen in Here City Lens application in Fig. 2.

Fig. 2. Here City Lens [14].

To acquire more accurate results the modern augmented reality technologies employ visual tracking as part of the process. The image from the device's camera is algorithmically analyzed to find stable points that can be used as a reference to measure how the device is moved around. The reference points, or feature points, can then also be matched to pre-created set of reference points. If they match with high enough accuracy, the reference point can be deduced as the camera is pointed to predefined content area which has accurately placed virtual content. The currently more traditional approach with predefined content is to use basic printed imagery as recognizable 2D markers. Complex images with high contrast and thus high amount of stable feature points work more reliably, but in some cases even photographs can be used as markers.

The more developing way of tracking is to use 3D objects as markers. They can produce both more accurate and stable registration, but also allow more viewing directions than the 2D surfaces. 3D markers are however more time consuming to create and require more data and thus bandwidth to transfer and also require much more complex and computationally heavy algorithms to be used. Since in the last few years both mobile networks have gained higher transfer speeds and devices have become more powerful, it is now possible to employ large datasets of 3D markers as the basis for mobile augmented reality applications. The next step for accurate registration lies in actual environments being used as markers, instead of just small objects. This however

requires even more complex solutions, as for example changing lighting in outdoor environments creates new challenges for the current algorithms.

Solutions come in the form of both new sensors such as depth cameras [15] and also as new solutions to registration, as perhaps more than the actual feature points the registration could be based on the geometry of the real scenery. Even without directly depth sensing devices some steps to this direction can be taken by employing Simultaneous localization and mapping technology, SLAM, where the end-user's device's camera image is used to recreate the viewed scene as 3D geometry [16]. This way just different types of objects and surfaces could be recognized – not just the very objects used as reference material. With this approach it will be possible to create AR experiences that are not limited to be used in a single real world environment, but could instead automatically adapt to new surroundings.

As augmented reality technologies become more and more complex, the importance of professionally developed and maintained dedicated software libraries has become vital part of the industry. The wide range of end-user devices available and different tracking techniques required for varying situations makes even maintaining such libraries a daunting task, let alone developing and researching new complex algorithms for better results. Thus, the currently wide adopted solutions are sparse and only a few competitors exist. The most used easily available AR software library is the Vuforia SDK, currently owned by PTC Inc. after acquiring it recently from Qualcomm [17]. One of the many, but likely the most feature rich and most used open source library is the ARToolkit, which also was recently acquired by DAQRI [18]. For more simple use cases and targeted for non-technical users exist for example the Aurasma and Layar platforms, which both are mostly built around augmenting printed or other fiducial material [19, 20][2].

In addition to just displaying information and small gadget type of application, there are some examples of more complex augmented reality products. Likely one most known one currently is the AR conversion of the famous sandbox game MineCraft, that Microsoft has used as part of its HoloLens demonstrations and advertising [21]. Even if VR is likely the more suited medium of the two for gaming, AR will probably also gain much traction from the sector.

2.2 Our Prototype

One of the first augmented reality adventure games for mobile devices was developed during 2014–2015 as part of the Futuristic History project at Technology Research Center[3] of the University of Turku for use in an outdoor museum environment which is illustrated in Fig. 3. The game was to provide visitors with a more lively experience in the museum, as currently the once busy streets of the 1800s town are now mostly empty. By bringing virtual characters into the court yards it was possible to demonstrate in a very concrete manner how people lived in the area and what they were like.

[2] See c.f. trc.utu.fi/mrdb for list of SDKs.

[3] http://ar.utu.fi.

Much care was placed on clothing, speech and especially building backstories for the characters. In a very classical point-and-click adventure game approach, the players were given small tasks to complete in order advance in the story that in end turned out to be about finding a missing wedding ring. Mostly the tasks were completed by visiting different areas and getting the right virtual characters to give the player the right information to proceed. The gaming experience was targeted to be as seamless as possible, even though the advanced ALVAR 3D tracking technology provided by VTT [22] was still experimental and not completely production level reliable [6].

Fig. 3. Luostarinmäki adventure [6].

Most frequent individual problems while testing the application was related to finding the AR content with 3D tracking. While the technology allowed us to not print 2D markers in the museum area thus preserving the original look of the cultural heritage site and structures which was a requirement from the museum. This unfortunately caused some problems with technical functionalities because some of the users had to spend some time before finding the augmented spaces thus weakening the experience.

3 Research Method

Even though several related mobile Augmented Reality applications have recently emerged also in Cultural Heritage sites, most of them are developed to enhance the visitor experience. AR applications which focus on gaming are limited as well as the AR User experience studies with actual end-users [23].

As the UX is in connection with the user environment and varying content, it creates challenges in setting research assumptions for Museum AR-Game User Experience. There is no existing supporting or contradicting theories with similar

combination of interactive content and actual museum audience as a target group. Also, according to Yin, the results of this kind of case studies are not generalizable to populations [23, 24].

Our research assumptions are based on use case- and concept evaluations of AR applications for Cultural Heritage sites [23]. They include that (1) regardless of the technological limitations that can poverish the AR-User Experience and the users see augmented reality as suitable for museum and cultural travel environment, and (2) it generates added value to the visit [23, 25]. We also assume that there are (3) market potential for future AR solutions in museum and cultural travel sector.

The user experience study was conducted June 1st to June 18th 2015 and it included themes from various different technical features to the content and marketing. The data was gathered in a structured questionnaire, build in the application. The basic user data was gathered before the testing and the usability data after the testing was done. Target sample size was 150 visitors. Accidental sampling was used. Existing study subjects were encouraged to recruit more subjects into the sample. Full data set is gathered from 129 visitors.

The main objectives of the testing were to collect feedback for the AR/MR-application and its content from various user groups, to discover its possible usability problems and to validate consumer demand for related AR/MR applications and interactive content.

The practical arrangements included a *research base* outside the museum gate where the test persons receive the equipment and a free museum ticket as a reward, four iPads and a selection of headphones for the audio content. Research personnel included 1–2 researchers on site during opening hours. The testing event was advertised throughout media.

Themes of the research were:

(a) *Sample structure* (Age, gender, gaming experience, etc.)
(b) *Reception* (How the idea of AR was received)
(c) *Usability* (Technical functionality, UI, easiness of use, learning, interactivity, use of audio)
(d) *Content* (How the app guides the user/tutorials etc., storyline, gamified content)
(e) *Consumer business related* (Demand, Willingness to pay for contents/apps, How the AR-experience is connected to the museum experience)

Sample structure (n = 129) is shown by age and sex in Table 1 and level of education in Table 2:

This sample consists of museum visitors that were available to test the system in the outdoor museum during the test period. It represents the typical Finnish customers of Luostarinmäki Museum during the beginning of the summer season. This mostly consists of the customer base of the museum except those that could not participate for personal reasons or because of traffic (e.g. visitors within tourist groups with dedicated guides and thus unable to participate at all). Moreover the customer base for the museum varies by the time of the year and therefore e.g. school groups or those people having holidays later in the summer were not represented [26]. The prototype app had content ready in Finnish thus restricting the participation of non-Finnish speaking people.

Table 1. Age and gender structure in study

Age	Male	Other	Female	Total
07–12	14	0	10	24
13–18	6	0	3	9
19–24	2	0	10	12
25–34	15	0	9	24
35–44	10	2	15	27
45–54	3	0	12	15
55–65	4	0	5	9
65+	3	0	4	7
Other	2	0	0	2
Total	**59**	**2**	**68**	**129**

Table 2. Education structure in study

Education[a]	
1st level degree or less	35
2nd level degree in vocational school	9
2nd level degree in high school	10
Bachelor's degree	15
Master's degree	60
Total	**129**

[a]Finnish Education system is 3-levelled: primary school (7 to 15 years of age), two different secondary schools (16 to 19): high school and vocational school and two different higher level school types: bachelor level (universities of applied sciences) and master level (science universities).

4 Results

First questions after the background were about attitudes. Most of our test subjects were found to be quite enthusiastic about the app and thus almost all of them agreed with the questions "Museum visit can be entertainment" (99 %) and "Museum visit can be learning" (97 %) as illustrated in Fig. 4. 78 % of the people were interested in technology, 89 % in culture and 88 % in museums. Exactly 90 people out of the 129 (70 %) were interested in gaming as is presented in Fig. 5. (To note, the eldest were not that enthusiastic about it). Therefore, an indication towards a group of enthusiastic testers was found. Most of the test users were regular users of desktop computers and smartphones but only 60 % of them used regularly tablets. Answers towards activities in digital gaming gave more heterogenic answers.

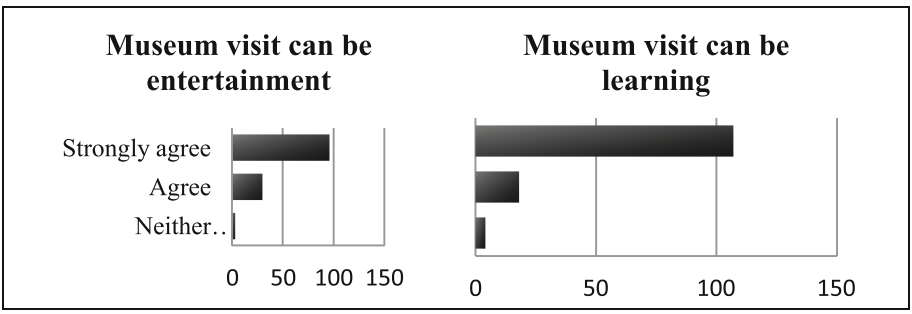

Fig. 4. Attitudes towards museums.

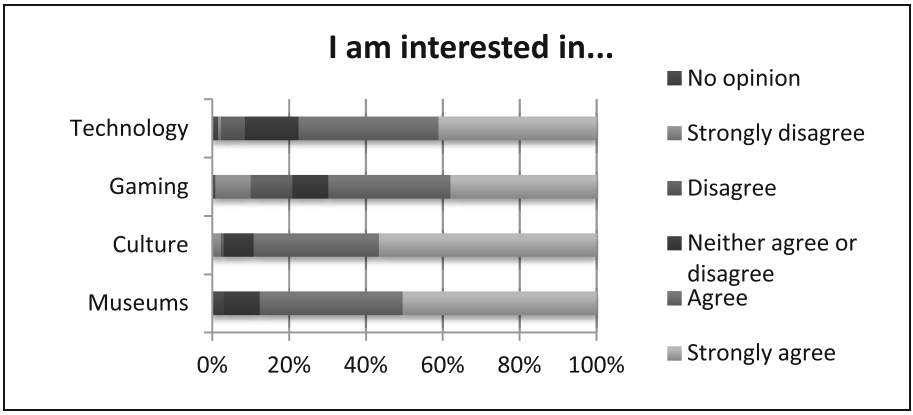

Fig. 5. Interest in the app.

As shown in Fig. 6, in our study the share of active gamers (gaming every week) was found to be about 49 % and the share of those who play digital games every month as 68 %. This – even though the definition differs a bit – follows study [27] of playing in population, where 69 % were considered players and 48 % as active players.

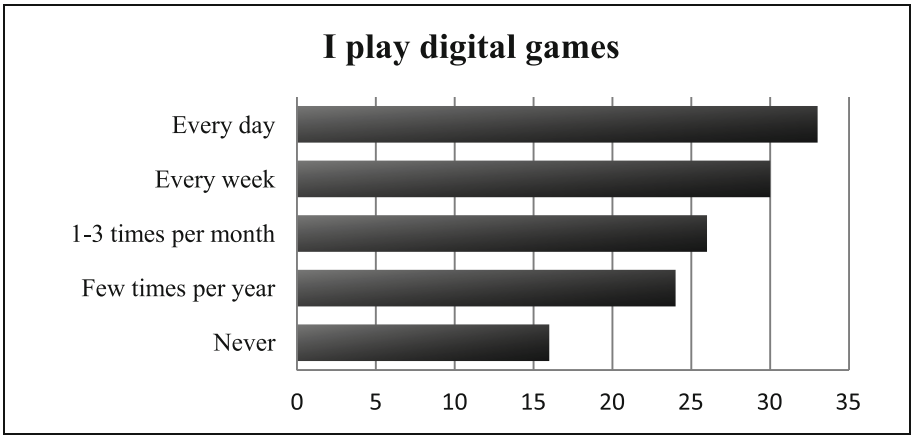

Fig. 6. Gaming activity.

It must be noticed that even tough 91 % thought the first impression of the app was interesting, as shown in Fig. 9 but yet only 81 % stated that they understood the idea of the app. Moreover, it must be remembered that the actual percentage might be even lower. Those still in primary school and those who have at least master's degree got the best impression about the app (Table 3).

Table 3. "First impression of the app was interesting" and number of museum visits

"First impression was interesting"/Museum visits	Total	% of n
Never visited the museum before	46	
Strongly agree	33	71.7
Agree	10	21.7
Neither agree or disagree	1	2.2
Disagree	2	4.3
Visited 1–2 times	49	
Strongly agree	25	51.0
Agree	18	36.7
Neither agree or disagree	4	8.2
No opinion	2	4.1
Visited 3–6 times	24	
Strongly agree	18	75.0
Agree	5	20.8
No opinion	1	4.2
Frequent visitors (6 + times)	10	
Strongly agree	9	90.0
Disagree	1	10.0
Total	129	
Strongly agree	85	65.9
Agree	33	25.6
Neither agree or disagree	5	3.9
Disagree	3	2.3
No opinion	3	2.3

As shown in Fig. 7, the AR app and the pleasantness of the AR experience was seen quite differently: the experience can be pleasant even though the app is still seen less so. While 84 % saw the experience as a pleasant one, only 59 % of users confirmed that the app was pleasant to use thus indicating clear problems in the usage of the app. The pleasantness of the app's use was one of the lowest scores gathered and can be combined with the problems and feedback in functionality (see below). Males were more demanding for the experience than females.

Whether the app is seen as a pleasant one depends hugely on the age group. People from 25 to 34 years of age are most critical towards the app and demanded better experience while children of 7 to 12 years of age were quite pleased with the application which is illustrated in Fig. 8.

Even though the app got a lot of positive feedback, the functionality got even less praises than the pleasantness (22 % bad or very bad, see Fig. 9). As mentioned in chapter 2, this and the pleasantness-problem can partly be explained with several issues with tracking.

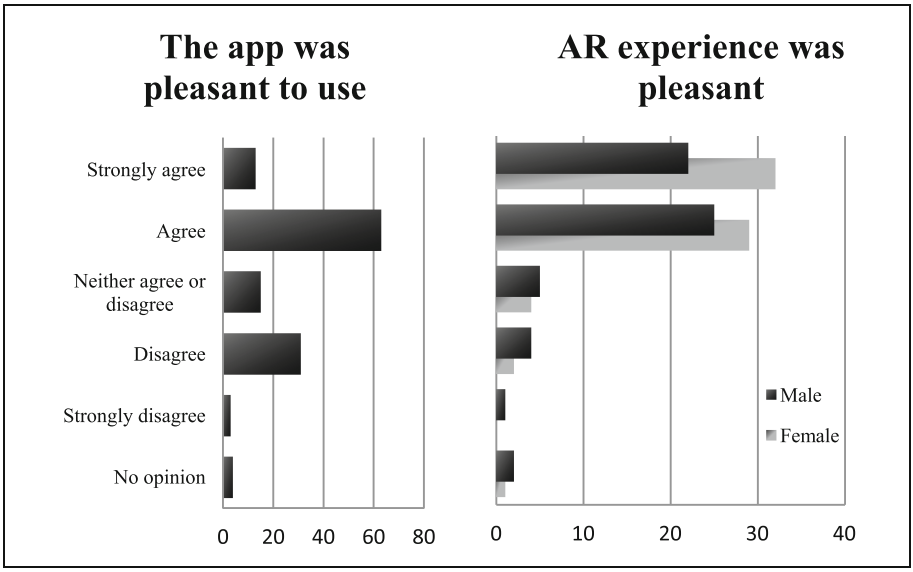

Fig. 7. AR experience overall and by gender.

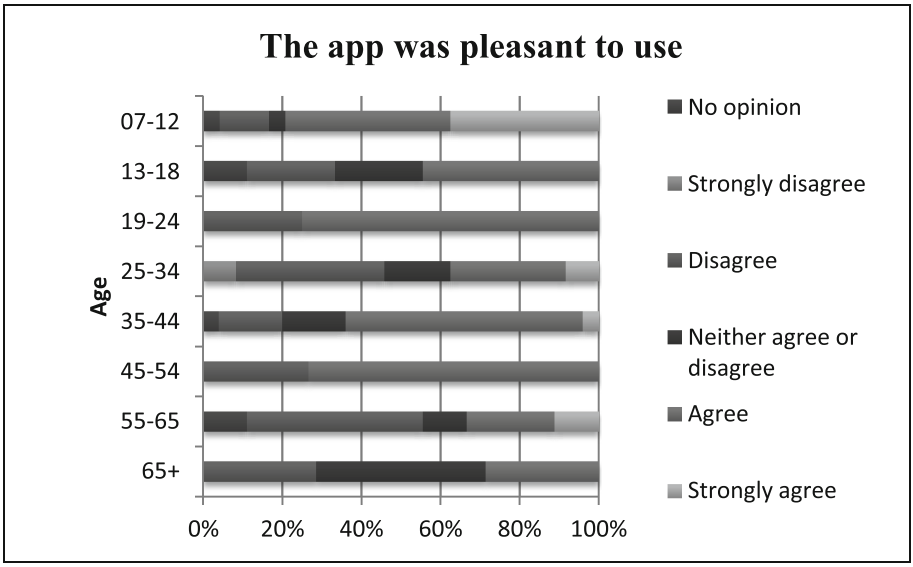

Fig. 8. "The app was pleasant to use" by age.

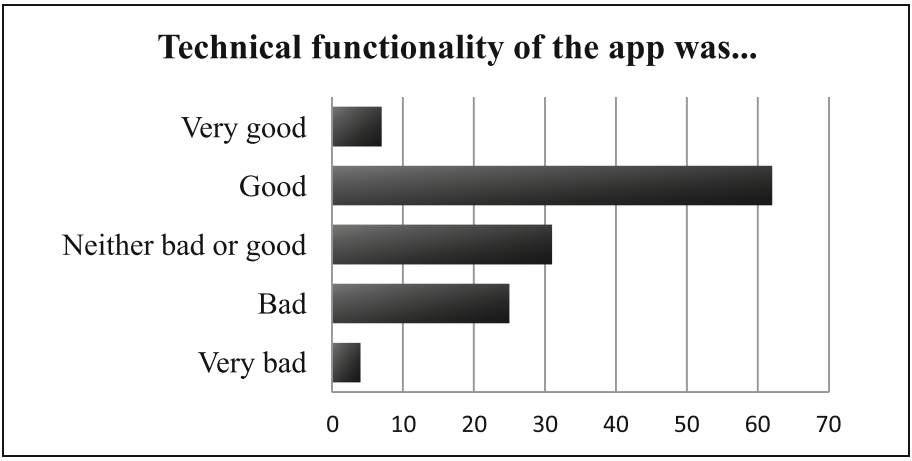

Fig. 9. App functionality.

In Fig. 10 is illustrated the results for questions about movement with device. The using of the device and moving with it was found easy enough even though the museum grounds are in unpaved hillside with lots of obstacles.

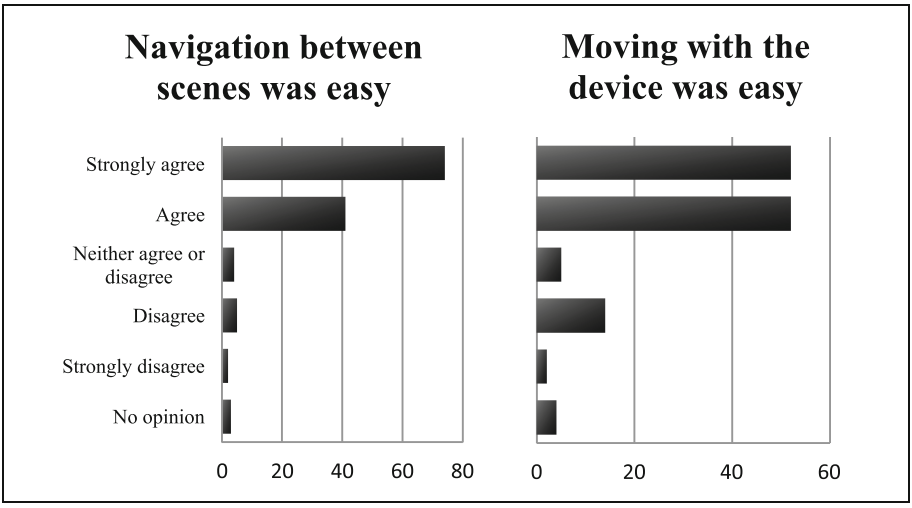

Fig. 10. Easiness of use in navigation and movement.

The storyline and gaming time (c.a. 45 min) was found to be fine, but problems arose within the museum pedagogic level of the app which according to the testees was not that visible. Moreover the hardship of separating fact from fiction caused 24 % of users some issues, as illustrated in Fig. 11.

The adventure length – as seen in Fig. 12 – was seen as a proper length but yet people wished both more and less scenes to the app. Most of the users were quite

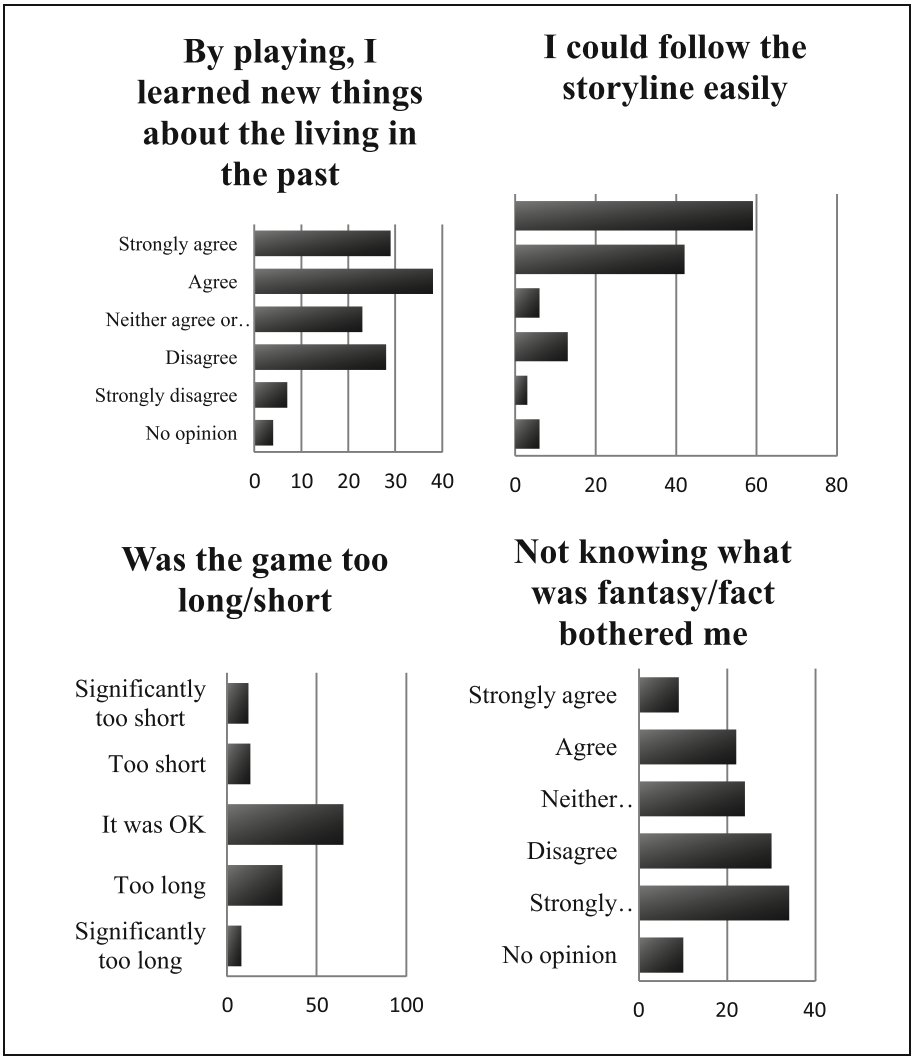

Fig. 11. Opinions about content.

gratified on the amount of content presented. More historical background information was still requested by most of the users, as shown in Fig. 14. Thus, it seems that the most of the testees required more historically in-depth content within the same time amount while the requirement for the amount of scenes (and thus the length of one scene) was more heterogeneous in variance.

Most of the testees would be enthusiastic to continue their adventure later on outside the museum area, as illustrated in Fig. 13. The age group 35–44 was the most eager in this. Yet again the question did not specify the means in continuing the adventure and thus more specific research on the subject is recommended to further develop the possibilities in connecting the on-site experience with off-site experiences.

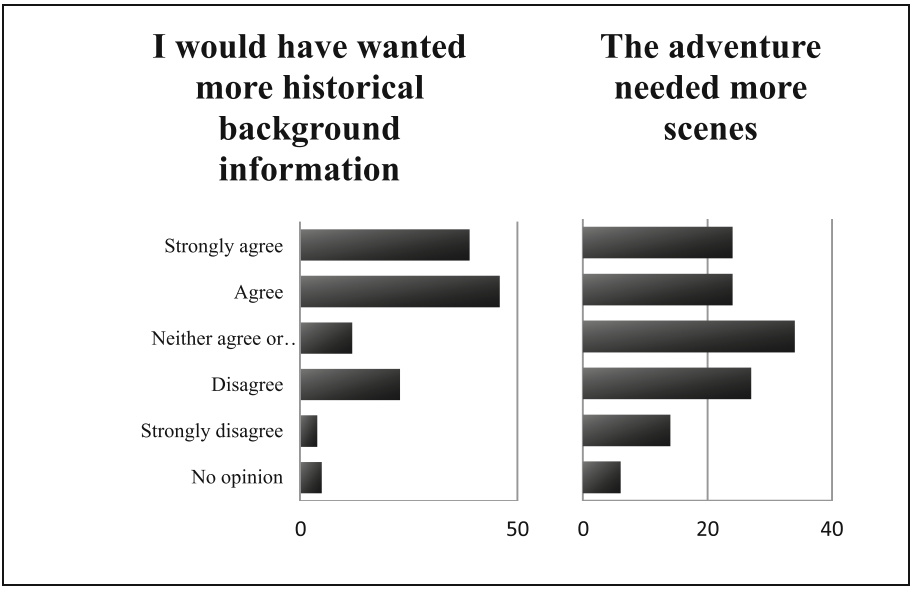

Fig. 12. Requests by the testees.

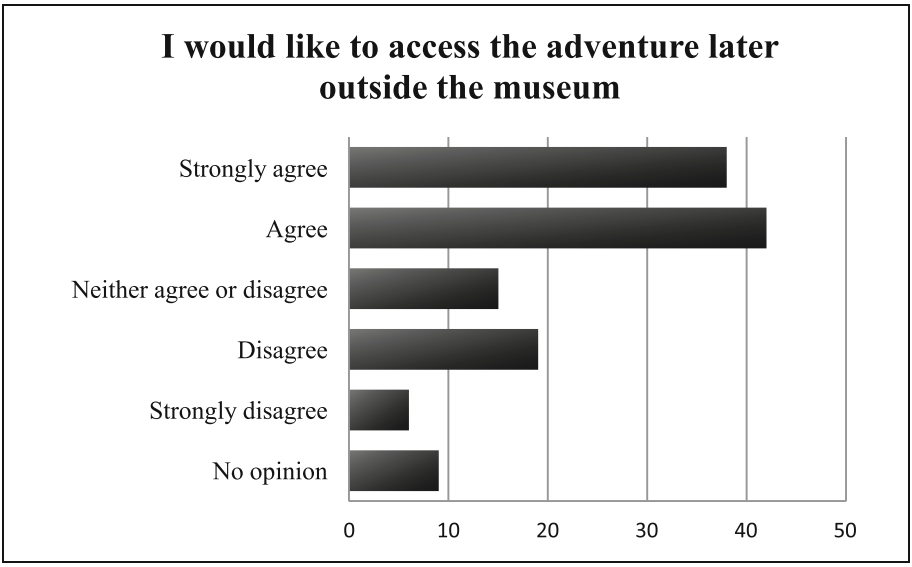

Fig. 13. Eagerness to continue the adventure after the museum visit.

In Fig. 14 it is shown that while it seems that the users were quite pleased towards the app and 78 % of them saw that the "application brought added value to the museum visit", many of them saw the idea of paying for the application in a different light.

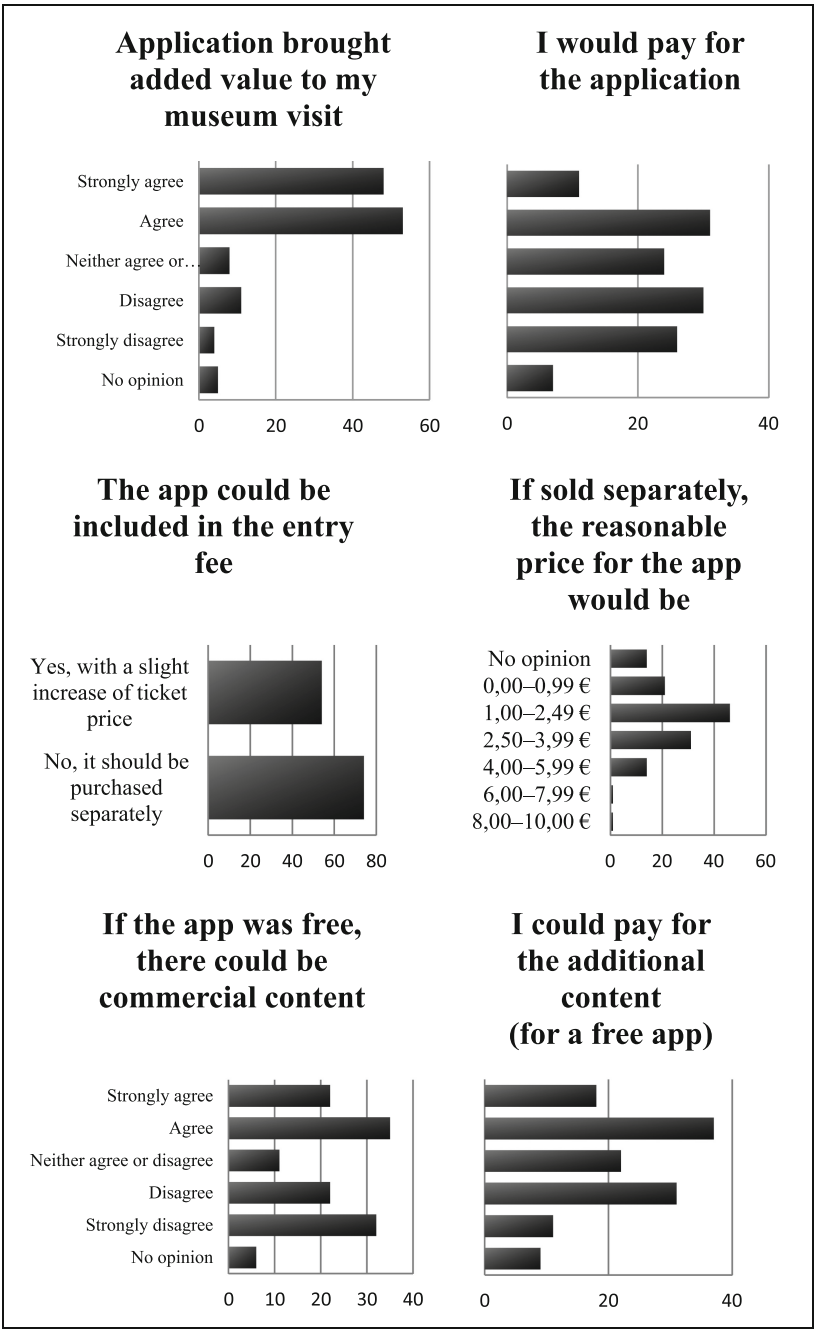

Fig. 14. The value of the app and willingness to pay.

However, only one third (32,5 %) of them would have wanted to pay for the test application. The museum experience as a whole was seen more valuable when combined with the AR experience but more evidence is needed to validate and increase the demand ratio and the total amount of possible customers for the sole application.

When considering commercializing alternatives of Augmented Reality content for Cultural Heritage sites, the results show that user groups vary also regarding their favourite business model. In other words the testees were relatively evenly distributed in terms of how the AR content could be offered for a museum visitor.

Thus, there seems to be a requirement for extended adventure after the experience, our study shows no clear guidelines to what kind of extended adventure it should be. There are several possibilities – all taken from the gaming industry – by making payable content, by tying the use of extra content in social media or selling additional content or features afterwards [28].

There does not seem to be clear evidence that there would be a single *one-fits-for-all* commercialization method as the prizing and delivery preferences varied amongst the testees. Augmented reality technology is yet emerging and thus unknown but still quite fascinating media to most museum visitors.

5 Discussion

It must be kept in mind that the app tested was a prototype – and the testees were aware of that. Still, the understanding and vision of a prototype by a developer or IT professional varies from the understanding of a standard test person. Therefore the test data does not provide definite answers but a guideline for development and some understanding of the possibilities and market share.

The feedback the app received was generally very good: most of the feedback came back as either positive or very positive and thus, the general line must be derived from the fact that people were testing the product with positive mindset. The product got obviously a lot of credit and thus positive feedback on being free and in prototype state: similar functionality issues on a e.g. 8€ product would have gotten a lot of negative feedback. In our understanding based on the testing the robustness of the tracking functionality would be the primary key in promoting the whole usability and thus develop the user experience but to point out that correctly more research is required.

The AR-experience in the Luostarinmäki was found to be very pleasing and, combined with the perceived value added, it clearly indicates that there is a demand in enchanting the museum experience with augmented reality content. This indicates positive results for research assumption 1.

The testees were quite pleased with the idea of using a tablet for an augmented reality adventure in a museum-style heritage site even though the site itself was not as easy terrain and thus not as accessible for everyone as one could hope for, and there were challenges in some technical functionalities. Some elements from the other

medias (e.g. products from gaming industry), especially for the males in age group 25 to 34, could be promoted to further develop the experience for this most demanding testee group. If the target audience is younger (7–12) or older than the aforementioned 25 to 34, there is not that great of demand for game-like appearance and functionality. The storyline was found good and the length of the adventure (45 min) was found proper. The amount of historical elements to the story were found a tad wanting and thus more information both to promote the historical information and specially so that the users can separate of fact from fiction require more work, but overall for a product that is first of its kind the reception was excellent. We argue that this answers to research assumption 1 & 2 showing that the AR experience adds value to the museum experience and that AR is indeed – when generated promoting the historical values – suitable for museum and culture travel atmosphere.

There seems to be no good basis for comparison since there are no similar products in the market, so the market analysis is rather hard. Although the application was known to be a prototype with limited features, the willingness to pay was low in comparison to the value added perceived. Still we argue that the rate of one third (32,5 %) in willingness to pay is rather adequate for a decent marketing potential. Yet it is harder to analyse the true market potential of AR in museums and cultural travel, but we argue that with the positive attitude received from the testees in this study, the amount of possible customers should rise when this technology comes more commonplace. Although we must admit that the results to back up the research assumption 3 are not enough and the question remains still unanswered. Thus researching this shall remain as one of our research focuses in the research yet undone.

6 Conclusions

Augmented reality adventures for museum and cultural travel seem to have demand potential and it seems to add value to the museum and cultural travel experience to be a meaningful addition worthy to create. It also seems to be – when created promoting the historical values – suitable for cultural heritage atmosphere.

As discussed before, there is no single one-fits-for-all commercialization method as the prizing and delivery preferences varied amongst the testees. As the technology is yet emerging and unknown to most museum visitors we suggest low-threshold approach in engaging the possible future customers with easy access to the content provided while promoting the possibilities for new and exciting experiences.

The potentiality for selling new additional content should increase when the audiences become familiar with the AR technology. Overall it seems these kind of apps have their place in the markets and there are several people who are willing to pay for them. The question remains is there enough and if, when? The inclusion of the app prize to the museum visit or charging a separate payment – or any other funding method – is yet another thing that should be researched more upon.

To further understand the negative feedback gotten in this project, we need to distinguish the frustration over functionality, usability issues and overall lack of interest from each other. Our next goal in future studies is to promote the separation of fact and fiction in the storytelling. We are doing more research in the field of cultural heritage AR applications and thus will continue studying also the UX aspects further. Moreover we aim to create guidelines on how the future apps for cultural and museum sites should be constructed.

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Using a Mobile Phone as a 2D Virtual Tracing Tool: Static Peephole vs. Magic Lens

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Abstract. Traditional sketching aids rely on the physical production of templates or stencils which is particularly problematic in the case of larger formats. One possible solution is 2D virtual tracing using a virtual template to create a physical sketch. This paper evaluates a mobile phone as a 2D virtual tracing tool by comparing three tracing methods: (i) a traditional tracing method with a printed template, (ii) a virtual tracing method Static Peephole (SP) in which the virtual template is manually adjusted to a physical contour by drag and pinch gestures, and (iii) a virtual tracing method augmented reality Magic Lens (ML) in which template is projected on the physical object such as paper hence navigation is possible through physical movement of the mobile device. The results show that it is possible to use mobile phones for virtual tracing, however, ML only achieved comparable performance to SP mode and traditional methods continued to be quicker and preferred by users.

Keywords: Magic lens · Static peephole · Sketching · Virtual tracing

1 Introduction

Traditional sketching methods include template approach incorporating a transparent drawing surface (i.e. tracing paper) placed on top of the template (Fig. 1), a stencil cut placed on-top of the drawing surface, or carbon paper placed between the template and the drawing surface. An alternative to traditional sketching tools is virtual tracing. Using technology in such context is intimate in nature as it supports activities that are personal and at the same time expand the potential of our bodies by augmenting precision and drawing capabilities of the hand.

Virtual tracing is a method of creating physical sketches on paper given a virtual template on the mobile device (i.e. mobile phone or a tablet). The mobile device renders a virtual template image, such as a contour line, onto device screen together with a live video stream of the drawing surface. By looking through the screen, or into a virtual mirror[1], the user is able to see the virtual image and the hand holding the pen allowing the user to transcribe information from the virtual image onto the paper (Figs. 2 and 3).

[1] https://www.playosmo.com/.

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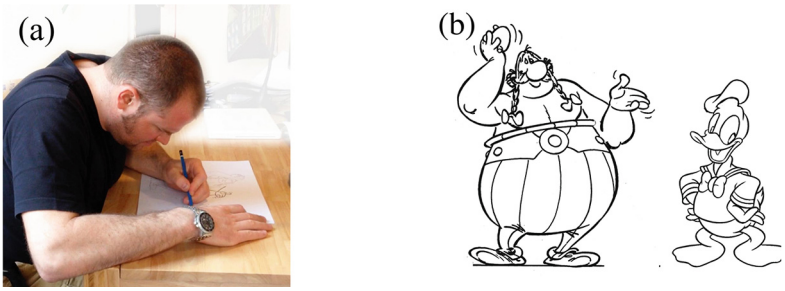


Fig. 1. (a) Template sketching aid—the user places a semi transparent paper over the template (b). (b) Printed template on A3 paper.

Compared to traditional methods, virtual tracing has a clear advantage in that it does not require the physical production of sketching aids, which is particularly problematic when one desires to draw on large formats. In case of virtual tracing, the drawing size is not limited; although, when the drawing surface does not fit on the screen, one needs to move the device in order to reveal the unfinished drawing surface. The core challenge is alignment of the virtual template with what has been drawn thus far. One possibility is to ask the user to manually align the virtual template by dragging the image around the screen using touchscreen gestures. This interaction method is better known as static peephole (SP) [13]. Due to manual alignment drawing is only possible as long as the device is held perfectly still (e.g. on a stand) (see Fig. 2).

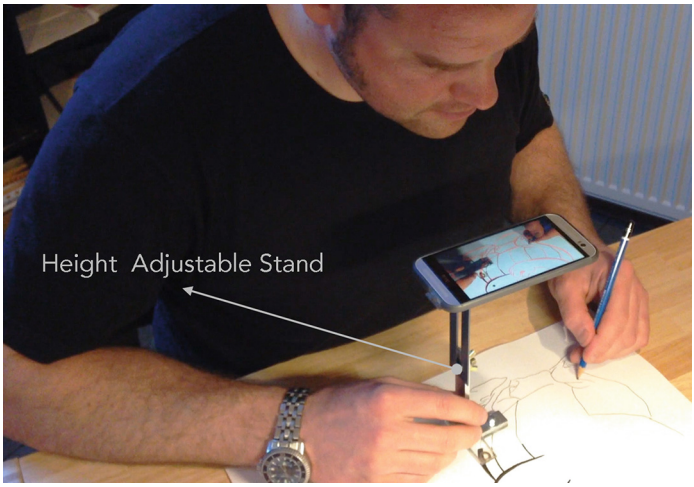


Fig. 2. Static Peephole (SP) virtual tracing method. Every time the mobile device is moved to reveal an unfinished segment of the drawing surface, the user needs to align the virtual template (red line) with what has been drawn this far using touchscreen gestures. (Color figure online)

An alternative is Magic Lens (ML) interaction paradigm [1]. ML is an Augmented reality (AR) interface where the lens acts as a transparent glass pane revealing an enhanced scene behind the pane. In case of virtual tracing, the ML augments a physical sketch by projecting a virtual template onto the drawing surface irrespective of the position and orientation of the device (see Fig. 3). This has the following advantages over SP: (i) as long as it is possible to track the camera pose in relation to the drawing surface the ML automatically aligns the virtual image with what has been draw thus far; and (ii) as the alignment is done at each rendered frame, the user does not need to keep the device perfectly still while drawing a particular segment and may hold the phone in hand. However, the ML is highly dependent on camera tracking which may diminish sketching experience, particularly as it is difficult to implement robust and accurate camera tracking on a blank drawing surface where the hand holding the pencil can occlude segments of the scene. Additionally, when compared to traditional sketching aids, both virtual tracing methods require the user to look through the phone while sketching and only show a segment of the image being drawn at the time.

The aforementioned opens up interesting questions such as:- (i) How effective are phones in supporting user sketching through virtual tracing?; (ii) Do users find the advantage of the ML useful?; and (iii) Can users' draw whilst holding the ML in hand? In order to answer these questions, we built a prototype and run a user study with seven participants that drew a contour on an A3 paper using a pencil and three different interaction methods: a traditional template, the static peephole (SP) virtual tracing, and the Magic Lens (ML) virtual tracing.

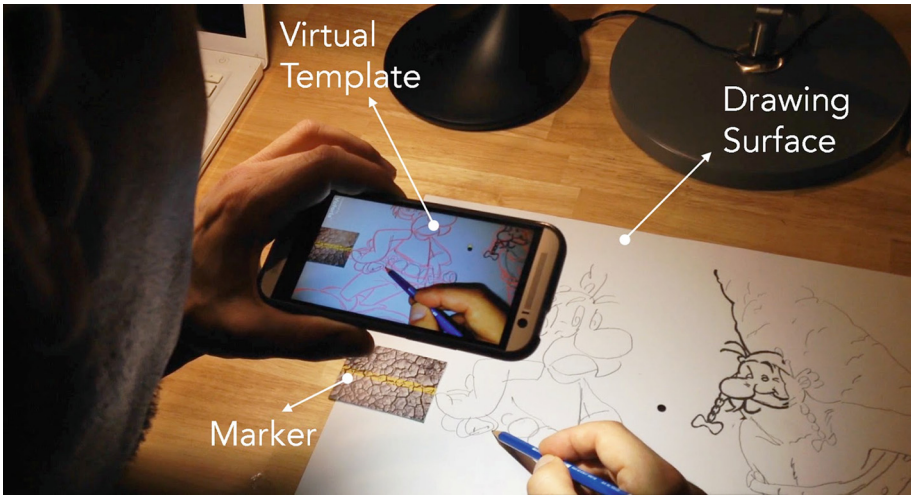


Fig. 3. Magic Lens (ML) virtual tracing method. The virtual template is projected onto drawing surface by tracking the position of the marker.

2 Related Work

Despite the fact that mobile AR apps are available to a large number of users [13] it is still uncertain in which contexts ML can actually provide value to users. For instance, comparative studies of ML and SP interfaces did not identify clear advantages of the ML interfaces for navigation [5] and information browsing tasks [6]. In a similar way, for gaming [8, 10] and information browsing tasks [9, 15], the ML only proved advantageous in certain contexts, such as, when the AR workspace was large [9] or the social setting allowed expressive spatial interaction [10].

In case of information browsing and large document navigation tasks the ability to retain a mental model of the information space is crucial [18, 19]. This is not the case for in-suit sketching where the most important part of the task is user's ability to relate digital information to the real world (e.g. transcribing information to the real world such as digital instructions/routes to paper maps or virtually tracing a character on a blank paper, or where tangible objects are placed at instructed positions within AR workspace (e.g. AR chess with physical pieces)).

The ability to relate augmented information to the real world was previously studied in [3]. The study tasked users to find and tap on an augmented-reality target (without seeing one's hand in a rendered scene) that could help as a method of establishing common ground between what was shown on the screen and the real world. The results show that when the AR workspace is complex users require on average more than 6 s to complete this task.

ML has proved popular for supporting sketching (e.g. [11, 14, 16, 17]). However, this body of research predominantly focused on complementing physical sketches and not on supporting in-situ sketching through virtual tracing, which is the focus of this paper. Our two recent studies looked into virtual tracing. The first one is a preliminary study presenting and comparing a dual-camera magic lens with ML and SP interface with 6 participants [4]. The results show that virtual tracing with dual-camera magic lens is feasible, has higher perceived satisfaction score and is faster when compared to ML and SP. However, dual-camera ML system requires marker placement above the drawing surface, limiting where such a system can be used.

The second observational study with three participants explored how depth distortion affects 3D virtual tracing (e.g. virtual tracing a contour to a cup) with a 3D virtual tracing prototype [7]. Drawing performance in the study exceeded authors' expectations suggesting depth distortion, whilst holding the object in hand, is not as problematic as initially predicted. Although, when the object was placed on the stand and drawing was performed with only one hand (the other is used for holding the phone) their performance drastically decreased.

3 Virtual Tracing Prototypes

In order to evaluate a mobile phone as a virtual tracing aid, we implemented two virtual tracing prototypes, namely: SP and ML. For achieving the stability of a mobile device when virtually tracing with SP we built a height adjustable stand (see Fig. 2). In case of

ML, there is no such requirement, as the alignment is done automatically at every rendered frame. This is achieved by tracking the camera pose in relation to the drawing surface by adding a marker on Fig. 3. This was done to ensure that there were always sufficient features for camera pose tracking which was implemented using the Vuforia[2] library. As more of the contour is drawn, it could be possible to replace marker tracking with contour tracking systems [11, 12]; however, such tracking systems are prone to failure if contour is occluded.

Even markers can be occluded, which can be avoided with using multiple markers or a marker that can be moved around. To avoid covering the whole drawing surface with multiple markers we opted for a second solution. Participants move the marker when it is in the way of the pencil or when the marker is no longer visible within camera field of view. Every time participants move the marker they have to manually align the virtual template with what has been drawn this far.

Due to the fact that the virtual template is projected on top of the drawing surface, the virtual template overlays anything that exists on drawing surface (e.g. pencil markings). Current system is not able to detect and remove the part of the virtual template that has been drawn thus far. In order to mitigate this effect, we made the virtual template semi transparent and allowed the user to adjust transparency level.

4 Methodology

The experiment presented is a within-subjects design with interaction as an independent variable having one of the three values, namely: (i) Template; (ii) Static Peephole (SP); and (iii) Magic Lens (ML). The size of the drawing surface was set to A3 paper in landscape orientation placed on a desk. Whilst completing the task, participants sat at the desk.

4.1 Interaction Modes

In template mode the user placed an A3 printed template below a sheet of tracing paper and drew the contour as shown on Fig. 1.

In the case of SP the phone was placed on a height adjustable stand (15–25 cm) as seen on Fig. 2. In order to align the virtual template with what has been drawn already, the user utilized two touchscreen gestures: (i) drag-and-drop for panning; and (ii) pinch for resizing the virtual template.

In contrast to SP, the ML mode does not mandate placing the phone on the stand while drawing. Thus, a decision was made to remove the stand even though this may have placed ML at a disadvantage within this test case. This was done because in real world use removing the need for a stand was considered an important advantage as it increases the portability of the system. Depending on the stand type, it might also affect the flexibility of the ML interaction by placing restrictions on phone's movement. Finally, we were also keen on exploring if users' performance drastically decreased

[2] http://www.vuforia.com/.

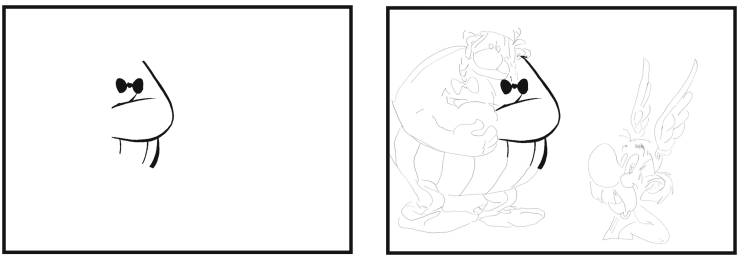
when performing 2D virtual tracing with one hand (e.g. the other is used for holding the phone), as was reported in case of 3D virtual tracing [7].

4.2 Participants and the Tasks

We recruited seven male participants aged between 23 and 45 (3—employed, 4— students). The recruiting was based on convenience sampling at the department of computer science (3 participants) and within social circles of the authors (4 participants). Participants came from various backgrounds, such as: nursing (1), architecture (1), computer science (3), medicine (1) and mechanical engineering (1). All participants knew the term augmented reality and have previously used AR systems on a mobile phone.

Participants were tasked with completing the partially finished contour drawing of a cartoon character (Fig. 4a) using a pencil. The drawing was partially finished to observe how users manage to precisely align virtual template to a pre-drawn segment and to ensure all participants draw a character of maximum size that will fit on A3 paper.

Participants were asked to complete each task as quickly and as accurately as possible. In total 3 drawings were produced by each participant. Each drawing featured a different cartoon character and was drawn with a different interaction mode using a 2B pencil.



(a) (b)

Fig. 4. (a) Partially finished contour drawing of a cartoon character participants were tasked with. (b) Finished contour drawing.

4.3 Data Collection and Experimental Procedure

We predominantly focused on qualitative data collection methods utilizing questionnaires, observational note taking and video analysis. Although, we also timed the tasks. As all participants were familiar with tracing using a physical template, they started with this task followed by two virtual sketching tasks (randomising SP and ML). Before each virtual tracing tasks, we demonstrated how the prototype works and users started the task without additional training or guidance. The assignment of contours was also randomised. The character contour assignment and the order in which interaction modes were tested are counterbalanced. After completing all three tasks, the user completed the questionnaire.

The questionnaire started by estimating participants' perceived satisfaction utilizing the "overall reactions" section from the Questionnaire for User Interaction Satisfaction (QUIS) [2]. In the second part, participants were asked: (i) to rank interaction modes from best to worst and justify their decision; (ii) if they would use the stand in ML mode if one was available; and (iii) to highlight the most difficult part of each task and make suggestions for improvements.

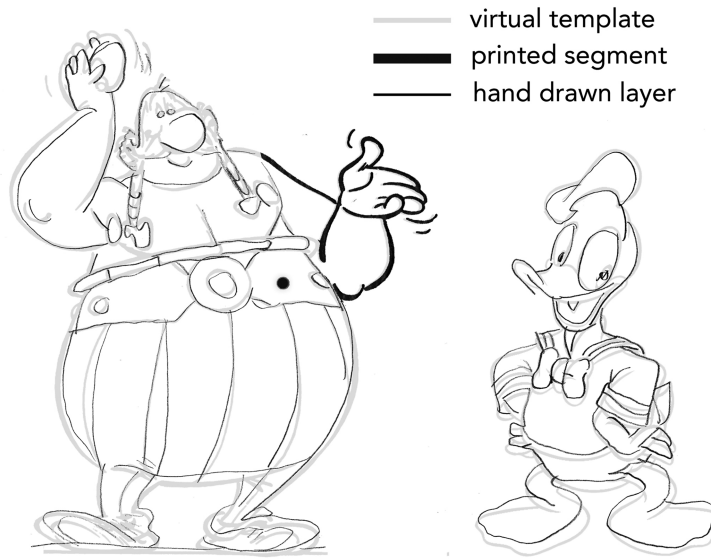


Fig. 5. The figure shows an example of the quality of drawing by overlaying the virtual template over the hand drawn layer.

5 Results

Due to a small number of participants, detailed analysis of result significance was not possible; thus, we present results using only descriptive statistics. Although, these results are of preliminary nature, they clearly show trends worth presenting.

5.1 Drawing Quality and Task Time

By overlaying virtual template contours over produced drawings (Fig. 5), two researchers independently and subjectively compared the quality of all three drawings for each participant and ranked them from best to worst. As expected the template scored best, followed by ML and SP (Fig. 6d). However, the results did not highlight any obvious deviations in obtained rankings. The task time results (Fig. 6c) showed that template mode was on average more than twice as fast compared to SP and the ML mode which achieved comparable task time results.

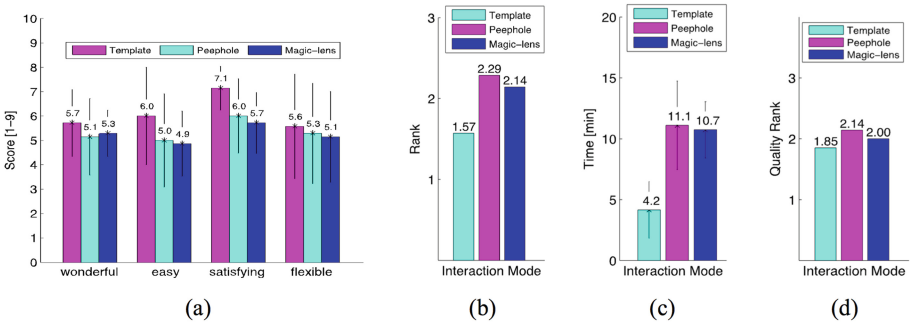


Fig. 6. (a) QUIS scores [1–9]; (b) Ranking results for preference (smaller is better); (c) Average task time completion in minutes; (d) Ranking results for drawing quality (smaller is better).

5.2 Questionnaire Results

QUIS results show template mode produced highest scores across all properties, whereas, SP and the ML obtained similar scores (Fig. 6a). In case of preference ranking, a similar pattern repeats, template mode ranking best and SP and ML achieving a similar rank.

Perhaps surprisingly, when participants were asked to name the most difficult aspect of the task, none said they found it difficult to look through the phone while tracing. Instead, most reported difficulties linked to manual alignment. In SP mode manual alignment was required every time the phone was moved, whereas, in ML mode manual alignment was required every time the marker was moved. Even though fewer alignments were required in case of ML mode, participants reported this difficulty for both modes.

When asked what should be changed in case of virtual tracing sketching aids, beside solving manual alignment, participants also highlighted general dislike of the marker and the fact that they had to avoid occluding the marker for the system to operate.

One participant proposed to modify the system so that it will be able to remove parts of virtual template that had been already drawn because this would make it easier to "know how my drawing really looks and what I still need to draw". Additionally, in case of SP mode, participants expressed the need for an extra way to overview the whole virtual image. When participants were asked if they would use the stand in ML mode if available, 3 out of 7 participants said they would, sighting tiredness as the drawing took on average 10.7 min.

5.3 Observational Results

Observations of the distance between the phone and the drawing surface showed participants adjusted the stand or held the phone at 17–22 cm. Participants always looked at the paper through the phone keeping the pencil within the cameras' field-of-view (FOV). This was also observed in situations when it was obvious how to

fill in the missing segment of the drawing surface and completing the drawing using virtual tracing required the additional user effort of aligning the virtual contour with what has been drawn this far. Hence, whilst virtually tracing the pencil never crossed the boundary between the phone and the surrounding context although users did look at the paper to see how they were progressing (three participants were observed to do this several times).

The above suggests that covering the drawing surface with a virtual template had some undesirable effect. One such effect is not knowing exactly how the produced drawing looks like, because it is occluded with semi-transparent virtual template whilst at the same time making it more difficult to know what segment of the drawing still needs to be finished. A comment relating to this was made by one participant (see Sect. 5.2).

Another interesting observation relates to the unique strategy developed by participants in SP mode. They always drew all instructions within the screen segment, including those at the very edge of the screen, before they decided it was time to move the device to the new area. This behaviour was not observed in the ML mode where participants moved the device as the drawing progressed.

6 Discussion

The results show that the drawing quality achieved by template method did not produce an evidently better score when compared to ML and SP; however, the template mode still scored best. This can be linked to experiment design, which asked participants to complete the task as quickly and as accurately as possible. In template mode participants completed the drawing more than twice as fast, hence the speed with which participants completed the task may have reduced the quality of the drawing. As the template mode was by far the fastest, with highest QUIS score and best quality ranking results, we can conclude that template mode performed best on our test.

6.1 How Effective Are Phones in Supporting User Sketching Through Virtual Tracing?

Even though virtual tracing with mobile phones took twice as much time compared to traditional tracing, participants were able to complete all tasks and achieve comparable drawing quality to template mode. This allows us to conclude that it is possible to use mobile phones as in-situ sketching aid such as a virtual tracing aid. This is also supported by the fact that none of participants found it difficult to look through the phone while virtually tracing, even though the task completion time took more than 10 min on average. These finding are also in line with our previous study [4].

6.2 Virtual Tracing Whilst Holding the ML in Hand

All participants managed to complete all virtual tracing drawing tasks with comparable drawing quality. This includes those where the phone was placed on the stand

(e.g. SP mode) or held in hand (e.g. ML mode). This outcome is not in line with results from our 3D virtual tracing study [7] where placing a 3D object on a stand and holding the mobile phone in hand drastically decreased user's ability to trace draw. Holding an object in hand may have had several advantages, amongst others, the sense of proprioception—sensory input about where one hand (and its fingers) is positioned in relation to the other hand (and its fingers) which may lead to better depth perception [21]. Our results suggest that proprioception does not play such an important role in case of virtual tracing on 2D surface; however, this may be different if one would focus only on achieving the highest possible drawing accuracy.

6.3 Magic Lens vs. Static Peephole

The study results are promising for ML, even though they position ML at an equal footing to SP mode. ML performed similarly to SP even though the users had to hold the phone in hands while sketching which increases the possible usage of such a system in real. However, the fact that participants showed general dislike towards the marker and the fact that they had to avoid occluding the marker in order for system to operate suggests that such tracking diminish sketching experience. Hence, building a ML system where these limitations are not present is bound to significantly improve ML performance. This is in line with our previous study where such a system (dual-camera magic lens) was built and revealed it has potential to be both faster and lead to a higher perceived satisfaction compared to SP and ML [4].

6.4 Understanding the Information Space

Only in SP mode participants expressed the need for an overview of the virtual image. Contrary to ML mode, in SP mode gaining an overview of what needs to be drawn is difficult because in SP mode participants had to stop drawing and use dragging and zooming gestures to explore the wider context. This action broke the alignment between the virtual template and the drawn contour, hence, every time this was done the user had to manually realign before virtual tracing could resume. In ML this was not a problem. Users moved the phone in order to explore a wider context during which the alignment of virtual and drawn segment was maintained.

6.5 Crossing the Boundary and Manual Alignment

Observations also show that participants spent most of the time looking at the paper through the phone's screen whilst keeping the pencil always within camera's FOV. We hypothesize that there are two reasons for this: (i) the dual-view problem when the observer's perspective does not match the perspective of device camera [3]; and (ii) multiple disparity planes because the drawing surface and the phone screen lay at different distances. Both make it difficult for users to simultaneously look at the phone and the surroundings.

Manual alignment was identified as the hardest part of the task; hence it is not a surprise that users tried to minimize the number of alignments. This was achieved by drawing to the very edge of the phone before moving to a new area. However, even though it was possible to capture a wider segment of the drawing surface by moving the phone to a greater distance, reducing the number of manual realignments and the need for an overview, participants adjusted the stand to a distance ranging between 17 and 22 cm. This was considered a comfortable viewing distance for the setup.

7 Conclusion and Future Work

Traditional sketching aids rely on the physical production of templates or stencil which can be limiting and time consuming, particularly in the case of larger formats. The alternative is virtual tracing using a mobile phone. We have evaluated and compared three different interaction modes (a physical template, Static Peephole (SP), and Magic Lens (ML)) by running a user study with seven participants in which participants attempted to draw a cartoon character in each mode.

The results show that (i) traditional template mode is the fastest mode with highest perceived user satisfaction and best rank, (ii) it is possible to use mobile phones as in-situ sketching aids, (iii) contrary to 3D virtual tracing [7], 2D virtual tracing is possible whilst holding the phone in hand, and (iv) that only in SP mode, participants expressed the need for a feature that will allow the to understanding the wider context (e.g. minimap[3]). Finally, the results suggest that currently available tracking system diminish the ML sketching experience, hence future systems should aim to find camera pose tracking solutions that: (i) avoid requiring manual alignment; (ii) avoid marker use; and (iii) enable participants to occlude desired segment of camera's FOV without causing system failure.

In addition to the aforementioned, future systems should look into ways of detecting what has been drawn thus far and update virtual template to only augment the paper with what remains to be drawn. Due to a small number of participants, statistical analysis was not possible, hence in the future a greater number of participants should be recruited to complete the study. Moreover, a study exploring the use of the stand in the context of the ML interaction mode should be carried out. Finally, future studies should explore virtual tracing using virtual mirror and look into ways of supporting sculpturing practices.

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[3] https://en.wikipedia.org/wiki/Mini-map.

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Futures

The Beginnings of Government Support for Computers in Schools – The State Computer Education Centre of Victoria in the 1980s

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Abstract. The 1980s saw the introduction into education of a new technology – the microcomputer – that many of us saw as an enabling technology that could offer new educational opportunities and potentially change the nature of schools. Discussion of events at this time is very much a socio-technical history of a technological innovation that involved both the computers and the people who managed them, supported them, taught with them and used them. Support structures were introduced to assist with the use of computers in schools and to provide teachers with professional development in order to understand their benefits, to evaluate software, to suggest curriculum applications and to evaluate computer systems for school use. The goal was to offer schools and teachers choice in how they handled this innovation rather than coercion in an attempt to force adoption. Due to the large number of low-cost microcomputers bursting onto the marked in the 1980s computer systems evaluation was especially important. This paper concerns the historical purpose, formation and development of the State Computer Education Centre of Victoria.

Keywords: History of computing · Technological innovation · Computer systems · Computer education · Schools support · State computer education centre

1 Introduction

The 1980s saw a huge increase in the number of microcomputers on the market at a cost that made them affordable to schools. This, however, was not long after the period when to many people the computer was seen as a remote and incomprehensible 'electronic brain'. Why would you want to introduce them to school children? Some educators quickly saw the possibility of making good educational use of the new microcomputers, but at the time most teachers had little knowledge or understanding of this potentially enabling technology.

A study of the history of Computers in Education is a socio-technical one that requires an understanding of both computers of the time, and of the teachers and students who were to use them. As in the introduction of computers in business, support was needed and the research reported in this paper is about the historical purpose, formation and development of the State Computer Education Centre of Victoria.

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2 Computers in Australian Schools in the 1980s

The Commonwealth of Australia is a federation of six states and two territories each operating largely independently. School education is constitutionally a matter for State Governments, and State Government Education Ministries determine school curriculum and how it is supported and delivered. However, in matters considered to be of national importance the Commonwealth Government sponsored and provided funding for specific school education projects [1]. In the 1980s, one of these was the Commonwealth Computer Education Program through which the State Computer Education Centres were funded. While each Australian state had its own Computer Education Centre this paper will examine the State Computer Education Centre of Victoria (SCEC).

In 1983 the Australian Government set up the *Commonwealth Schools Commission National Advisory Committee on Computers in Schools (NACCS)*, whose purpose was to provide leadership and funding for Computer Education across all Australian states and territories [2]. In the 1984-6 triennium $18.7 million was allocated to the Commonwealth Schools' Commission Computer Education Program [3], one goal of which was co-ordination of Computer Education facilities and offerings in each of the States. NACCS published its first blueprint for Computer Education in Schools in 1983 [4] in a report: *Teaching, Learning and Computers* which listed a number of possible uses for computers in schools:

- Computer Awareness/Computer Literacy courses at the upper primary and lower secondary levels aimed at teaching students a little about computers, how they are used, and the social effects of this use.
- Computer Science/Computer Studies/Information Processing.
- Using computers across the curriculum in many areas such as: word processing, problem solving, information handling, simulation and modelling, educational games, spreadsheets, graphics, drill and practice, tutorial and electronic blackboards.
- Curriculum Support including information retrieval, preparation of teaching materials and the maintenance of student records.
- Communications with other teachers and students and for the interrogation of remote databases.
- Administrative applications performed by school ancillary staff and teachers for the normal business applications of database management, financial management and word processing.

3 The Beginnings of the State Computer Education Centre of Victoria

In Victoria, early developments in School Computer Education were 'bottom-up', beginning with the efforts of a small number of mathematics/science and commerce teachers and it was some time before the Education Department itself became sufficiently interested to set up any form of central involvement [5]. When the Computer Education 'explosion' began in 1983 the Department saw the need for some form of top-down planning, central focus and control for some for computer education in the state.

The Commonwealth Schools Commission proposed the need for computer education centres in those Australian states that did not already have them, noting that [6]:

> Education Departments in some states introduced computing into their schools before microcomputers became plentiful and inexpensive, by installing a minicomputer in a central place and using it to provide a service to schools. Having made this decision it was essential that a Centre be established with staff to operate the computer and provide support to teachers who were using it.[1]

Formation of the State Computer Education Centre of Victoria in 1984 was the eventual result [2, 5].

4 Computer Education Support Centres in Other States

As noted by the Commonwealth Schools Commission, both South Australia and Tasmania, each of which commenced programs of Computer Education earlier than the other states, had by this time already set up some form of Computer Education Centre [6], Angle Park in South Australia and the Elizabeth Computer Centre in Tasmania.

4.1 Angle Park Computing Centre, South Australia

South Australia first became involved in Computer Education with the setting up of the Angle Park Computing Centre (APCC), which comprised professional staff, support staff and regional advisers, in the early 1970s [5]. The Centre initially provided schools with a batch-card input system for teaching computer programming, and with access to two extensive microcomputer networks. It also loaned computer equipment to schools. Peter Sandery, the APCC Principal Education Officer at the time, describes the function of the Centre as support for school activities including:

> Teaching at the APCC, teaching in schools, development of software - the APCC currently sells software at cost price to schools through the Education Department bookshop, software and hardware review, consultant assistance to schools, LAN installation and operation assistance, teacher professional development activities, curriculum support activities, development of teaching techniques, forward planning[2].

The APCC also had an important role in the recommendation, ordering and installation of computer hardware in South Australian Schools.

South Australia has a support service for schools in relation to the purchase of equipment. The Angle Park Computing Centre will discuss school plans, demonstrate the recommended hardware and a range of software, and assist the school in preparing its submission seeking approval to purchase. Following approval, the Centre will place the equipment order on behalf of the school and check the installation prior to the school making payment. … New equipment is evaluated by the Centre as it becomes available[3].

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[1] *[4, p. 5].*
[2] *[7, p. 109].*
[3] *[8, p. 48].*

4.2 The Elizabeth Computer Centre, Tasmania

Tasmania also had an early involvement with educational computing beginning with the introduction of a year 12 Computer Studies course in 1972 [6]. It developed a state-wide timesharing network (TASNET) for educational purposes and, in the mid-1970s, created the Elizabeth Computer Centre whose role involved:

> … development of educational and administrative software for the network and for microcomputers; the provision of expert advice on computing to the Department, to schools and to colleges; the provision of advice and training to Tasmanian teachers and the production of the regular newsletters …[4]

Thus the notion of a State Centre for the support of Computers in Education as a curriculum arm of central educational administration became generally accepted across Australia.

5 Research Methodology

This study is about the historical purpose, formation, development and ultimate end of the State Computer Education Centre of Victoria and so the research technique primarily used is that of case study. According to Orlikowski and Baroudi [9], as IS research topics commonly involve the study of organisational systems, a case study approach is often quite appropriate. Case study evidence can come from documents, archival records, interviews, direct observation, participant-observation or physical artefacts. In this quasi-historical case, evidence comes from several of these sources and in particular from participant-observation as I was a professional member of SCEC from 1985–1988.

One problem in researching the formation of SCEC was that primary sources of information are, in many cases completely lacking, apart from anecdotal information. Researching its operation, on the other hand, was much more straightforward as I had access to documents and was able to interview professional staff and teachers.

6 The State Computer Education Centre of Victoria (SCEC)

In January 1984, the State Computer Education Centre was set up in temporary premises at the old Moorabbin High School in Melbourne, with 10 seconded education staff. At the same time, in each of the twelve Education Department regions, Regional Computer Education Resource Centres were set up with a teacher seconded full–time to act as 'Computer Resource Centre Manager'. Late in 1984, all positions at the SCEC were declared vacant and advertised as three year appointments with a total of 27 professional positions. In early 1985 I was appointed as Educational Computer Systems Analyst (Principal) with the task of evaluating microcomputer systems for school use and producing the 'Recommended List' of school computers. Other positions included: Senior Computer Education Officer (Centre OIC), Software Coordinator, Professional Development Coordinator, Curriculum Coordinator and Equal Opportunity Officer,

[4] *[8, p. 49].*

Senior Software Officer, Senior Curriculum Development Officer, Professional Development Officer, Information Officer, Schools Commission Program Officer, Software Officer, Professional Development Officer (Non-Government Schools) and Policy Analyst as well as the twelve Regional Computer Resource Centre Managers.

6.1 Head of the Centre

In an interview in 1985 the Head of SCEC (formally a secondary maths teacher) noted that there were several reasons for the existence of the Centre [5]:

1. A place for administration of the computer education program that was needed to provide financial and program accountability and 'supervision' of the program.
2. To provide a major input to policy development as this needed to be done on a broad spectrum and to involve other people. An example is the computer systems policy that really had to be done as a central initiative for efficiency and because of Government and Education Department constraints.
3. To be a (non-exclusive) focal point for a variety of computer education services of the Education Department and to provide co-ordination of elements like state-wide professional development.
4. To be a focal point for the provision of advice and to act for the provision of services and/or resources associated with computer education.

He went on to add that SCEC should give and take advice from: Regional Computer Education Centres, consultants and schools and that it needed to be a centre of expertise where people were invited and encouraged to discuss possibilities, not so much to make decisions about policy. It also needed to act as a sounding board for various ideas and to work with other Education Department agencies. "Now that the money has begun to flow, all states also need to determine how Commonwealth and State grant money in computer education will be spent and/or be allocated to schools. Giving advice in this area is also a function made easier by the existence of some form of State Centre or central committee."[5] He pointed out that in this computer education is not unique and a similar situation would apply to any curriculum area having a large number of dollars to dispense.

6.2 Software

One of the problems faced by schools early in the microcomputer era was a lack of suitable software. The State Computer Education Centre was set up to support computer *systems* not just hardware, and software development thus constituted an important role. Programming was now not considered as the only possible use of a computer and educational software began to become more important. In the early stages software from organisations like the Minnesota Educational Computing Consortium was utilised, but there was a cultural issue as what software there was often had an American outlook. One example of this was the Apple II simulation game 'Lemonade', based on making

[5] Head of Centre.

and selling lemonade from a street stall. While this had some merit in terms of teaching students about mathematics and one aspect of doing business, lemonade stands are almost unknown in Australia. Education authorities saw a need to develop *Australian* educational software [10], but at SCEC a first step was seen as software evaluation [11].

In an interview in 1985 the SCEC Software Coordinator (whose original teaching background was in chemistry and maths in secondary schools) reported that in 1981 he was seconded full-time as a consultant to produce and run a 'software library'. This later became a part of SCEC. (Actually the name 'software library' was a misleading one as its function was not to *loan* software but to sell it. 'Software Clearing house' would have been a more accurate name.) The initial aim of the Software Library was to sift through the available public domain software for Apple II and CP/M and to distribute to schools that which was found to be suitable. As it was not possible for the Software Library to actually produce educational software the Victorian government took a 50 % interest in Prologic – a company which aimed to produce educational software [12], and sponsored the secondment of a number of teachers to work with professional programmers to produce educational software.

6.3 Curriculum

The task of this area was production of curriculum materials. The Assistant Curriculum Coordinator (teaching background in English, maths and history who had recently been teaching in a small country high school) said in a 1985 interview: "The role of the SCEC is to create magic, to be all things to all people. Because of this it will inevitably disappoint people. People want heaps of stuff and this is not possible."[6] He argued that the Centre needed to provide basic support and be a forum for discussion in all computer education areas as well as getting involved in publishing, but sometimes 'red tape' was a problem as to publish curriculum materials SCEC had to work with subject committees which could be a help or a hindrance depending on their personnel [5]. He indicated that there had been an over influence on production of materials for general secondary school subjects but not for computer science. He found the primary school area particularly exciting as so many things were possible. "I expect that the greatest things may be possible with the youngest kids."[7]

6.4 Professional Development

Co-ordination of Professional Development (PD) or In-Service Education (ISE) of teachers was another function perceived as sensibly done from the Centre. The Professional Development Coordinator remarked that: "The ISE role is important, vital. There are problems though. You can't instantly in-service everyone; staff can't get out of schools because you can't get Emergency Teachers and you can't easily communicate with people in schools."[8] In the early days of a new curriculum like this, professional

[6] Assistant Curriculum Co-ordinator.
[7] Assistant Curriculum Co-ordinator.
[8] Professional Development Co-ordinator.

development was especially important as few teachers knew much about using a computer or about any of its educational possibilities. Consequently, many of these early PD activities were still typically of an 'awareness' nature.

Much of the PD was done from the regions by the Regional Computer Centre Managers with SCEC acting to co-ordinate these activities. One type of activity involved speaking to all the teachers at a school during a Curriculum Day. This really was an awareness activity. Other activities involved smaller groups of teachers from a variety of schools, often looking at a software package such as a word processor, spreadsheet or educational simulation or game. The Professional Development Co-ordination also spent a lot of time working on publishing curriculum materials for use in the PD activities. This was particularly useful and of value to schools.

6.5 Educational Computer Systems Evaluation

The late 1970s and early 1980s saw a huge increase in the number of low-cost microcomputers on the market that were available to schools. These included: Apple II, Tandy TRS-80, Commodore VIC-20, Commodore-64, Acorn BBC, Microbee (an Australian designed and built CP/M machine), Atari 400/800, Cromenco, Osborne, Sinclair ZX80, XZ81 and Spectrum, Sorcerer, Altos, Franklin ACE, DEC Rainbow, Hitachi Peach, SEGA, Amstrad, Spectravideo, Apricot, Micromation, Pulsar and Olivetti. (The IBM PC and Apple Macintosh did not appear in Australian schools until later.) This made the need for computer systems evaluation most important.

As the incumbent of the position of Educational Computer Systems Analyst I can speak from personal experience and observation as well as making use of documents and interviews. In Victoria in the 1980s there was no central mechanism for purchase or maintenance of school computing equipment and so schools made their own arrangements [13]. SCEC assisted through a process of evaluating computer systems for educational use and producing a 'Recommended List'. Government Schools were obliged to purchase only *recommended systems* with Education Department funds as this was necessary in order to comply with Government tender, offset and preferred supplier requirements. Government 'offset policy' was designed to encourage local manufacture of computing equipment by requiring that 'foreign' companies re-invest in the state 30 % of the profits they made as the result of being nominated as a 'preferred supplier'. An important thing here is that it was *systems* and not just hardware that was evaluated for student use in schools.

The evaluation and recommendation process involved staff at SCEC, in consultation with practicing teachers and other curriculum personnel, determining the system needs of schools in educational computing and drawing up a detailed Educational User Requirement statement. This was then further developed into specifications for educational computing systems which were then put out to public tender and, as a result of the responses received, the systems of a number of suppliers were tested extensively for their suitability in schools by staff at the SCEC, and recommendations made. This was an annual process due to rapid developments in computer hardware and software. As there was little software compatibility between the early types of PC used in schools and it made a big difference to a school's computer education curriculum whether it used

Apple II, BBC, Microbee, CP/M, IBM or Macintosh computers, another reason for the recommendation process was to control the proliferation of these brands In order to facilitate support services [14].

Like several other countries Australia even commenced a project to design an Australian Educational Computer [15] as the Commonwealth Schools Commission in its 1983 report recommended the development of a set of Educational Technical Requirements based on Educational User Requirements for an Australian Educational Computer. The reason for this was partially to provide computer systems that did not have a bias towards US or UK culture and partially to stimulate the Australian computer industry [10]. I was a member of the team involved with this process. After the Educational Technical Requirements had been developed the next step would have been the design and development of appropriate systems. Fortunately (in retrospect) this did not proceed past the design stage as later developments saw the rise to dominance in schools of the IBM-compatible PC (Windows) and the Apple Macintosh.

6.6 Regional Computer Centres

One of the Regional Computer Centre Managers (originally a secondary maths teacher) said in an interview in 1984: "In the region I've got a fair degree of autonomy. I think I work hard, particularly with in-services, and have a good relationship with teachers and schools. For instance I know all the computer coordinators in secondary schools in the region and have done a lot of primary school curriculum days."[9] He went on to describe how the Computer Centre Managers met quite regularly as a group (as well as socially) and were a pretty cohesive group as they all had similar problems and got a lot out of sharing them [5].

He was not particularly complementary about SCEC, noting that: "I do wonder though at times what Moorabbin[10] is on about as many of the staff there don't seem to have the same interests as us. Most of them, with a couple of notable exceptions, don't have any idea of what goes on in the regions either. It would have been better if more of them had been involved in a region at some time in their career!"[11] He suggested that some members of the Moorabbin staff were out of touch with reality as it had been too long since they had actually taught in a school or even had any real involvement with real school problems like students, timetables and extras. "I don't want to sound too negative but we don't see much of what goes on at Moorabbin, perhaps you do great things."[12]

[9] One of the Regional Computer Centre Managers.
[10] Moorabbin was the location of SCEC.
[11] One of the Regional Computer Centre Managers.
[12] One of the Regional Computer Centre Managers.

7 Some Views of SCEC Professional Staff

It was interesting to see that the SCEC professional staff had diverse views of both their roles and of the value of the Centre. The comments of some of the staff are given below. (The names I have used are fictitious to preserve privacy.)

7.1 Mary

"Our role is to point out a direction for computer education in this state, based on our inside knowledge of Commonwealth programs and on discussions of current educational issues plus interstate and overseas information. We should be an 'Information Bureau' on computer education in schools and should assist with cross fertilisation of ideas between schools and other groups."[13]

7.2 Oliver

"My main concern for the SCEC is that it is, and is seen to be, valuable in assisting schools to further computer education in this state. An inward looking SCEC is of no use to anyone. We must always remain aware of what schools are doing and what their needs are. It is very easy in such an organisation to forget these things and get totally immersed in what you are doing yourself for your own ends. If this happens to us then we will be useless."[14]

7.3 Janice

"It's hard to answer questions like: 'You people at the SCEC are costing thousands of dollars a year. What are you doing with it?' Our role is not to produce heaps of software, we can't do it. Even software evaluation is of doubtful value, what's useful to someone may not be useful to someone else – they may teach in a completely different way. You need to know where people are at now before you start doing anything. For instance there is a place for drill and practice and we shouldn't rule it out for everyone."[15]

7.4 Matthew

"We've been going now for some time but still have no formal strategy to determine which way we are heading – particularly in curriculum. This is partly due to the centre's personnel. I'm not at all certain about the curriculum use of telecommunications and I don't know that the trials we're conducting at the moment will give us the answer. It's also strange that we're doing so little for the use of computers in maths.

[13] Mary was a member of the SCEC professional staff.
[14] Oliver was a member of the SCEC professional staff.
[15] Janice was a member of the SCEC professional staff.

This is where it started and largely because we all tried to compensate for our maths backgrounds, it has not developed much."[16]

7.5 Betty

"I have a difficulty in talking with some of the 'technical' people and I don't know what we have in common. We need to meet more often to talk over issues or we are in danger of knowing less than schools. If this happened, our credibility will be nil! We need to further define our role at the SCEC. Is it our role to produce curriculum materials, to conduct ISE or what? It's becoming increasingly important to re-assess this so we can be of use to schools."[17]

7.6 Allan

"I think that were doing a pretty good job and that things are all working quite smoothly. People at times expect too much of us; we can't be expected to produce much in the way of curriculum materials here. Our job is to co-ordinate curriculum committees and curriculum programs people to produce them. This all takes a lot of time and people have to realise that. The Government Printer is not over speedy either but we need to send out any materials with a high quality of production so we have to be prepared to wait. People shouldn't be so impatient. It's also a bit of a problem to have to work through regions as we must."[18]

7.7 Mark

"My job is fairly clear cut and doesn't really involve a lot of contact with schools. I don't think we're doing enough to help schools develop curriculum, although perhaps we can never do enough. We should be doing more for the disadvantaged kids; computers can be of tremendous value to them. Answering the phone to reply to 'silly' questions gets irritating but I suppose this is all part of our job. People don't realise though that we could get a lot more done, and product a lot more goodies if we didn't have to waste so much time on trivialities."[19]

8 Conclusion

Today in Victoria, central Education Department support for the use of computers in schools comes mainly in the form of on-line information regarding ICT support and services [16] and curriculum [17]. As there is now no scarcity of people with expertise in this area there is no longer any perceived need for a Computer Education Centre.

[16] Matthew was a member of the SCEC professional staff.
[17] Betty was a member of the SCEC professional staff.
[18] Allan was a member of the SCEC professional staff.
[19] Mark was a member of the SCEC professional staff.

In most developed countries the situation is much the same with any form of support of this type coming from the private sector.

Many other technological innovations have impacted school education since the 1980s including the Internet, Google, mobile smart phones and Facebook. A discussion of these technologies is, however, beyond the scope of this paper. What is clear though is that school principals, teacher professional associations, national computer societies and interested university academics need to assist with school ICT infrastructure choices and offer suggestions for the future use of computers in schools.

It is instructive to consider why a central operation was undertaken to support computer education in Victoria in the 1980s and to compare this with the introduction of new enabling technologies in other curriculum areas. There were several key aspects of the computer education support situation in Australia that distinguished it from other curriculum areas and from support for the use of computers in business. These pointed towards a perceived need for a central operation and included both the scarcity of people with expertise in the area and the need for oversight of funds received as part of the Commonwealth Computer Education program [6].

It can be seen that the State Computer Education Centre of Victoria played an important part in the history of computing in schools by providing advice and guidance to teachers in a time when this was most needed. Children quickly picked up and made good use of this innovative technology, but convincing teachers of the value of computers in education presented more of a challenge. SCEC certainly assisted in this.

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Collaborative Annotation Sharing in Physical and Digital Worlds

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Abstract. Despite the existence of a plethora of annotating software for digital documents, many users still prefer reading and annotating them physically on paper. While others have proposed the idea of merging these two worlds, none of them fits all the design requirements identified in this paper (working in real-time, use readily available hardware, augment physical annotations with digital content, support annotation sharing and collaborative learning). In this paper we present the implemented prototype and a focus group study aimed at understanding studying habits and how the system would fit in these. The focus group revealed that paper material is often discarded or archived and annotations lost, web resources are not saved and fade with time, and that the prototype proposed fits in their studying habits and does not introduce any privacy concerns – be it ones related to the prototype's camera (used in public setting) or ones related to annotations sharing.

Keywords: Document annotation · Change detection · Computer vision · Physical-digital interaction

1 Introduction

Digital revolution has changed a large part our lives, including the way in which we read annotate and interact with documents. During the early ascent of personal computers many have predicted the end of the paper. Quite contrary, we use more paper than ever before [1]. Moreover, we create more information than any other generation before us – be it video, audio or textual. It is the vast abundance of content that is so easily created in the digital form that has contributed to more printing. Nevertheless, many still prefer reading on paper for various reasons: reading on paper eases the learning process [2], using a pen is a ubiquitous process compared to all annotating software [3, 4] and the sheer physicality of the paper provides a sense of possession, control and manipulation. Reading and creating annotations is thus a process that the physical world supports very well and affordances of the physical world are hard to surpass [3, 4]. Dog-ears, immediately visible bookmarks, high density of information available at the same time, ease of visual scanning, persistence of information are just a few from the list. However, digital world brings other

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advantages to the table such as the ease of editing, sharing, duplicating, versioning, archiving, collaborating and searching especially when a large number of documents is in question.

The gap between digital and physical worlds has not diminished. We still struggle to keep both worlds in sync, which is notable also in the domain of learning and acquiring new knowledge, and which happens through annotations as one of the basic practices in these processes. Despite various attempts to bring physical and digital annotation together as described in next section, we still do not have a viable solution for merging them. In this paper we propose a system that would perform real-time capture of physically created annotations and mirror them to digital documents using a laptop and a smartphone camera. The proposed system aims at expanding physically created annotations with digital world capabilities such as real-time translations, broadening content with URL links, digital archiving (preserve annotations even when paper gets discarded) and most importantly sharing annotations with others. By filtering, ranking, moving and modifying the system strives to support users in integrating annotations of others into their mental model map that fits their personal learning style. In addition to solution design, we presented an early prototype of such a system to users in focus groups who provided an insight into how such a system would be accepted (e.g. acceptance of camera use in a public space such as library) and how sharing would fit into their learning process (e.g. how is intimacy, privacy and sense of ownership of one's annotations perceived).

2 Previous Work

There have been many attempts to bring physical world closer to the digital. The earlier attempts were to synchronise the files between an electronic and digital file cabinets. For example, the Self-organising file cabinet enhanced physical file cabinet and allowed users to import physical documents in a digital form and then annotate, organize, update and find information in the digital and consequently in the physical world [5]. Another such example is Protofoil that let users find paper documents in an electronic file cabinet [6].

Several attempts were made to track physical documents in the working environment with the help of digital technology. DigitalDesk used a camera and a projector mounted on the top of an office desk and captured user's interaction with physical documents and projected related digital information providing tangible manipulation of digital content [7]. Kimura used also other sensors that tracked user's movements and interactions in the physical and digital domains and showed these as activity montages on a wall-sized display [8]. Similarly, Magic Touch tracked user's movements on the desk with wearable computing [9]. Tracking of physical documents has been done also by printing special codes on the margins of the papers such in PaperSpace [10]. This computer vision based system allowed users to locate paper copies of printed digital documents and retrieve their digital versions based on these codes. In addition, a set of instructions (annotate, open, link, email, information) were printed in the margins of a physical document as well, which could be activated by system-recognised gestures on them (e.g. by selecting an email icon on the margin of a physical document resulted in attached digital counterpart to an email). Systems designed and tested by Wendy et al. looked at ways of

digitizing handwritten annotations using graphics tablet placed below the physical document and a PDA as an interaction lens for attaching digital annotations such as electronic documents [11]. Other systems went even further and tried to bring the physicality of paper documents in the digital domain through augmented reality (AR) such in BubbleFish [12] that projected digital documents in the physical environment or Pacer [13] that allowed highlighting in physical documents through phone's screen. Similar "direct manipulation" AR approach was implemented in several recent prototypes such as in [4, 14–17]. Using different approaches and different levels of immersion, the above presented research successfully blended the two worlds together – however, it lacked particular focus on study processes and requires system setup that are not easily accessible or easily transferable, or create annotations in digital domain, which are visible in physical space only through phone's screen.

It has been noted in the academic literature that reading occurs most often in conjunction to writing than not [4, 18]. Reading accompanied with writing (drawing, underlining, highlighting) as a support process helps users to form a conceptual understanding of the text while these secondary tasks are requiring no or very little cognitive attention. In such contexts the benefits of paper outweigh that of digital documents. A few systems have been proposed in this line of research that tried to bring physical annotations back to digital documents. For example a commercially available MEMENTO [19], Xax [20], Paper Augmented Digital Documents (PADD) [21], and S-notebook [22]. However, these systems require specially developed input devices (so called digital pens with a high precision micro camera integrated), and micro patterned paper that supports transference of physical annotations (writing and drawing) to digital documents. In some cases, they are restricted to only a set of recognisable patterns and only on predefined areas on forms. There have even been attempts to bring the physical affordances to the digital world such as in [23], OneNote and similar annotation software. However, we are not discussing these since they try to eliminate paper, which, as explained above provides tangibility, persistence and other affordances that can better support studying processes.

The limitation of the a above presented studies is that they require either specially equipped paper and input devices. In addition to this, none of them fulfils all of requirements we highlight in the design requirement section, particularly the collaboration aspect of visualising other users' annotations that allows grouping and grading these based on one's personal style of learning. As the designed system focuses on collaborative learning this paper presents also an exploratory study into (i) annotation sharing and possible intimacy/privacy implications users might perceive in doing it, and (ii) intimacy/privacy concerns of using camera phone when studying in public spaces such as libraries or other people's dwellings.

3 System Design

For our initial prototype design, we set up several requirements gathered from the literature. Studying commonly shifts from public/shared (library) to private/intimate environments (room) and requires a portable system with lowest possible amount of energy

needed to move and set it up at a new location [24, 25]. Beside portability, social acceptance of the designed system need to be taken into account [26]. For example, one of the reasons why Google Glass has not been successful is the fact that its benefits failed to overshadow its social acceptance. Adding the camera and see-through display to traditional eyeglasses was too intrusive and obvious, and attracted unwanted attention to people wearing them (imagine someone with such glasses coming into our intimate space such as home and filming it). It is also very important for such a system to be effective and require limited to no additional effort when adding new annotations – introducing any additional burden to the study process is likely to discourage users, particularly as studying happens over longer periods of time [27]. Annotations also need to be digitalized individually and linked to a particular digital content being annotated in order to enable indirect search of created annotations, its underlying text, and annotation interactivity (e.g. gaining explanations of words being highlighted or pointed at). Besides, such a system also needs a possibility to (i) expand annotation with additional digital content (e.g. images, video, translations/definitions<) [28], and (ii) retrieve this content when needed. The final requirement relates to supporting collaborative learning introducing the need to: (i) view and select annotations curated by others, (ii) rate annotations, and (iii) organize them according to one's personal style of learning [29, 30].

3.1 Solution Design and Prototype Implementation

We present a solution using a laptop computer and mobile device on a stand as such devices are readily available within student population. Laptop is the processing and rendering unit, whilst the mobile phone is used for video capture of a printed document being annotated (see Fig. 1). Such setup has sufficient processing power (particularly important during annotation synchronization and rendering phase), battery capacity (the system is required to run for an extended amount of study time), screen estate (important for annotation sharing, grouping and organization) and video capturing capabilities (an important aspect of annotation digitalization).

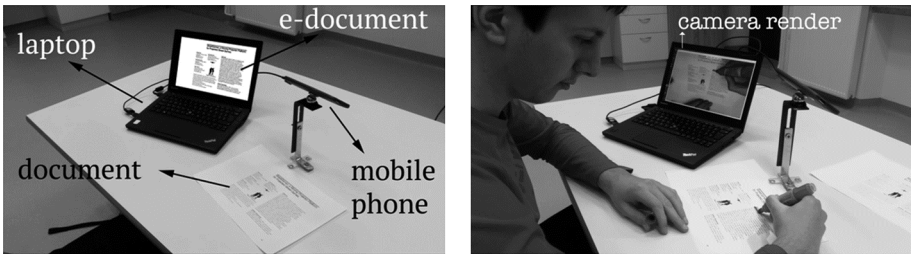

Fig. 1. Left: virtual view in which highlighted text on the paper results in highlighted text on the screen. Right: Augmented view shows a real-time video of user annotating with augmented content on a screen

We provide the user with two views: the virtual view (Fig. 1 left) and the augmented view (Fig. 1 right). In the virtual view, the laptop screen shows the page of the document

the user is currently reading. The document is overlaid with personal and shared annotations. The second view is called augmented view and provides a virtual mirror view of the book. In this case laptop screen renders a live video feed of a webcam captured through the prism glass. Depending on the configuration of the optics being used we alter the video in such a way that it shows the captured scene in correct orientation and provides users with virtual reflection (similar to one used by the Osmo[1] system) of their hands and the document segment. As long as the position of the camera in relation to the paper is known, one can augment the document with shared annotations. In addition to this, as long as it is possible to track the pen, it is possible to make the captured surface fully interactive.

From software implementation perspective the solution is divided into 3 parts: (1) annotation synchronization; (2) annotations actions in digital domain; (3) annotation sharing, grouping and organization that suits one's personal learning style. Each segment is discussed individually within the following subsections.

Annotation Synchronization: The solution utilizes video stream captured by the phone's camera in order to retrieve the e-version of the printed page. After a page is identified, the system looks for differences between the digital and physical version of the document and transcribes user's annotations to the digital version utilizing colour based tracking. This is done in a 3 stage approach. In first stage a colour filter is applied for blob detection, which is then used in second stage for detecting location and size of these blobs. The final stage is transformation of annotation locations to the document coordinate system. In order to do this, we need to know the position and orientation of the camera phone in relation to the page, which can be done using various camera pose tracking techniques [31, 32]. The prototype (see Fig. 2) is implemented using openCV library and is able to digitize annotations coloured in red, green or pink. Using the position and size of the blob, the prototype appends annotation to the text segment being overlaid.

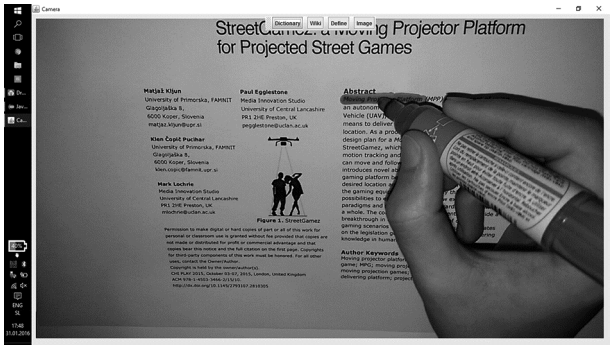

Fig. 2. Prototype showing four options (Dictionary, Wiki, Define, Image Search) that can be executed on digitalized highlight "Moving Projector Platform"

[1] Osmo: https://www.playosmo.com.

Annotations Actions in Digital Domain: There are two basic annotation actions that the system supports: digital search actions based on the text below the annotation (e.g. word translations, wiki search,…) and augmentation of knowledge with content from the web (e.g. appending URL links to curated annotations). Saved digital links can be revisited by mouse clicks on the digital document or through pointing gestures on a physical document. The prototype supports this feature and allows users to trigger 4 different actions (Dictionary, Wiki, Define, Image Search) using a URL driven API's. By clicking the right button or shortcut on the keyboard, a web search query URL is generated and opened in a web browser. If users find a valuable web resource, they can save its URL to the annotation, which becomes augmented with additional digital information.

Annotation Sharing, Grouping and Organization: Besides viewing one's personal annotations such as highlights, notes and sketches, the page can also be overlaid by annotations curated by other users. The system allows users to choose which annotations they want to keep, where they want to place them on the document and rate their importance. This is important in order to customize the learning environment according to one's personal learning style as demonstrated on Fig. 3. This segment of the prototype has not yet been implemented, hence we provide here a concept sketch of the system (see Fig. 3).

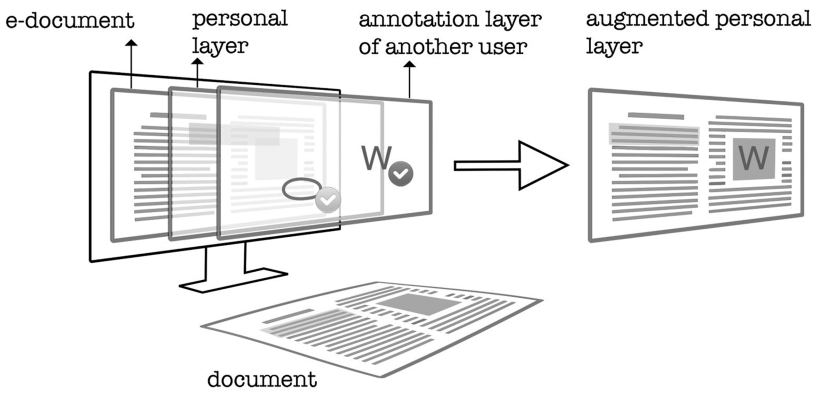

Fig. 3. Design concept for sharing and organizing annotations. Different layers belong to different users. By ticking annotations at various layers of other users, the user adds them to their personal layer. Once on a personal layer, these digital annotations can be moved and modified in order to fit the learning style of the user. The expanded digital content is also transferred to the personal layer.

4 Method

For acquiring the insight into how users would perceive intimacy and privacy of (i) sharing their personal annotations, (ii) people around when using a system and (iii) social acceptance of setting up such a system (in both a public space such as a library or private

space such as schoolmate's bedroom) we conducted a preliminary study before fully developing the prototype. The method chosen was a focus group with students as studying a variety of subjects occupies a large part of their lives. The focus group allowed us and participants to develop a rich group discussion around different opinions. To assure the diversity of studying practices we posted the announcement of the study at all departments at our university. 15 participants answered the announcement (4 females, 11 males) with an average age of 21 from 5 different departments: bioinformatics, applied mathematics, applied economics and finance, computer science, and biology. To further diversify the groups, we held two focus groups with mixed students from different departments as well as of different gender.

The focus group questions have been concentrated around four topics: (i) participants' usual studying settings (e.g. room, kitchen, library) and surroundings (people, studying material, devices), (ii) studying resources used (digital, physical), (iii) annotation sharing, intimacy and privacy concerns, and (iv) participants' opinion about the prototype. For the latest, participants have been shown the system as seen on Fig. 1. The purpose of the demonstration was to support participants in visualising the style of studying with such a system and further the discussion of the focus group sessions. Both sessions have been filmed, videos transcribed and coded by two researchers. The main findings are presented in following section.

5 Discussion

Discussion section is presented around four topics of the focus group session. The empirical findings provide implications and uncover possible limitations of the proposed prototype.

5.1 Studying Environment

Except for one participant who studies whenever opportunity arises (e.g. while commuting, between lectures on a bench, etc.), the majority mainly use their room desks and library study rooms as studying environments. In both settings users have access to all technology needed for the prototype to work: laptop, mobile phone, power plug and internet connection. While room desk provides an intimate and private studying environment where *"things can be left as they are" (p. 10),* library environment requires users to prepare and clean their studying setup. For the later, the prototype needs to be portable and easy to setup.

5.2 Studying Resources

As our system supports annotations synchronisation between physical and digital document we wanted to find out what materials students use when studying. In line with other studies, participants expressed a preference for studying and annotating on paper [1, 4]. However, the kind of studying material available depended on a course subject – hence it was not always possible or rational to print out the materials prepared for a lecture.

The mentioned reasons were: printing large quantities of material is expensive, lecture slides have little or no text to be worth printing, lecturers deliver content on a blackboard, and some subjects (e.g. mathematics) do not require learning by reading. In such cases, taking notes in exercise books is a preferred way of creating the material that participants later study from. This is a limitation for our prototype since exercise books of each participant in the course are unique, therefore, even though our system could capture created annotations (for the user to extend them with digital content) such annotations could not be searched and shared with others in a meaningful way. To achieve such annotation sharing, both, the annotations and the exercise book need to be shared.

Regardless of study material format (printed documents or exercise books) participants also use other resources (books, web) to supplement existing material and to clarify the created content. Interestingly, participants never store links to supplementary resources, but transcribe the relevant content to the main study material. If they need to revisit this resource, they browse for it again (in a book or on the web). Such practice does not externalise these mental links, which cannot be shared with other users and fade with passing time [33, p. 159].

During the discussion, participants identified the loss of links as problematic, but also highlighted that an even bigger problem is the fact that paper material (either exercise books or annotated printed material) is either archived and never looked at again (it is difficult to access and search through such material) or discarded due to lack of space and required effort. They also mentioned that on several occasions, having such content would come in handy, but it was not possible to use it. On the other hand, the majority of participants kept their digital content as it does not take up physical space and was easily retrieved by searching. If used, our prototype mitigates the loss of physical study material with digitalised annotations and enhances such annotations with indirect digital search capacity through such material.

5.3 Annotation Sharing, Intimacy Privacy Concerns

When asked about sharing their annotations, focus group members did not highlight any intimacy and privacy concerns. Some questioned if such annotations would be meaningful to other participants, but not all agreed and highlighted that they regularly share annotations with classmates who photocopy them. However, the later group stressed out that shared annotations are not used in current format, but recycled and integrated into one's own annotations. This is not surprising as annotations represent personal mental model maps, hence are most useful for the person who created them [34]. The implication for the prototype is that the system needs to focus on enabling user's highest possible flexibility when integrating shared annotations into one's personal layer.

5.4 The Prototype

Participants generally liked the prototype and found its use socially acceptable in private and public domain. No concerns were raised when participants were asked about acceptability of the system if used by their neighbours in the library or colleagues studying in their rooms (as long as the system did not make additional noise). The use of camera

does not seem to cause any concern amongst participants. This was expected as the camera is pointed towards the table and only captures tabletop surface in-front of the user, which is very unlikely to raise privacy issues. If used in silent mode, mobile phone and laptop use in public and others' people private environments, is nowadays acceptable and even supported through the provision of internet, power access and laptop renting.

Participants found the system as too cumbersome to move for daily use at lectures. However, most agreed that during exam periods, they do not see mobility as problematic because they stay in the same place for extended period of time or study in private setting where clearing one's desk after use is not required. When asked about the extended set of features they would like to see, participants highlighted that they would like to be able to create links to a particular segment of the webpage. This idea was expended to videos where participants expressed the need to create link to a particular segment of a video.

6 Conclusion

Real-time digitalisation of physical annotations in order to archive, share, search, and expand them can bring added value to the process of acquiring new knowledge while digitally preserving it for the future. The implemented prototype demonstrates that such a system is viable on hardware that is readily available within the student population. In addition to this, the presented focus group sessions also highlighted that such hardware configuration is acceptable in private and public domains. The sessions also revealed that finding supplementary digital information resulted in a failure to link it to study material on paper and losing it in the long run (e.g. writing down URLs as annotations is not always a suitable solution), and that even paper material is often discarded, lost or archived in a way which makes it difficult to use again. In addition, the focus group also highlighted that the prototype proposed fits in their studying habits and does not introduce any privacy concerns – be it ones related to the prototype's camera (used in public or others' people private setting) or ones related to annotations sharing. At last, sharing annotations as supported by our prototype was seen a valuable feature complementing and expanding sharing that is already happening in physical world (students are photocopying notes from one another) where users recycle their colleagues' annotations and make them fit their own studying process and mental models.

We are currently building a full prototype, which will be studied both in the lab and in the wild. The former will measure usefulness, usability, and scalability (e.g. how many users can use it together) of the prototype in a predefined task that will include reading a selected text, free annotating the text and viewing (selecting, rating) annotations of other users (researchers). After this study, we plan to use the prototype in a long-term study run as part of university course which is based on reading research papers.

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Revocable Anonymisation in Video Surveillance: A "Digital Cloak of Invisibility"

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Abstract. Video surveillance is an omnipresent phenomenon in today's metropolitan life. Mainly intended to solve crimes, to prevent them by realtime-monitoring or simply as a deterrent, video surveillance has also become interesting in economical contexts; e.g. to create customer profiles and analyse patterns of their shopping behaviour. The extensive use of video surveillance is challenged by legal claims and societal norms like not putting everybody under generalised suspicion or not recording people without their consent. In this work we propose a technological solution to balance the positive and negative effects of video surveillance. With automatic image recognition algorithms on the rise, we suggest to use that technology to not just automatically identify people but blacken their images. This blackening is done with a cryptographic procedure allowing to revoke it with an appropriate key. Many of the legal and ethical objections to video surveillance could thereby be accommodated. In commercial scenarios, the operator of a customer profiling program could offer enticements for voluntarily renouncing one's anonymity. Customers could e.g. wear a small infrared LED to signal their agreement to being tracked. After explaining the implementation details, this work outlines a multidisciplinary discussion incorporating an economic, ethical and legal viewpoint.

Keywords: Video surveillance · Privacy protection · Anonymity · Data security

1 Introduction

Today, life in urban areas is hardly imaginable without omnipresent video surveillance (VS). Screens showing the recorded images are installed in prominent locations to remind us that we are constantly being watched or even recorded. Ideally, this makes us feel more secure; but it might also reveal intimate details about our lives and make us change our behaviour in subtle yet profound ways, thereby threatening our rights to political liberty and personal self-determination.

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VS can of course help to convict a criminal, preemptively detect imminent danger, or chase a fleeing suspect more effectively. It is also reported that the visible installation of cameras does in fact reduce crime in that respective area.

Thus, from a crime fighter's point of view there are clearly advantages of having as much VS as possible. With more installed cameras the monitoring and evaluation of recorded data becomes insurmountable for human operators. Therefore, efforts are made towards automatising the video analysis through computer algorithms – as it was e.g. the goal of the infamous EU project INDECT.

But not only crime fighters are interested in VS. In an emerging trend, VS has also come into the focus of commercial applications. Similar to internet users being tracked and analysed, people can be automatically identified and tracked on video recordings. Thus, e.g. a supermarket can track the paths customers take through the aisles, analyse where they stop or which advertisements catch their attention. The resulting data allows to optimise the arrangement of products or send customised promotions or discount offers based on the costumer's behaviour. Again, there are obvious advantages of VS in these scenarios: both for the shop owner (optimisation of products and advertising) and for the customers (individual discounts and a more seamless shopping experience).

However, in spite of legal norms governing the allowable use of VS, the public debate on its drawbacks or even threats to an open free society is not ceasing. A most prominent example is the so-called 'Big Brother Award', an annual ironic award by civil-rights activist to persons or organisations who have in their views greatly contributed to shifting society towards George Orwell's dystopia from '1984'. Among the German awardees, there were particularly VS related cases in the years 2000 (German Railways, surveillance of station platforms), 2004 (Lidl supermarkets, surveillance of employees) and 2013 (University of Paderborn, surveillance of lecture halls and computer labs).

In this work, we are discussing a possible reconciliation between these concerns about already present VS and its advantages for both crime fighting and economical endeavours. The *'Digital Cloak of Invisibility'* (DCI) is a generally applicable concept of anonymising personal information in vastly collected data [4] that is here applied to VS. This anonymisation, however, can be partially revoked if necessary. While there have been several studies about automatic privacy and intimacy preserving in VS and even some about revocable anonymisation, we first suggest an alternative method to achieve revocable anonymisation and – to best of our knowledge for the first time – present a scenario of how such a technology could be implemented in a modern society. In contrast to purely technical approaches, this work's main contribution is the multidisciplinary discussion of VS with revocable anonymisation within its societal (legal, economic and ethical) context.

Section 2 outlines the computer scientific details of the DCI, preparing the ground for a multidisciplinary discussion of the approach. Section 3 evaluates VS and the DCI from a legal perspective, exemplarily taking into account the German legislation. In order to provide a more holistic discussion of the societal implications of VS and the DCI, Sect. 4 discusses the DCI from an economical

point of view, while Sect. 5 provides an ethical analysis of VS and how the respective concerns are met by the DCI. To preserve the scope of this paper, these viewpoints are kept very brief. The intend is to initiate a debate, whose main points and future directions are concluded in the final section.

2 Technological Implementation

The problem of compromised privacy in VS has been addressed by several works; e.g. [10,13,17,20,24,25]. Most approaches automatically detect and irreversibly obfuscate privacy critical image regions like human silhouettes, faces or car licence plates. Some approaches like [7–9] have also suggested methods for revocable obfuscation. In contrast to these purely technical approaches, this work's main contribution is the multidisciplinary discussion of VS with revocable anonymisation within its societal (legal, economic and ethical) context. We therefore draft a rather simple yet efficient way for revocable image obfuscation; namely to XOR their pixel values with a pseudo-random cipher stream generated from a secret key seed. This scheme is sufficient to demonstrate the relevant concepts of embedding it into the societal context but could also be interchanged for any other possibly more sophisticated reversible obfuscation technique.

As more and more of the recorded video footage is going to be analysed automatically by pattern recognition algorithms, we propose to use the same algorithms to identify persons but *blacken* them before the footage is stored or viewed by a human. This blackening is done by a cryptographic method that allows to restore the original image with a key. This key is securely stored in the camera and by a publicly accepted *key keeper authority* (KKA). Whenever video footage is required to identify criminal suspects after an event, the crime fighter requests the required key from the KKA. For cases of imminent danger, a "break glass" functionality can immediately grant a key, leaving a log entry for the KKA to double-check. For commercial applications, the DCI allows shop owners to do their tracking of filmed customers – however, only of those who have agreed to being tracked, similar to the loyalty program 'Payback' where people agree to their shopping receipts being recorded and analysed in exchange for monetary compensation. ('Payback' was incidentally awarded a Big Brother Award in 2000.) People who agree to being tracked could signify their approval e.g. by wearing an inconspicuous tag on their clothes or by inserting a personal smartcard into their shopping cart.

As with classical VS, the recordings are made by a camera we assume to be digital, i.e. the video image is processed by digital circuits before the data is digitally transmitted out of the camera – an assumption that is valid for many VS cameras today and will in the future be true for all VS. The DCI extends such camera with additional internal circuitry that performs a certain post-processing on the video data before it leaves the camera's hardware. The workflow is depicted in Fig. 1.

First, an image recognition algorithm identifies all persons in each video frame. The perfectly reliable implementation of such algorithms is nowadays still

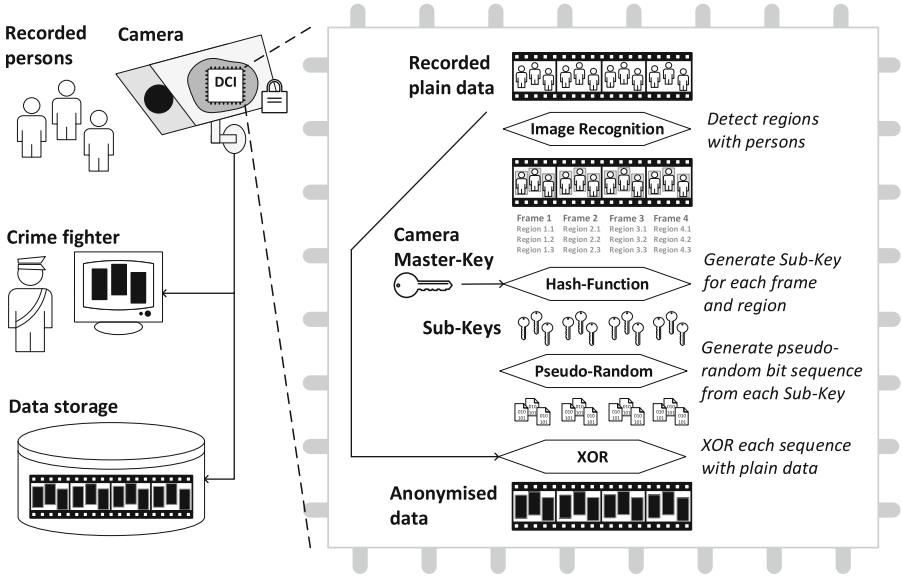

Fig. 1. The schematic concept of a DCI camera system.

in its beginning [3,6,11,28] but most certainly the future will see them running reliably on embedded systems like those of digital cameras. Each DCI-enhanced camera has a unique cryptographic key securely embedded in its hardware, called *Camera Master-Key* (CMK). For each video frame and image region showing a person, an individual *Sub-Key* (SK) is created by feeding the CMK with frame number and region coordinates to a *hash function* [26]. Strong hash functions have the property that the input cannot be derived from the output. Thus, it is not possible to derive the CMK from the SK – even if the used frame number and region coordinates are known.

The SKs are used to generate a pseudo-random cipher-stream of bits that is XORed with the pixel data of the corresponding region in the original video frame. In the resulting video, this region appears obscured (in fact the pixels have random colours). The meaning of pseudo-random is that the generated bits look random, but the sequence solely depends on the respective SK, such that it can always be reproduced. The XOR function ($\oplus$) is reversible:

$$data \oplus cipherStream(SK) = encryptedData$$

$$encryptedData \oplus cipherStream(SK) = data$$

Thus, the blackening of a region in a frame can be undone, when the respective SK is known. This is applied in the DCI deanonymisation scheme shown in Fig. 2. If a crime is recorded, the crime fighter makes a request to the KKA which verifies its legitimacy and then grants the SKs for the requested frames and image regions. Only the suspect persons in a recording can be deanonymised while all others remain anonymous.

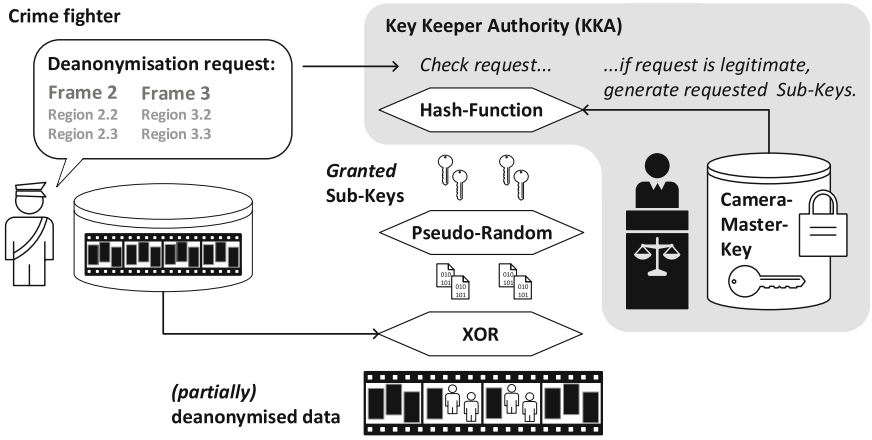

Fig. 2. Deanonymisation is only possible with the SKs granted by the KKA.

To cater for cases of imminent danger, a "break glass" functionality is implemented such that a sequence of SKs can be requested remotely (e.g. via internet) and is automatically granted. This, however, leaves a log entry with the KKA such that the request's legitimacy and whether the "break glass" was justified can be verified afterwards.

In a first proof of concept, we implemented a DCI camera as an *opt-out* system instead of *opt-in*. I.e. instead of anonymising everybody by default except those who opt-in, nobody is anonymised except those who opt-out (conceptually similar to [24]). This was done to firstly abstract from the person-identifying image recognition. We designed an infrared LED beacon that is picked up by the camera to subsequently anonymise the region around this beacon. Figure 3 shows the practical results. The anonymisation is done with the cryptographic scheme as described above. With sufficiently reliable person-identifying algorithms, the system can easily be transformed into the DCI opt-in variant.

Fig. 3. A first proof-of-concept implementation of the DCI as opt-out: only regions surrounding a detected infrared beacon are anonymised.

3 Legal Considerations

In 1995, the European Union issued the Data Protection Directive (95/46/EC) to be implemented by all member states. In this section, we exemplarily focus on the German implementation of the directive in its Federal Data Protection Act (Bundesdatenschutzgesetz, BDSG). The legal basis regulating the use of VS (§ 6b BDSG [1]) only allows it under specific circumstances. The VS has to be both *sufficient* to reach the intended purpose and *necessary*; i.e. there has to be no less severe economically reasonable alternative [12, paragraph 236]. Furthermore, a weighing of interests must be fulfilled between the intended VS purpose and the constitutional personal rights of the affected (Article 2 paragraph 1 of the Basic Law for Germany), i.e. in particular the right to one's own image and the right to informational self-determination [5, paragraph 22].

The *sufficiency* of VS is mostly given, insofar as it is assumed to fulfil its typical purposes: crime prevention, detection and deterrence. But also the *necessity* is generally easy to prove with the argument that high personnel costs are hardly an economically reasonable alternative to the comparably cheap VS equipment [5, paragraph 21]. The weighing of interests is mostly decided in favour of the intended purpose, as § 6b BDSG allows VS to be used for exercising one's right to domestic authority, or – even more generally – to exercise any justified interest for a concretely defined purpose; and justifications – like the state's obligation to avert danger and prosecute crime or the individual's interest in protection of one's property – mostly outweigh the mentioned personal rights of the VS affected, as long as the VS is not done covertly but clearly signified. Furthermore, recordings must not be stored longer than required to fulfil the respective purpose, which of course can allow for rather long time spans depending on the purpose interpretation.

Evaluating the *necessity* of classical VS versus the DCI, it can be asserted that the DCI is in fact a less severe alternative. As all people are anonymised by default, there is no infringement of personal rights any more. These benefits should outweigh the slightly higher costs in most cases, such that the DCI can also be considered an economically reasonable alternative.

Whether it is also *sufficient* in the same way as classical VS requires a more thorough analysis. The foremost purpose of VS is to identify recorded suspects in hindsight, which is definitely also provided by the DCI. If recordings are to be analysed in a typically already protracted criminal proceeding, the relatively short delay of requesting the SKs from the KKA does no harm. For emergencies, there is the "break glass" functionality to immediately get a set of SKs. Another purpose of VS is the deterrent effect, which is also catered for by the DCI. Because people will be aware that they will be deanonymised if the crime fighter convinces the KKA of the crime having taken place. This will in most cases be possible by pointing out the respective scenes in the anonymised recordings, because most suspicious actions are still recognisable, even if the "protagonists" are obscured. This is also the reason why DCI-enhanced VS is just as suitable for real-time monitoring. Turmoils or robberies, for example, show typical patterns

of movement that are easily spotted irrespective of whether the persons are obscured or not. It can thus be concluded that the *sufficiency* is fulfilled.

In economical scenarios, where customers renounce their anonymisation in a loyalty program (cf. Sect. 4), the DCI is legally rather unproblematic. The operator simply has to comply with § 6b BDSG by signifying the use of VS and to let the participating customers sign his general terms and conditions (cf. § 4 and § 28 BDSG).

Of course, this exemplary discussion of the German legal context is not exhaustive and other legal contexts could be included. Furthermore, technical concepts like the DCI have hardly been taken into account in the legal practice. Thus, in addition to the following economic consideration, Sect. 5 extends the limited normative discussion presented above by including an ethical analysis. This will allow us to look more broadly at normative issues and conflicts introduced by VS and how the DCI can address these in a constructive way.

4 Economic Applications

DCI systems can not only be utilised for protecting individuals' privacy in the context of VS-based crime prevention and detection. They also allow for conducting economically motivated video surveillance in a privacy-aware manner. In the following, the potential of the here presented system in the context of customer analysis for marketing in brick and mortar stores is discussed.

Store owners have long used video surveillance systems not only to deter shoplifters but also for being able to present evidence in case of incidents within their premises. However, video surveillance systems are also suited to precisely track customers' movement and even their direction of view [18,19]. This allows shop owners to gain valuable insights that can be used for marketing, e.g. for shop design or advertising campaigns. In Germany, however, customers' high privacy concerns are an impediment to the adoption and usage of such analysis methods. The here presented DCI system has the potential of addressing these concerns on the one hand and to guarantee that only the movements and behaviour of customers who have consented are tracked, on the other hand.

The DCI system can be used analogously and complementary to the currently popular loyalty cards in order to restrict tracking and behavioural analysis within the store to customers who have consented on the one hand, and, on the other hand, to reduce the privacy concerns of customers who have not consented. Two options to harness this potential exist. In its current state of implementation, the presented DCI system can be utilised as an easy opt-out mechanism. Through wearing a respective signal emitter, e.g. on their clothes or on their shopping cart, customers can opt-out of movement tracking and behavioural analysis. However, this application would be in stark contrast to the "privacy-by-design" requirement as laid down in the current draft of the new European General Data Protection Regulation [14, Art. 23]. Still, the DCI can also serve as an opt-in mechanism. Customers who consent to being tracked within the store can signal this through signal emitters on their clothes or shopping carts.

For example, infrared LEDs could be used in this scenario, emitting light signals that correspond to a customer account or profile. This would also allow for combing the DCI with existing loyalty programs. In that scenario, the VS system would have to encrypt the whole video by default except for regions in which a respective signal is detected. A problem to be solved in the commercial scenario is the selection of an appropriate KKA. Further, the presented system has to be extended in order to prevent "bycatch". In case two customers, one who consented to tracking and analysis and one who did not, are standing close to each other in the store, the will of the customer who did not consent should be prioritised and both customers are anonymised.

5 Ethical Impact Assessment

Due to the complex nature of both society and technology development, an ethical impact assessment should not be considered an accurate prediction of the future. Rather, it can be seen as a projection of intended and unintended consequences of technology use and of the potential moral risks and chances. Especially with regard to unintended consequences (side effects) of using new technologies, legal frameworks often lag behind and do not address emerging conflicts adequately. Ethical impact assessment then sketches plausible scenarios and outcomes that can be used as a normative basis for deciding how to deal with technological change in society. In many cases, as done here with regard to the DCI, this normative basis can then be used constructively in the development process. In this way, at least some of the foreseeable moral risks – even if they are not yet fully covered by the legal framework – can be addressed by technological means [22].[1]

If we take a closer look at the unintended ethical impact of implementing VS technologies in public places, two argumentative perspectives can be differentiated: (1) the unintended impact can affect specifiable individuals, especially with regard to their fundamental rights and liberties; or (2) the unintended impact can affect the character of a society as a whole, especially by contributing to developments that make it more restrictive. The latter perspective becomes especially important in cases where the impact for most specifiable individuals is comparably small or mostly indirect, but where, in sum, we can still foresee a considerable impact on the openness of society. Examples for this is the subtle but constant expansion of security technologies over a longer period of time (sometimes called the 'boiling frog argument' [27]) or the ex post expansion of the purpose of data collection ('mission creep argument' [21]).

In the remainder of this section, we present a brief assessment of the ethical impact of VS with and without the use of the DCI. This is done by means of four metaphors [16] that are commonly invoked by critics in the relevant public and

[1] Of course, not all moral risks can be addressed technologically and every technological "fix" may introduce new unintended consequences. Therefore, constructive ethical impact assessment should rather be seen as a continuous process of reflection than as providing a static set of design requirements.

scientific debates in Germany.[2] Regarding the ethical impact on specifiable individuals, we first look at the commonly perceived risk that the private lives of customers or citizens become "transparent" to commercial and governmental actors (*gläserner Kunde/Bürger*). Afterwards we discuss the fear that persons under VS are subject to what is called a "generalised suspicion" (*Generalverdacht*). Regarding the ethical impact on society as a whole, we look at the metaphors of an "Orwellian" and a "Kafkaesque surveillance society".

5.1 Individual Centric Perspective

In the discussion about spatially limited VS in publicly accessible places, the metaphor of the transparent customer predominantly denotes the fear that commercial actors may collect and process data about their customers to an extent that they can infer facts about their wishes, intentions and living situations. Such information often includes private or even intimate facts that are widely considered to be worthy of protection based on cultural norms of modesty (e.g. regarding sexuality or illness) or based on the societal fear that some individuals may be affected disproportionately (e.g. due to their financial or social situation). Furthermore, since intimacy depends on *selective* sharing of information, the control over information about oneself has been recognised as a necessary precondition to establish relationships with varying levels of intimacy as well as for the development of our personality free from the impingement of others [15]. In contrast to this, the metaphor of the transparent citizen predominantly denotes the fear of far-reaching data collection and processing on behalf of state actors. Here, the reason for considering certain information private and worthy of protection is founded additionally in the fear of governmental overreach and an overly powerful state. In democracies, therefore, state sponsored VS must always be viewed in relation to rights and liberties that defend the individual against the state. In comparison to commercial actors, state actors are therefore usually subject to stricter checks of proportionality and more often require the implicit or explicit consent of the affected individuals.

In both cases, however, such privacy intrusions are often considered justifiable (especially in a legal sense) if they allow the protection of other societal values – for example if there is the suspicion of criminal activities. Here, the metaphor of the generalised suspicion expresses the fear that security measures such as VS may be used indiscriminately so that *all* individuals may be subject to privacy intrusions on the basis that *some few* individuals could be said to have criminal intentions.

In classic forms of VS, individuals can generally be identified either manually or automatically by making use of biometric facial recognition or other optical criteria. In addition to that, the tracking of their movements throughout the area under surveillance can allow to establish buying patterns, to infer personal intentions or to reveal intimate aspects of their living situations. How much

[2] Although we focus on metaphors from the German speaking debate, the terms translate well and are just as informative for English speaking debates.

time did this customer spend in front of the shelves with the condoms and how often does she come to buy liquor? Does this person commonly use the public transport system during working hours? How long does that man talk to the preacher in the public square, how long to the people from the election campaign? Especially techniques of long-term storage and automated analysis of video data can present a severe infringement of individual privacy and the free development of personality that goes far beyond what people have to assume anyway when they move in public places.

By obscuring the information that allows the identification of individuals in the video images, this moral risk can be mitigated effectively as the recorded data cannot be directly related to specific individuals. Depending on the implementation of the KKA, such an intrusion is only allowed in cases where the reason for it is checked and considered legitimate by an independent instance – for example to collect evidence in case of shop lifting or assault. Furthermore, even in such cases, only specific pieces of information can be revealed, such as data relating to concrete individuals during a specific time frame. At the same time, the intended benefit of the VS – e.g. police officers watching a public area to react quickly in case of assaults or a shop detective watching the customers to spot shop lifters – can still be achieved. Both scenarios show that the usage of a DCI system can protect the privacy and intimacy of customers or citizens much better than classic forms of VS. Furthermore, they allow restricting legitimate intrusions to the necessary information.

5.2 Society Centric Perspective

The term surveillance society is used to express concerns about the prevalence of surveillance measures of commercial or state actors throughout society. In the context of VS, the term does therefore not refer to singular, isolated instances or strictly limited locations, but rather to the gradual proliferation of this measure and the threat that those systems could be networked bit by bit and the recorded information merged to a large pool of surveillance data. In this context, the metaphor of the Orwellian surveillance society denotes the concern that the proliferation of surveillance measures may lead to a situation in which we are almost constantly monitored and where we can never be sure how our behaviour will be interpreted or which negative consequences might ensue later on. From a democratic point of view, this implies the risk that the realisation of some of our rights and liberties may fall victim to a form of self-control – for example because we fear a more negative credit rating or being classified as a high risk airline passenger. This can be seen as a pressure towards a certain standard of normalcy that limits the open character of our society to a considerable extent.

In addition to that, the metaphor of the Kafkaesque surveillance society expresses the fear that we may loose the de facto possibility of achieving an effective remedy in case we suffer illegitimate negative consequences. This is especially relevant in cases where it is highly opaque why the relevant decisions were taken, based on which information and on which criteria and how those

decisions can be disputed. With regard to VS measures, this risk becomes material especially in those cases where recorded data is handed over or even sold to third parties without the consent of affected persons, since this would facilitate the consolidation and misuse of data from different sources – for example in order to allow pattern recognition for the detection of potential criminals or insurance risks.

In classic forms of VS, it is very difficult to effectively limit the circulation and processing of the recorded data. Even in cases where signs inform customers or citizens explicitly about the VS, it is almost impossible to foresee what information can be inferred from the recorded data and how it could be used in the future. Some of these risks can be mitigated to a certain extent when surveillance actors promise to restrict themselves in the use of such data – but it is unclear what would be the incentive for commercial actors to do so and how misuse could be sanctioned effectively. The use of a DCI system by commercial or governmental actors, on the other hand, allows the use of the KKA as an independent party to effectively mitigate the risk of circulation, consolidation from different sources and misuse of the recorded data. This is especially true if only those pieces of data are revealed that are strictly necessary for a certain legitimate purpose. Furthermore, for commercial surveillance actors, it could be an incentive for the use of a DCI system if they can advertise their use of higher standards of protection of their customers' privacy. For both the commercial and governmental case, we can thus conclude that a DCI system allows to also effectively mitigate the society centred ethical risks of circulation of surveillance data, of data consolidation from different sources and of misuse of that data.

6 Discussion and Conclusion

The advantages of a DCI-enhanced VS system over the kind of VS that is already massively in use today has been demonstrated in each perspective of our multidisciplinary discussion. Still, there might be remaining criticisms towards DCI that shall be addressed in the following.

A concern raised from someone generally opposing VS could be, that a DCI technology would merely be a fig leaf for VS; leading to a higher rate of social acceptance followed by an implementation of even more VS systems. That concern would be justified if VS today would in fact be used very sparsely. Reality, however, shows that we are already living in a society where VS is implemented on a large scale, mostly accepted or not pondered over by large parts of the populace. Replacing it with DCI systems will be given just as little thought by those, but people concerned about VS today will experience a real improvement.

Another such concern could be about the DCI security. The whole DCI system relies on the CMK's secure storage both in the respective camera and in the KKA's central storage. If the CMK is obtained e.g. by a hacker attack, all recordings made with the respective camera could be deanonymised. As a precaution, it is therefore recommendable to keep the same strict constraints of how long recordings may be stored that are in place today for classical VS. Then, even if

the DCI security should get compromised, it would only be as "bad" as it is right now without DCI. To keep a CMK save in the hardware of a camera there is a manifold of techniques from the field of hardware security and trusted hardware. e.g. *tamper-sensing Meshes* [2] or *Physically Unclonable Functions* (PUFs) [23]. Equivalently, the KKA's storage has to be secured with state of the art security measures.

Another question is: "Who is the KKA?" The trust of the populace in the KKA's integrity is essential. Thus, one could consider a democratic board unsuspicious of collaborating with the respective camera operator. We presume that among the civil-rights activist now fighting against VS many would volunteer to be part of a KKA and that they would be trusted; particularly by those sceptical of VS. Another possibility could be a judge or ombudsman to decide about when a key request is granted. In any case, transparency and accountability of the KKA's decisions and procedures are paramount for the creation of trust.

One also has to be aware, that DCI-enhanced VS does not provide perfect anonymity. An obscured person might still be identified by a diligent analyst e.g. by the fact that she was walking a dog or because he was – although anonymised – observed leaving his residency. With an extension of the DCI algorithm these sources of identification could be further hampered, but one should not be illusionary about the limits of anonymisation.

A last concern could come from advocates of classical VS; namely that a DCI is more expensive than classical VS. This is of course true. The extra hardware in the cameras and the administrative efforts to regulate the exchange of requests and keys between the crime fighting instances and the KKA does not come for free. The question we have to ask ourselves as a society is, whether a decrease of intrusion into our privacy and intimacy as well a decrease of infringements of our civil liberties would be worth that extra cost.

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Edges, Surfaces, and Spaces of Action in 21st Century Urban Environments – Connectivities and Awareness in the City

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Abstract. The purpose of this paper is to introduce a philosophical and phenomenological perspective to complement, extend, and enrich algorithmic and network views of social media in support of connectivities and awareness in the city. The edges, surfaces, and spaces of 21st century urban environments are explored in relation to how social media is being used to support greater opportunities for awareness and in turn, for more meaningful engagement, learning, and participation in city life. The research design for this study employs an exploratory case study approach, a minimally viable social media space, and multiple methods of qualitative and quantitative data collection and analysis. Anecdotal evidence from informal individual and group discussions conducted in parallel with this study supports further data analysis, comparison, and triangulation. This work makes a contribution to the research literature across multiple domains and a conceptual framework is developed, operationalized, and advanced for connectivities and awareness.

Keywords: Awareness · Choice · Connectivities · Edges · Learning cities · Smart cities · Social media · Spaces · Surfaces

1 Introduction

The rapid growth of cities is posing unprecedented challenges and opportunities for society [1] and for education [2]. In response, this research explores social media technologies in relation to awareness in 21st century cities, communities, and commons [3], when used to foster meaningful urban engagement, participation, and learning. Theoretically, this work is situated at the intersection of social media and the information and communication technologies (ICTs) being developed as a strategy for cities to innovate their structures and their communities [4]. As such, this work is concerned with people and their awareness in the context of ICTs as aware technologies in the smart city. Berne [5] relates awareness to autonomy, claiming that awareness pertains to aliveness. According to Stone, Deci, and Ryan [6], autonomy "concerns the experience of acting with a sense of choice, volition, and self-determination." Awareness, as it relates to people and learning, "keeps changing all the time" and is "the totality of all experience" for an individual [7]. Using a city-focused social media space, this work focuses on people and their experience of edges, surfaces, and spaces for action in the city. Vander Veen [8]

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comments that "cities without people aren't cities at all" and perhaps Orgos, Inner Mongolia in northern China, described as the world's largest ghost city, provides an example of a city without the intended scale of people [9].

This paper is significant because it theorizes and explores awareness and the experience of city life in relation to choice and emerging understandings of the interweaving of physical and digital environments as smart cities. This awareness is particularly critical at a time when Brandt [10] for example, points to a kind of obliviousness in the United Kingdom where "nearly 100 percent" of the citizens "do not notice smart cities growing around them." Further, the philosophical, phenomenological, and theoretical work of Casey on surfaces and edges [11, 12], combined with a human geography perspective on spaces [13, 14], and urbanism thinking [15–18] are used to complement and extend the computational and algorithmic understandings of social media [19, 20] in the city. As such, this study looks at how awareness in social media-infused and technology-rich urban environments may be influencing choice and contributing to meaningful engagement, learning, and participation in city life.

Methodologically, the research design for this study employs an exploratory case study approach, a minimally viable social media space, and multiple methods of qualitative and quantitative data collection and analysis. Content analysis is employed inductively and deductively to gather insights from individuals across the city and from the research literature, respectively. Anecdotal evidence from informal discussions conducted in parallel with this study supports further data analysis, comparison, and triangulation.

What follows is a review of the research and practice literature relevant to the theoretical perspective for this paper, followed by a presentation of the methodology, the findings, discussion of implications, contributions and future directions, limitations and mitigations, and concluding comments.

2 Review of the Literature

A review of the philosophical and phenomenological literature is presented to complement and enrich the algorithmic and network perspective on edges, spaces, and surfaces in relation to people and social media in the city. In interdisciplinary fashion, a review of the human geography and urbanism literature related to theorizing on edges, space, surfaces, and the in-between is presented, followed by a review of contemporary urban environments in terms of awareness, infrastructure, and experience.

2.1 Edges, Spaces, Surfaces, and the In-Between

A discussion of the research literature on edges, spaces, surfaces, and the in-between is presented from an interdisciplinary perspective across the domains of philosophy, sociology, human geography, urbanism, the socio-material, and the legal/regulatory.

Edges. In an urban context, Lynch [15] describes the physical form of cities in terms of five elements – paths, edges, districts, nodes, and landmarks, noting that this contributes

to heightening attention and enriching experience. Drawing on the work of Dutch sociologist, De Jonge, on the *edge effect* [21], Gehl [18] applies the concept to urban areas "where the preferred stopping zones also are found along the borders of the spaces or at the edges of spaces within spaces." Gehl [18] notes that edge zones "offer a number of obvious practical and psychological advantages as a space to linger" concluding that "events grow from inward" as people move from inside a building, to outside, along the façade, and "from the edge toward the middle of public space." Gehl [18] cites the work of Alexander [22] in the context of "the edge effect and edge zones in public spaces", noting that, "if the edge fails then the space never becomes lively." Casey [11] provides an analysis of edges and discusses whether places have edges from a philosophical and phenomenological perspective. Defining places as "any spatial spread ranging from a bioregion or a national territory to a human settlement of any kind," Casey argues that places must have edges in order to be coherent. Casey identifies a relationship for places and edges, claiming that they interact and concluding that places indeed have edges, in the form of boundaries. Further, Casey adds that, "places as well as events" including experiences, "come fully edged." Casey adds that boundaries pertain to other entities including persons, groups, and so on. Characteristics of boundaries are identified by Casey as indeterminate, absorptive, and osmotic, as distinct from borders, as more fixed, precise, and distinct. Casey indicates that, "porous and vague is to allow, and sometimes to facilitate movement" [11] and that porous also denotes, to take in and to give out [12]. Where Casey notes that places intersect, Wapnick [23] reminds us that it is at the intersections that innovation occurs.

Thwaites, Mathers, and Simkins [24] note that "the two adjacent realms of the edge are not independent but are mediated by it and this means that edges have intrinsic permeability in their capacity for connectivity between realms." Thwaites et al. [24] cite Jacobs [25] who stated that, "the best streets have about them a quality of transparency at their edges." According to Casey [12] edges are also associated with margins and points of access. It is worth noting that this conceptualization of edges and boundaries gives way to the potential for extension to interactions with social media, the Internet, and other aware technologies.

Surfaces. Discussing urban form in terms of *settlement form* or the physical environment, Lynch [15] refers to "the spatial arrangement of persons doing things" and "the resulting spatial flows of persons, goods, and information and the physical features which modify space in some way significant to those actions" citing "enclosures, surfaces, channels, ambiences, and objects." Lynch [15] refers to continuity as "continuance of edge or surface" using the examples of "a street channel, skyline, or setback." Lynch further claims that "citizens converse, using the surfaces of the city." Schmitt, in Future Cities [26], notes that by looking beyond the surface of a building, a city, or landscape, much more invisible information becomes available that can be used for design and planning purposes.

Spaces. Lévy [27] interprets the concept of spaces as environments and spatialities as actors in the urban context while defining inhabiting as "a successful encounter between space and spatialities." As such, "the various spatialities and the multiple spaces that constitute a society are made compatible and take advantage of each other in a dialogical interaction" [27]. Thwaites et al. [24] cite Madanipour [28] who noted

that, "in practice, public and private spaces are a continuum, where many semi-public or semi-private spaces can be identified, as the two realms meet through shades of privacy and publicity rather than clear cut separation." Advancing space as "practice, problem, and theory", Lévy [13] notes that people are space, that "we are constantly changed by space", and that "we constantly change it through our acts." Further, Lévy [13] claims that we experience and create "contact, remoteness" in between "different kinds of nearness." According to Lévy, people are multi-sensorial; are able to interact with the world in multiple ways; and interact "through immaterial vectors" as in, telecommunications and the Internet as space, contributing to the importance of space in the digital society [13]. Baude [14] articulates how the Internet is a real space that responds to our need to overcome a range of things including distance and time. Baude argues that the space of the Internet is a new type of space and an innovation of space that is continuing to be evolved and remade based on our emerging uses.

In-Between. Casey considers that the in-between is not confined to the surface but rather, "has a depth of its own that is part of the surface itself" [12]. Speaking of transitional edges, Thwaites et al. [24] note that, "in the streetscape, this edge environment is widely recognized as having an important function in framing and forming space in between buildings", citing Jacobs [25]. Casey [12] argues that edges "open up possibilities" and "come in a plurality of types" and that "when we are in the midst of any activity we are *in-between* edges," as in, interspace. Casey speaks of "edges of things and events and persons that together constitute the in-between" where activities happen.

2.2 Awareness, Infrastructure, and Experience

Hildebrandt [29] points to the importance of "how the emerging ICT infrastructure reinvents us" and that "affordances such as a certain degree of autonomy cannot be taken for granted." As such, Hildebrandt [29] adds that "actual re-engineering and active participation in the design of the novel architecture of everyday life" are required, providing the context for a discussion of the practice and research literature on awareness, infrastructure, and experience.

Awareness. In an organizational and organizing context, Orlikowski [30] commented that, "I think people forget they have a choice" and in instances where "people recognize they have a choice they might not act on it" because "the consequences of that choice are often tough." Indeed, Orlikowski [30] states that "I'm not even sure people are aware that they have a choice" pointing to the importance of context and the identification of three components – "It's awareness, choice, and action." Reflecting on this interview with Orlikowski [30], Scharmer identifies a link between her work and "that of Arthur, Varela, Rosc, Bortoft, and Nan" in relation to "the different qualities of awareness from which we can choose to act."

Lévy [13] argues that it would be "an error to assign the smallest scale to the individual just because the human body is tiny in comparison with a city." Features such as mobility, multi-dimensionality of the senses (multi-sensorial sensors), and technology-enabled bodily movement "through immaterial vectors" give rise to a vast potential for reach and influence so that humans "are not reducible to the size of their bodies." Here the

intersection between people, technologies, and information gives way to emerging and expanding considerations for awareness and action in the city.

A typology of techno-effects was introduced by van den Berg and Leenes [31] to expand what they consider is a limited focus of techno-regulation that, "overlooks non-legal forms of intentional influencing on the one hand, and implicit, unintentional forms of technological influencing on the other." The first typology involves the concepts of *pervasive technologies*, *nudge*, *affordances*, and *techno-regulation* plotted in relation to the level of choice and compulsion on the one hand, and the level of user awareness, where the intention to influence behavior is present. The second typology features the concepts of *scripts*, *anthropomorphisation*, *the media equation* ("eliciting social responses to technology"), and *techno-regulation* plotted in relation to the level of choice and compulsion, and the level of user awareness, where the intention to influence behavior is unintended, implicit, and automatic. Hildebrandt [29] claims that "by providing a framework that goes beyond the usual dichotomy of effective or ineffective technological measures" van den Berg and Leenes "have opened a new field of research" important for "democratic legislators, courts and citizens as well as designers, producers and users of technological artefacts." Acknowledging that the study of techno-effects is "no straightforward matter", van den Berg and Leenes [31] caution that "predicting techno-effects always ought to be a contextual, technology-dependent matter" given the characteristics of different technologies along with variation of use by technology and user group.

Infrastructure. Cohen [32] identifies three generations or waves of the smart city with the current or third wave as Smart Cities 3.0 involving co-creation. Where 1.0 focused on the technology-driven smart city and 2.0 is city-driven, Cohen sees promise in a combination of all three. Leveraging 2.0 to enable and encourage urban entrepreneurship, Cohen advises that "cities must move from treating citizens as recipients of services, or even customers, to participants in the co-creation of improved quality of life." Expanding upon the notion of stocks and flows of goods and services, Lévy points to the importance of "stocks of experience and acting capacities" of people in urban spaces [13], a possibly relevant way of thinking about awareness and further endorsement for the emphasis placed on action and choice by Orlikowski [30]. Dourish and Bell [33] remind us that infrastructures are "normally taken for granted" and that "new technologies inherently cause people to reencounter spaces." Inverse infrastructure described by Egyedi and Mehos [34] as ad hoc, user-driven, adaptive development from the bottom up, broadens the potential scope of agency and involvement [35] and opportunities for awareness, choice, and action.

Experience. Dourish and Bell [33, 36] refer to the transformations that are emerging in terms of how "we experience and interact" as computation increasingly moves "off the desktop and into the world" around us "as an aspect of the everyday environment." The world of embedded and wearable technologies is explored by Dourish and Bell in relation to implications "for encounters with space" where space is held to be an infrastructure for both technology and the "experience of the world" [33]. Thwaites et al. [24] claim that "the properties of permeability and transparency are closely related" where the latter "enables us to experience the interplay of 'here' and 'there' by means of features which allow us awareness of nearby settings."

2.3 Summary

In summary, complex issues pertaining to aware technologies in urban environments give rise to the need for philosophical and phenomenological perspectives on edges, surfaces, spaces, and the in-between to complement and extend algorithmic and network perspectives. Additionally, the urbanism literature provides insight for leveraging social media interactions and discussions in the city in relation to awareness, infrastructure, and experience. As such, this review of the literature provides the theoretical perspective for formulation of a conceptual framework, depicted in Fig. 1, to guide exploration of the research questions for this study in terms of connectivities and awareness involving choice and action.

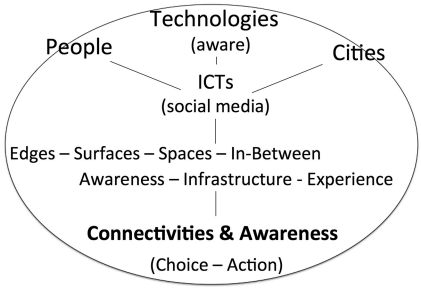

Fig. 1. Conceptual framework for awareness, choice, and action in 21st Century Urban Spaces

Research Questions.

Q1: Do edges, surfaces, spaces, or the in-between contribute to greater awareness in relation to choice in contemporary urban environments?
Q2: How do social media and other aware technologies support opportunities for action and choice in contemporary urban environments?
Q3: What is the nature of the relationship between connectivities and awareness for choice and action in contemporary urban spaces?

Propositions corresponding to the research questions are as follows.

Propositions.

P1: Edges, surfaces, spaces, and the in-between contribute to greater awareness in relation to choice in contemporary urban environments.
P2: Social media and other aware technologies contribute to emerging understandings of urban infrastructures fostering opportunities for action and choice in contemporary smart city environments.
P3: The experience of evolving urban infrastructures contributes to greater connectivities in support of greater awareness, influencing choice and action in the city.

3 Methodology

The research design for this study employs an exploratory case study approach incorporating multiple methods of quantitative and qualitative analysis. This study spans a 7-month timeframe from mid 2015 into 2016, across multiple small to medium to large sized cities in Canada and extending to northern Europe. Interest and involvement was sought from people 18 years of age and older. In parallel with this study and beginning 5 months earlier, anecdotal evidence was gathered over a 1-year period through informal individual and group discussions with people across the city. The methodology is described in more detail in Sects. 3.1, 3.2 and 3.3 in terms of the process used, sources of data collection evidence, and the analysis of data.

3.1 Process

This study invited a cross-section of people in the city in the use experience of an interactive, city-focused, minimally viable social media environment. Study participation accommodated individuals across six categories: city officials, business, community members, educators, students, and visitors to the city.

After registering for the study and sharing minimal demographic data (e.g., age range, urban location, and self-identification in one or more of the six categories), participants were assigned an anonymous alpha-numeric identifier and invited to share information about their city pertaining to noticing and ideas. Content contributed to the social media webspace was available for viewing, comment, and interaction by participants in real time. Follow-up, in-depth interviews and an optional online survey were used to explore the research questions under study.

3.2 Data Collection

This study utilized multiple methods of quantitative and qualitative data collection, including webspace activity, a semi-structured online survey, and in-depth interviews. Interviews focused on use experience with the social media webspace, content creation, and questions related to smart and aware cities. Anecdotal evidence [37] was gathered from people across the city in parallel with this study, through informal group and individual discussions conducted in local coffee shops, online/phone, and in urban workshop and other informal group spaces.

3.3 Analysis of the Data

Quantitative data analysis included the use of descriptive statistics. Content analysis was employed inductively for qualitative data emerging from interviews and discussions and deductively, drawing on terms from the research literature to guide data analysis. Anecdotal evidence from informal discussions gathered in parallel with this study supported further data analysis, comparison, and triangulation. Overall, data were

analyzed for an n = 16, spanning age ranges of people in their 20 s to their 70 s, and included a gender representation of 55 % male and 45 % female.

4 Findings

Findings are presented in Sects. 4.1, 4.2 and 4.3 in relation to the research questions, focusing on the three propositions explored in this study. A summary of findings is provided in Sect. 4.4.

4.1 P1: Edges, Surfaces, Spaces and the In-Between: Awareness

Common throughout interviews and discussions with individuals and groups was the concern with the face-to-face and the non-physical and how the two realms work together. For example, a city councilor emphasized that "its important to think of technology as a tool" and as an aid and an augmentation that "allows us to have a safer more vibrant city." An educator pointed to physical spaces in the city, such as a fountain, to bring people out and together. And a community member identified a range of intersecting modes of transport that can be used to move from point A to point B. A local community placemaker talked about ad hoc, pop-up events, stating that, "we like to do those to demonstrate how a space can change" and to "look at any given space and analyze what's working and what isn't and what could improve it."

The importance of multi-purpose spaces was identified by one participant who stated that, "the survival of cities is that they are these multi-purpose spaces." Thinking about surfaces in the city, an educator questioned whether the corporate advertising on a local building display screen could be "seen differently" in terms of purpose. A government official used Oldenburg's [38] notion of a third place to refer to coffee shops as the space in-between "home and work." This in-betweenness is further described as the connectivity that occurs between people. Referring to routes of connection in Toronto, a community member noted that "you have so many different choices" of getting from point A to point B, "depending on the weather, the traffic, who you are with." So, "the city allows you to make choices about how you are going to get from A to B" and additionally, "its not just allowing you to make choices" but enables "customizing your own experience." For example, "a series of underground liveliness" including tunnels and walkways were described where, "the city is allowing you to play in it" contributing to a "game aspect." From a technology perspective, a business-person spoke of connectivity enabled by GPS (global positioning systems) within the city as outside-in and more recent GPS developments within buildings in the city as inside-out. With the increasing pervasiveness of connectivity, this individual observed that "everyone could work at home but they choose not to" as witnessed by the emergence of businesses renting shared urban workspaces.

4.2 P2: Social Media and Aware Technologies: Infrastructures for Action

A city councilor recalled that, "we held our first interactive e-TownHall" featuring a discussion of the strategic plan for the city. So, in addition to the face-to-face meeting at City Hall, "we were able to get feedback from people sitting at home who were watching the livestream video." The councilor later commented that the social media space would be "one place where we will be looking to use online tools" in the development of a youth engagement strategy. The space of conferences was described by an educator in terms of bringing people together from around the world. When a conference session uses a speaker background screen of Twitter feeds it was acknowledged that, "you've got 500 people at a conference but you've actually got 5000 that are participating in that conference through the Twitter feed." In the case of the interactive e-TownHall meeting, a city councilor noted that, "not only did we have a packed house in person" there was "also, an overflow room" that "had hundreds of people watching the video, tweeting, sending direct messages that we could respond to." As such, social media was described by the city councilor as able to, "definitely create discussion and connections." An urban placemaker used the example of a blog as social media where a post about "library boxes" resulted in unexpected interest and interactivity, contributing to an interweaving of Twitter activity, Google mapping, new connections, engagement and participation, 'things' in the form of books, and video sharing.

4.3 P3: Urban Infrastructure: Connectivities and Awareness for Action

The importance of an elaborate fountain in an urban space was described by an educator in terms of how people gather in this space, take notice, speak to each other, pause, and interact. The fountain was described as a touchstone that "brought people out" where they would say, "did you see that, did you see, look at how neat that is." The fountain also contributed to 'fun' and "made people talk." The erecting of temporary overflow spaces by the city, in multi-purpose fashion, outside a main sports event in Toronto using a giant jumbotron television screen was identified by a community member as "bringing a city together," accommodating up to ten thousand people in an urban space. A European educator described a "mobile cloud-based app to capture and share insights, feedback, and knowledge" as a "simple, cost efficient" mechanism for "instant awareness" intended for "business, design, infrastructure, learning, safety, sport, and tourism." An urban placemaker described "ways to animate a space" using the example of a city parkade with embedded sensor technology that "plays different sounds as you go up based on where you are in the stairwell" and the "lighting changes." An educator in Finland commented that, "one thing I really like about the city is that it is compact" with "smart construction, including lights" aiding flows of traffic and pedestrians.

In the context of a discussion about inverse infrastructure initiatives, a technology entrepreneur articulated the plight of taxi drivers paying high fees in adherence with regulatory requirements, now confronted with a largely unregulated Uber travel movement. An individual in the tourism sector argued that the Uber travel movement is

creatively "piggybacking on someone else's infrastructure in a way that is win win." An engineering student identified an interest in speaking with local government and community members to look for "an opportunity maybe for making the city a little smarter" motivated by the hope of changing "people's minds so they follow a more green way." A business technology entrepreneur highlighted the importance of the "smart city thought process" as a "wonderful thing that connects all the pieces," including "people, community." Another educator suggested, "lets spend less time *finding* the connection" and more time "actually *making* it," adding that people "choose to live somewhere" attracted in part by "smart infrastructures" and more livable lifestyles.

4.4 Summary

In summary, Table 1 provides an overview of findings pertaining to the research questions and the three propositions under exploration in this study in relation to connectivities, awareness, choice, and action. Proposition 1, encompassing edges, surfaces, spaces, and the in-between, was found to contribute to connectivities, awareness, choice, and action in the city. Similarly, Proposition 2, encompassing social media and other aware technologies was also found to contribute to these four elements, as was Proposition 3, encompassing urban infrastructures such as mobility, public spaces, and multi-purposefulness.

Table 1. Proposition findings: connectivities and awareness for choice and action in the city.

	Connectivities	Awareness	Choice	Action
P1: Edges, surfaces, spaces, in-between	✓	✓	✓	✓
P2: Social media, aware technologies	✓	✓	✓	✓
P3: Urban infrastructures	✓	✓	✓	✓

5 Discussion

A discussion of the findings is presented in Sects. 5.1, 5.2, and 5.3, organized in terms of three components: connectivities; awareness; and the infrastructural elements of edges, spaces, and surfaces for action and choice. A summary of the discussion follows in Sect. 5.4.

5.1 Connectivities

Where urban spaces bring people together and encourage talking and interaction, the possibilities for connectivities were found to extend to other urban spaces as evidenced by the e-TownHall example provided by the city councilor, enabling participation through video connection, Twitter, and other social media spaces. The example provided by an educator of conference presentations accompanied by live Twitter feeds,

demonstrated the potential for global connectivities involving many people in addition to those physically attending the event. The sports event where the city created a temporary, community-accessible overflow space for thousands of people, aided by jumbotron screens broadcasting the inside event to the outside audience, demonstrates the adaptive and ad hoc creation of urban public spaces for interaction, community connection, and any number of creative initiatives. Pop-up, ad hoc events organized by urban placemaking networks, in conjunction with city officials and many other people in the community, demonstrate temporary alterations and interactions with infrastructure, enabling emergent connectivities with the potential to influence action, awareness, and choice, going forward.

5.2 Awareness

Engaging people in discussions about noticing, idea generation, and the use of social media and other aware technologies in the city revealed considerable interest in awareness about the city, smart technologies, and the smart cities phenomena. Where urban spaces can be designed to bring people together and encourage talking, connection, and interaction, the possibilities for awareness also emerged around the interweaving of such spaces with social media and other aware technologies. In a world where increasing numbers of people carry or wear a mobile device of some type, the potential for additional awareness generation emerges. For example, the blog about "library boxes" generated action and awareness in the form of tweets, photos, video, Google maps, and other mixed media. Thinking about surfaces in the city, an educator commented that the corporate advertising on a local display screen could be enhanced for more informative purposes beyond advertising, "if it was used differently." Used differently, public display screens can become spaces for deeper information sharing, content generation, awareness, interaction, and action.

5.3 Edges, Spaces, and Surfaces for Action and Choice

The social relevance of urban edges [17] was found to extend and become interwoven with edges, spaces, and surfaces for action involving the use of social media and other aware technologies. For example, the realization emerged that conference spaces have the potential to attract many more visitors when presenters open presentations to social media spaces such as Twitter. As such, the space for action, experience, and choice broadens, enabling new forms of engagement, learning, and participation. In a moment of realization about the interactive e-TownHall meeting, a city councilor commented that, "so in that way, that is an interactive experience that makes the city more real for those people." Discussion of the Uber travel movement in the context of inverse infrastructures enabled information sharing and new awareness and insights to emerge.

Urban spaces were found to become multi-purpose beyond traditional, physical notions, to incorporate the innovations in space afforded by the Internet, social media, and other aware technologies. Indeed, content generated in multi-purpose urban spaces opens the way for further multi-purpose potentials. As the spaces, edges, and surfaces

of the physical are made to connect and interweave with the spaces, edges, and surfaces of the online or the 'immaterial', the intermingling of realms enrich and enliven each other, enhancing connectivities on the one hand and the potentials for awareness, choice, and action on the other. This intermingling offers opportunities for the evolving and enriching of relationships and partnerships across the city where barriers may previously have existed.

5.4 Summary

In summary, this work explored the potential for shedding light on, beneath, beyond, and around urban edges, surfaces, spaces, and in-between-ness in relation to emergent infrastructures of connectivities and awareness enabled through social media and other aware technology experiences, interactions, and activities in the city. Findings highlighted in Table 1 (Sect. 4.4) point to the interweaving of different types of infrastructures in the city and to the enmeshing of people and technologies within, between, and beyond urban edges, spaces, and surfaces. The four parameters – connectivities, awareness, choice, and action – are affirmed with a check for each of the three propositions. As such, this study highlights and reaffirms the importance of the people, technologies, and cities dynamic of smart cities [39, 40], shedding light on the importance of human awareness, choice, and action about the use of aware information and communication technologies (ICTs).

This exploration of edges, spaces, surfaces, and the in-between identifies new possibilities for action and choice in relation to connectivities and awareness. As such, this work operationalizes the conceptual framework for urban connectivities and awareness depicted visually in Fig. 1 (Sect. 2.3) as an approach intended for broader use in the city. This work extends edge, space, and surface theorizing in urban environments to social media, Internet, and other aware spaces enhancing connectivities and awareness in the smart city. As actors in the urban context, new understandings of people as forming part of, and contributing to, the critical infrastructure in smart cities emerges. As such, Dourish and Bell's [36] *infrastructure of experience* finds a home in smart cities and it is this human infrastructure, consisting of the critical components of connectivities and awareness, that serves to possibly moderate and provide balance for concerns with techno-effects [31] and the theme of this Human Choice and Computers (HCC12) conference – *technology and intimacy: choice or coercion*.

6 Contributions and Future Directions

This paper makes several contributions relevant to research and practice. First, this work contributes to the research literature across multiple domains, including but not limited to awareness, choice, and smart cities. Second, a conceptual framework is developed, operationalized, and advanced for awareness, choice, and action in 21st century urban spaces. As such, this framework offers a perspective on connectivities and awareness featuring an interweaving of aware people using aware technologies, as a way of possibly mitigating 'techno-effects' and concerns with the choice or coercion

dilemma. Third, in developing new understandings of the potentials associated with the interweaving of connectivities and awareness across physical and electronic spaces, this work is expected to open discourse areas for awareness research in relation to 21st century cities. As such, this work identifies future directions and opportunities for practice and research.

6.1 Future Directions for Practice

Awareness, Choice, and Action. Offering an alternative view of the concept of edges, edgefulness, surfaces, spaces, and the in-between in the context of aware people using aware technologies, this work offers insight into the potential for choice and action in urban environments. As such, opportunities emerge for initiatives fostering more meaningful engagement, learning, and participation in city life.

6.2 Future Directions for Research

Awareness, Choice, and Action in 21st Century Urban Spaces. The conceptual framework for awareness, choice, and action in 21st century urban spaces advanced in this paper is intended for broad use by: educators, researchers, city officials, and many others. This framework will benefit from further use and development going forward, with the potential to open the way for new research and practice approaches and opportunities.

Awareness and Choice in Smart Cities Research. Insights emerging from this paper contribute to opportunities for further development of contemporary urban theory and to a discourse space related to awareness and smart cities.

7 Limitations and Mitigations

Limitations of this work associated with small sample size are mitigated by in-depth and rich detail from a wide range of individuals across small to medium to large urban centers. The minimally viable social media webspace presented challenges that were mitigated by additional information sharing during in-depth interviews. Anecdotal evidence collected from informal individual and group discussions conducted in parallel with this study, contributed added rigor through further data analysis, comparison, and triangulation and is considered to be an important source of data by Trochim [41] and others [37].

8 Conclusion

In conclusion, through the use of an edges, surfaces, and spaces lens incorporating an interdisciplinary perspective, this work contributes to a discourse on the importance of fostering opportunities for awareness among people about cities and smart technologies. Using a minimally viable social media space, this study introduces an emergent environment for exploring connectivities and awareness in contemporary cities. This work makes a contribution by advancing a theoretical perspective to complement and enrich computational, network, and algorithmic views of social media by extending edge, space, and surface theorizing in urban environments to social media, Internet, and other aware spaces for enhancing connectivities and awareness in the smart city. Second, this work contributes to the research literature across multiple domains, such as awareness, choice, and smart cities. Third, a conceptual framework is developed, operationalized, and advanced for awareness, choice, and action in 21st century urban spaces offering a perspective on connectivities and awareness that features an interweaving of aware people using aware technologies, as a way of possibly mitigating 'techno-effects' and concerns with the choice or coercion dilemma. Fourth, in developing new understandings of the potentials associated with the interweaving of connectivities and awareness across physical and electronic spaces, this work is expected to open discourse areas for awareness research in relation to smart cities. Finally, this work identifies future directions and opportunities for practice in terms of *awareness, choice, and action* and for research in terms of a *conceptual framework for awareness, choice, and action*, and *awareness and choice in smart cities research*.

An important take away from this work is the emphasis on the importance of people, physical spaces, and the innovation of space afforded by social media, the Internet, aware technologies, and the Internet of Things (IoT). Taken together, this highly interwoven dynamic – people-technologies-cites – gives way to the potential for more balanced approaches and opportunities for action and choice enabled by connectivities and awareness. This work will be of interest to practitioners and researchers and will have implications for culture, policy, privacy, and sharing. Educators, city officials, urban planners and developers, awareness researchers, and anyone concerned with innovating infrastructures and relationships in support of vibrant, sustainable, and livable communities and cities will be attracted to this work.

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