Human and Value Sensitive Aspects of Mobile App Design: A Foucauldian Perspective

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Abstract. Value sensitive concerns remain relatively neglected by software design processes leading to potential failure of technology acceptance. By drawing upon an inter-disciplinary study that employed participatory design methods to develop mobile apps in the domain of youth justice, this paper examines a critical example of an unintended consequence that created user concerns around Focauldian concepts including power, authority, surveillance and governmentality. The primary aim of this study was to design, deploy and evaluate social technology that may help to promote better engagement between case workers and young people to help reduce recidivism, and support young people's transition towards social inclusion in society. A total of 140 participants including practitioners (n=79), and young people (n=61) contributed to the data collection via surveys, focus groups and one-one interviews. The paper contributes an important theoretically located discussion around both how co-design is helpful in giving 'voice' to key stakeholders in the research process and observing the risk that competing voices may lead to tensions and unintended outcomes. In doing so, software developers are exposed to theories from social science that have significant impact on their products.

Keywords: Governmentality, Value Sensitive Design, Co-Design

1 Introduction

The software engineering community does not traditionally evaluate research artefacts from theoretical positions located in social sciences. Given software pervades our daily lives and our social transactions, this is a potentially serious deficit. We argue that the design of information systems in the context of widespread ubiquity, mobile device based deployment and hidden data interchange places new challenges on designers and implementers of systems. In particular the need to preserve key human (moral) values such as privacy, security and autonomy within the design process is paramount. We propose that identification of values and tracing their subsequent governance through software design process remains relatively neglected, and potentially detrimental to final acceptance of software if not done. Scholars such as Van den Hoven, writing on the role of value sensitive design for ICT, made a similar and earlier case:

"...these values will have to be expressed in the design, architecture and specifications of systems. If we want our information technology - and the use that is made of it - to be just, fair and safe, we must see to it that it inherits our good intentions. [25].

Van dan Hoven however was making the case from a philosophical perspective and the *engineering* of values into the design process remains elusive.

The role of information systems especially in their new guise of *apps* delivered through sensor rich smartphones is particularly pertinent. Significantly, organisations responsible for these apps should recognise that their corporate actions, with respect to design and deployment of such systems, have a profound impact on all aspects of societal welfare including concerns around invasion of privacy and security concerns around the sharing of data.

This paper draws upon an empirical inter-disciplinary study involving social and computer scientists engaged in building mobile app based social technology to promote positive engagement between case workers and young people in youth offending teams in England. Such intended positive use is in direct contrast to prior use of technology in this domain, which has largely been for two reasons [18]. Firstly, in its attempt to manage risk, private firms such as G4S and SERCO are contracted to electronically monitor the movements of young offenders in the community. Secondly, technology is employed as a tool for data management and this signals its own tactics of surveillance and discipline. Both efforts are part of the general move towards neoliberalism in public services and the so-called new public management models that emerged in the early 2000s [19].

The thrust of this paper explores (moral) universal values and their incorporation into the design of a mobile app. The paper presents an analysis of the French social theorist Michel Foucault's writings on 'how the human subject is governed and fashioned by disciplinary power' [6, :221]. Examination of software practice and the resultant artefacts from such a lens became significant because the methodological approaches (co-design) used in the mobile app study elicitated a class of non functional requirement we refer to as a *value*. In the context of technology artefacts, values are what Friedman refers to as: ownership and property; privacy, freedom from bias, universal usability, trust, autonomy, informed consent and identity. She defines values as: *what a person or group of people consider important in life* [11]. Further, reinforcement, or erosion of such values occurs through the use of software either through deliberate design or through accident.

This exploration is used to appraise the development of our own social technology as a tool for positive engagement in the youth justice sector and to critique Foucault's idea of surveillance in the context of the findings from our study. In this exploration, we contribute a critical discussion of the potential risks of designing technologies that have un-planned side effects around surveillance and propose that software engineering practice has to find ways to account for these human impacts arising from technology. While recognising the case study limitations of our work, the risks and concerns identified in this paper have relevance to designers of software for widespread consumer use. Our intention is to invoke

discussion amongst engineers who would not normally consider such concerns from a social science perspective.

The remainder of the paper is structured in structured in four segments. In Section 2, key Foucauldian theoretical positions on governmentality are sketched out together with an outline of the context within which youth justice is currently located [13, 14, 20]. In Section 3, we provide the reader with a background to our study aims and methods, together with an understanding of co-design and value sensitive approaches as tools for inclusion and empowerment. Section 4 presents a qualitative discussion on our findings related to the concerns generated from adopting a Foucauldian perspective and the impact on values in the software design process [10]. In section 5, concluding remarks are made.

2 Theoretical Background

2.1 Governmentality, Discipline and Knowledge

The French social theorist, Michel Foucault, has left an important legacy in his writings on the genealogy of the modern state. His studies on power, knowledge, surveillance, and governmentality have a broad cross-disciplinary appeal. Although, Foucault died before the advent of the Internet in public spaces, his theories lend themselves to an understanding of information technology. Indeed, Foucault's reach is such that he is beginning to wield some influence beyond the Social Sciences to the disciplines of Information Systems and Computer Science [28, 1, 5].

Several writers have suggested the increasing importance of Foucault's theoretical ideas to our understanding of the ways in which the state seeks to manage crime and criminal justice processes in modern society [15, 13]. One of the central planks of Foucault's work, generally discussed, is the notion of governmentality. Governmentality as a concept arose originally from Foucault's lectures at the College de France as part of a broader concept of what he called the 'art of government'. The governmentality thesis holds that the modern state wields tremendous power in the government of its populations through an ensemble of institutions, procedures, analyses and a series of social practices including codification. Notions of power and episteme are central to this. In line with Foucault's own later work where he attempted to respond to criticism of his work for its deterministic and narrowly defined approach to state power, we adopt a broad understanding of governmental power and focus on human agency and resistance to the processes of subjectification [4, 13].

Within the framework of neoliberal governmentality [12] we seek to advance Foucault's idea of surveillance in the context of the findings from our study. Foucault's application of, 19th century English political philosopher, Jeremy Bentham's Panopticon, to understand the 'art of government' is of key relevance for our purposes. Bentham's architectural design of a Panopticon prison sought to ensure that discipline and subjectification were to be achieved through this structure in which a guard in a central tower could see into the cells and maintain power and surveillance at all times [2]. Foucault [9, :203] outlined that the major

effect of the Panopticon was to 'induce in the inmate an illusion of of conscious and permanent visibility that assures the automatic functionality of power', and in this process, the inmate 'becomes the principle of his own subjection'. It is Foucault's analysis of discipline and the use of the Panopticon as an analytical tool for discussing institutions and society that the Panopticon in the form of *panopticism* has become the mostly widely used metaphor and explanatory theory for surveillance today.

The idea of the Panoptic society in our current information technology age is extremely apt. Willcocks [28] reminds us that although the word technology appears in Foucault's work, he rarely defines it for the reader. It is terms such as 'technologies of power', 'political technology of the body', 'disciplinary technologies', and 'technologies of the self' that have a fascinating appeal for contemporary scholars as they lend themselves to be employed as useful explanatory tools.

Gane, writing in 2012, proposes a heuristic typology for panoptic governmentality [12]:

- surveillance and discipline: where the state watches over the market and over its citizens, where watching is sufficient and intervention only happens when necessary;
- surveillance and control: where subjects are not limited to physical space and non-state actors such as commercial organisations also do the watching;
- surveillance to promote competition: the state or its proxy actors strive to create conditions for the freedom of markets, and through it, achieve legitimacy.
- interactivity: an inversion of the panopticon architecture so that the many watch the few.

As we will observe in later sections, these typologies are apparent in the technology described in this paper.

It is important to provide the youth justice context within which our social technology is located. We draw on the work of other writers who have paved the way to advance an argument of governmentality and youth justice.

2.2 Governmentality and Youth Justice

The discipline of criminology has a long tradition of studying youth crime to identify risk factors that pre-dispose young people to become involved in criminal activity. Such factors are generally located within a socio-economic context, and psycho-social behaviours and practices. Some writers have classified such knowledge to make actuarial predictions of would be young offenders [7].

The influence of risk predictive studies is evident in the technologies of government that are operational within youth justice. Arguably, these include the use of the ASSET risk assessment form[3] in youth offending teams in England and Wales, and the strategies of responsibilisation. Data collected from such instruments and further coupled with data from other information systems deployed

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[3] https://www.gov.uk/government/publications/asset-documents

within the sector allows comparisons and consolidation across time and space. Ultimately this can support an 'economic' rationality – the increasing reliance upon an "analytical language" of risks and rewards of objectives/targets [13].

Although Foucault did not consider the notion of risk in his work, we can see that the risk paradigm in contemporary neoliberal society fits in very well as technology of governmentality. Through their regular risk assessments (using the ASSET form instrument), the young offenders become marked/visible, and are served with the tools of self-discipline to become good neoliberal subjects. It is the management of risk and responsibility, during their involvement with the youth offending team, that will lead to subjectification. Here, the 'technology of responsibilisation' serves as a tool of governmentality. A recent study of 29 young offenders, distils the youth justice policy and practices of responsibilisation in three ways – 'reconfiguring the field of governance, extending the reach of governance and the ethical construction of the subject' [20, :433]. The key focus here is on governmentality of the new liberal state and the ways in which it operates to exercise power through key mechanism and processes (government/non-government agencies, civil society, bio-power, risk-based reasoning) to achieve 'governance at a distance' through 'mobile mechanisms' and thereby construct 'non-deviant, neoliberal citizens' [13, 20]. Such governmentality relies on a powerful discourse of 'evidence-based practice', efficiency, and effectiveness in the fight to prevent crime. Muncie reminds us that such a discourse 'of 'what works' is deceptively benign, pragmatic and non-ideological' [17, :778].

3 Study aims and methods

The socio-technical context for this research concerns young people in the UK Youth Justice system. Research suggests that engagement with young offenders to help promote social inclusion and prevent re-offending remain key challenges for public policy and youth justice service providers [24].

This study aimed to explore how social technology could be developed and adopted for the purposes of promoting better engagement between young offenders and their case workers. Our MAYOT (Mobile Applications for Youth Offending Teams) project developed a personalised mobile app for use by young people and their case workers in youth offending teams. The app provides relevant, timely information to a young person as well as features such as ease of access to their case history, relevant contacts such as professional networks, peer networks and their family networks. Given that, currently, digital tools that could engender closer engagement and encourage co-creation between case workers and young offenders are not available, we set out to address this gap.

The study adopted a mixed-methods approach to determine the current and intended/desired use of technology. A quantitative questionnaire was employed to establish the patterns of communication between young people and case workers. A total of 33 young people and 43 case workers contributed to this self-completion survey, from three youth offending services, representing inner-city (*Site 1*), urban (*Site 3*), and rural locations (*Site 2*) in England. The question-

naire sought to gain insight from case workers on their existing use of technologies.

The core of the method was the requirements elicitation process approach adopted. A combination of co-design and value-sensitive design approaches (VSD) [11] were used in the collection of data and the building of the mobile app. Co-design (and its earlier form of participatory design [3]) is a well established design approach for working with end-users.

Co-design involves potential (un-trained) end users working with researchers and designers using tools provided to jointly create artefacts that lead directly to the end product [22]. Yoo et al (2013) state that co-design has become a dominant user study methodology in the fields of product design, service design, interaction design and Human Computer Interaction (HCI) [29].

In our study, we advanced the use of co-design methodology in software engineering by embedding a VSD approach within it. Here, values include privacy, trust, freedom from bias, universal usability, autonomy, informed consent, identity and others.

VSD emerged to integrate moral values (and more broadly ethics) with the design of systems to address the issue raised by Wiener (1985) when he argued that we should be the masters of technology, not worshippers [27]. A key premise of VSD is that it seeks to design technology that accounts for human values throughout the design process (over and beyond the identification of functionality and visual appearance) of systems. Leading advocates of VSD have included those focused on technology such as Terry Winograd, Batya Friedman [11], and Nissenbaum [8] whose work identified issues of freedom from bias in systems. That is, computer systems should not systematically and unfairly discriminate against certain individuals or groups of individuals in favour of others [11]. Others such as Van der Hoven have explored value sensitive design through a philosophical lens, such as 'just' design.

Our study used co-design through a series of participative co-design workshops in a mix of inner-city, urban and rural settings. 17 case workers and 10 young people participated across two co-design workshops to contribute ideas to the design and development of the mobile app. Following the first co-design workshop in our inner-city location, mock-ups were created and represented in screen captures as co-designed requirements. These were presented to a new set of case workers and young people in the second workshop in our rural location, to capture their perspectives on the planned design. A software prototype, that we called the MAYOT app was developed. The requirements leading to the design of prototype were independently evaluated in our third urban research site. Here, a total of 11 respondents (7 case workers, and 4 young people) participated in a co-design workshop to provide us with their perspectives on the requirements. Self-completion questionnaires were also completed by these respondents to give us a sense of their everyday use of technology and techniques of communication between case workers and young people.

Following the data collection processes outlined above, the software comprising a web-based application (for use by the case worker) and a mobile app (for

the young person) was developed and then deployed in our case study sites. A further admin-web interface provided administrative functions for use by the researchers. Interviews were conducted with 26 respondents (14 young people and 12 case workers) who had made use of the software. These interviews reflected the views and experiences of users in all three of our research sites.

Participation was voluntary for all respondents and the use of the software was subject to ethical guidelines from the British Sociological Association. Participants were reassured that the technology was supplementary and data arising from its use would not be used to adversely affect participants.

Data analysis involved descriptive analysis of the survey demographic data and Internet use, and a thematic analysis of the co-design workshops and interviews. The qualitative data analysis software, NVIVO, was used to assist with the thematic analysis and to code the key terms and analyse data with greater ease [21].

4 Qualitative Findings and Discussion

We now present a discussion and analysis of our qualitative findings drawn from transcripts from interviews and workshops within the context of Foucauldian notions of governmentality.

4.1 Youth Justice and information technology infrastructures

Our findings suggest that although there is an appetite for the use of technology to assist communication with young people, youth offending services had not yet 'entered the 21st century'. With the exception of a few individual case workers who, at times, sent SMS text messages via their mobile phones to the young people with whom they were working, traditional methods of communication were in existence such as letters, phone calls, appointment cards, and so on. Such methods were rationalised as providing clear evidence in cases where young people were being breached for non-compliance.

In each of the three case study sites, no organisational wifi network was available, and workshops had to be conducted by the research team setting up their own wifi network in the working area.

Case workers had access to personal computers at work to assist them with ASSET data input, and general record keeping; however they did not have access to other devices to promote better communication:

> S1-CW1 (Site 1, CaseWorker 1): " . . . the mobile phones we have are very out-dated, um there aren't enough laptops so if you want to work remotely there often isn't a laptop and when you do get one the bloody thing won't log on most of the time. So, I think you know, I think we're slipping behind in terms of where technology is. We should all be having ipads or you know tablets to, with a good connection, 3G or 4G connection, cos there's all the stuff about security - this is always the argument - 'we can't make them secure' but you know the police use them in, in patrol, children's services use them."

The young people in the study also showed alertness to concerns around data. The notion of data security was expressed vociferously by the young people themselves who indicated fear and anxiety about the potential theft and loss of their mobile phone, and thereby their personal data. Young people were reported to change their phone numbers frequently as a consequence of loss of their phones through theft, or confiscation of their phone by the police. Such circumstances coupled with the youth offending team concerns about security of personal data relating to young people led us to ensure that we built appropriate safeguards in our planned social technology [23]. Both the young people and case workers were cognisant of how electronica data from multiple sources and over periods of time could be used for the purposes of control:

> S3-YP1 (Site 1, Young Person 1): "yeah, but its just like they can go into more detail probably, and its just a lot easier for them to..."

> S3-CW1 (Site 3, Case Worker 1): "...I mean its, its kind of wise to be careful in these, in this day and age isn't it? About anything digital or electronic... it is almost healthy to be a bit paranoid about . . . personal details."

4.2   Governmentality, human agency and resistance

Working within the framework of co-design and a value-sensitive approach, we held separate workshops with case workers and young people to ascertain their qualitative experiences of using apps, including likes/dislikes, usefulness, cost, and ease of use [26]. Case workers and young people were invited to tell us how communication between them could be enhanced using digital technology. Many of these discussions began from exploring current methods of communication, and areas of need. The ideas put forward by the first set of case workers were later presented to other case workers for their reflection and input. These were subsequently showcased to young people for their reactions to the building of the app. Young people were not only asked to critique these initial ideas but also suggest other possible need scenarios. This participatory research design proved to be extremely useful in helping to embrace ethical and practical challenges raised in this process.

Values such as confidentiality, privacy, security, trust, and autonomy began to emerge as we continued with our co-design and value-sensitive approach in our three research sites. Features became associated with specific values and it is evident that some features were perceived to be straightforward and raised little concern or conflict. For example, text messaging, group messaging (including sending messages to family members and a list of useful contacts were not regarded to be problematic by the respondents. It was generally believed that such methods of communication would a useful means of reaching young people to provide them with timely and appropriate information. Many of the ideas emerging from the case workers appear to have a tone of welfare/benevolence to help provide young people with appropriate and timely information. Interestingly, although there was recognition of low levels of literacy among this population, many case workers conceptualized the empowering role of technology:

S1-CW2: " ...they're highly phone literate. Many of them won't write on a piece of paper but are happy to text. Also, the mobile phone auto spells which helps them"
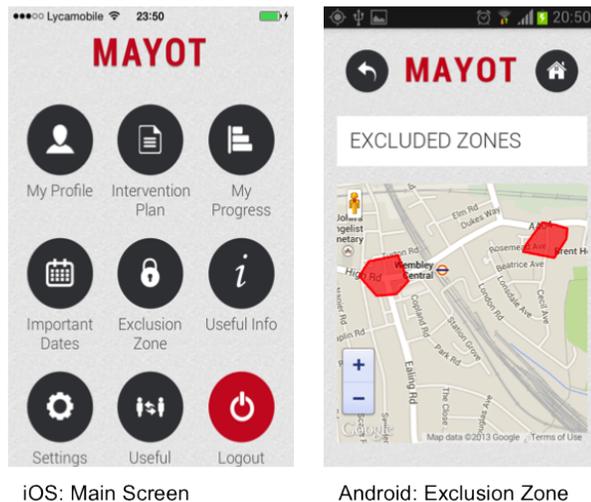

Fig. 1. Screenshots of MAYOT App

Garland notes that the governmentality literature presents a paradox whereby 'governing' takes place through our 'freedom' [13]. The paradox exists because of a conflation of two concepts: agency and freedom. Agency refers to the capacity of an agent to act on some decision based on perceived pertinent information. Foucault would consider this ability as a necessary condition for rules at a distance in the social sphere. Freedom, however is a capacity for an agent to choose an action without external constraint. Do we choose to buy a particular product? Or is it because of a marketing campaign that, perhaps, through a process of subliminal invasion, we choose to buy that product? Thus a central element of governmentality is that of creation and simulation of agency while simultaneously reconfiguring the constraints upon the freedom of choice of the agent. Arguably, the app features were designed to create agency within the young people. Simulateneously, these features are a re-configuration of constraints as these features were designed to be a vehicle of interaction between young people and case workers albeit with potential reference to concerns of surveillance and control by the case workers. Features such as access to contact details of close friends and family who can support the young person with respect to reminders for appointments creates a form of governance that rests upon the "willingness of individuals to exercise a 'responsibilised' autonomy" [13].

Thus, young people's narratives attest to the belief that to receive information directly to their phones in various forms including appointment reminders, progress charts, intervention plans, useful contacts, 'stop and search', 'drugs awareness', and health could be beneficial to them. This was particularly so,

and as they reported, they invariably misplaced/lost paper information that had been given to them. Crucially however, young people were all too familiar with the governmentality processes at work and were conscious of the re-configuration of constraints:

> S2-YP2: "Yeah, because if you forget when your appointment is, and you don't bother ringing, then you can end up back in court".
> S2-YP3: "Yeah, you get a warning and that, and you're just causing more problems for yourself".
> S1-YP3: "...if you had a reminder, then you wouldn't miss it and then..."

Having said this, case workers and young people both reported that their digital communication was largely one-way, i.e., case workers pushed out information via texts but young people did not reciprocate. Moreover, young people were said to 'delete texts,' 'block calls', 'block calls but send/receive texts'. Our findings show that such techniques were employed, possibly, as a reaction to governmentality. Such practices manifested themselves where young people found themselves being 'sanctioned or breached'. Moreover, it was not uncommon for young people to describe their weekly contact with the youth offending services in terms which suggested little value for them, that is, interaction was said to constitute simply 'turning up to your appointments', or just as 'a load of bollocks' [20].

In addition to the more information related app features, case workers also believed that some of their young people who had particular conditions attached to their orders, such as curfews and exclusion zones would benefit from alerts if these young people wittingly or unwittingly stayed out beyond the curfew or ventured into prohibited areas.

> S1-CW3: "...maybe bespoke... some young people are prohibited from going into certain areas so maybe their phone could vibrate if they are getting close to that area".

In their accounts of young people's experiences of private sector providers, contracted to run this operation for the youth justice sector, case workers expressed their disquiet about the fact that they invariably came to know about these incidents when it was too late:

> S2-CW3: "Curfews, in my view, are not at all supportive. They're punitive. I mean what's happening at the moment, it's a bit technical from a business point of view, because of the way the contract is set up with Serco, who are the enforcement, um, who actually run it, sorry, in this area, the curfews. The contract is set up in such a way that in fact the, um, the company don't let us know until the young person's accrued 2 hours of absence from their curfew. So, kids being kids, you know they test it. And they, the sort of test each night and of course each time they're, sort of like, staying away from the house or whatever for 20 minutes, uh and then stretching it out maybe for 40 minutes. Well then, you know, they've accrued an hour and they think 'oh its not working' so they don't bother the next night. Stop out for two hours and then we get a notice saying, you know, they're in breach".

The overarching theme from our interviews with the case workers was that their relationship with the young people was one of make or break. In this regard, they wanted to do everything within their power to ensure that they were able to build a relationship of trust to ensure positive engagement.

> S2-CW4: "I think the important thing is that you, you make them feel safe... So you spend the first part of your order building rapport...so that they can start to engage with you and trust you and feel safe with you..."

When the above ideas were presented to the young people in a subsequent workshop by means of screen capture images, to help illustrate these additional app features such as curfew alerts and exclusion zone alerts, we received a mixed response. The initial reaction was one of acceptance, however it soon transpired that young people resented the marker/visibility and hence the governmentality of these techniques:
    Re: Both exclusion zone and curfew alerts:

> S2-YP1: "So your phone's gonna vibrate when you cross?"
> S2-YP2 "Yeah, that would be alright."
> S2-YP3: "yeah, that would be quite useful."

The Exclusion zone feature had a both a stronger reaction and a change of position from the young people:

> S2-YP4 "...so it actually tells the YOT workers and that, that I'm in that area?" "
> S2-YP2: "You're basically just trying to get a tracker onto our phones "
> S3-YP1: "I wouldn't download it at all ".

The marker/visibility concern became more apparent as young people expressed a desire to re-balance the overall power-relation between themselves and their case workers. Recognising the potential of the exclusion zone feature as a tracking concern, they asked incisively:

> S3-YP1: "yeah, but how do we know, like, on their side of the app, they haven't got something they can click on to find out where you are, like..."
> S3-YP2: " ... yeah, you should show us their side of the app"

Concerns about being tracked were described within the context of an infringement of their sense of privacy and autonomy, and young people reported strategies to evade detection by law enforcement agencies. Understandably, young people voiced their apprehension about the possibility of being 'tagged' by default.

> S3-YP2: "...they could just be watching what road you're walking up, where you're going to"

Despite the view that that app had potential tracking facilities, there was also recognition, on the part of young people, that the app could be a source of power for them in cases where the police data/perception was inaccurate or out of date:

> S3-YP2: "it would be good if like police try to stop you or something and they've got the details and stuff and they put it through the system or you're not allowed in this area and you pull out your phone and be like yeah well I'm not in that area. You know what I mean? To prove them wrong."

It seemed that the power of aesthetics was also of importance to young people. It was suggested that the MAYOT app logo should not attract attention in a way that young people were left to explain to their peers why they had this app on their phone. Preference for a design that was less conspicuous was expressed.

In the final prototype for the MAYOT app, the features went through a number of design changes representing the perspectives of case workers, young people and the designers. For example, young people's concerns that the exclusion order alert feature violated their privacy was considered seriously by the research team to ensure that a balance was struck between relative individual privacy and security of information. Given that perceived autonomy and control have been identified as key components of empowerment, we were keen to build social technology, which afforded such capability. Thus, young people, in being able to exercise choice and autonomy about whether they wished to receive alerts and have access to a map of the exclusion zone, or simply have access to the exclusion zone without the alerts. They were thus assured that they were not being regulated but empowered through timely and appropriate information. The latter overcame the concern about GPS location and the fear of being tracked.

The unintended consequences of the MAYOT app loomed large as we persevered with the deployment phase of this study [16]. It was evident that although case workers recognised the value of empowering young people through appropriate social and personal information sharing, their role demanded that the app be used in a way that could evidence misdemeanours. Thus, whether it was proof that a text was received but ignored, or whether a young person ventured into the excluded zone, the practitioners wanted to know to be able to present this as evidence to a breach panel and/or youth court.

4.3 The researcher and the co-design process

A key contribution of this research is the experimental evidence use of novel co-design methods for eliciting requirements when working within a challenging environment. When offered the chance to become first order participants in the design of potential new technologies for their use, our young people demonstrated the necessary engagement for designers to benefit from their knowledge but raised critical challenges of how dilution of values such as privacy and autonomy can affect acceptance of technology. Such challenges only become apparent when participatory design approaches are augmented with value sensitive concerns as a central objective of the design.

The act of conducting and then reflecting on our co-design approach raises several lessons for those working in areas of social need. Researchers and design teams need to ensure that their interactions clearly demonstrate that they are not part of the governmentality infrastructure. How to do that persuasively without risk to the eventual deployment of software applications is potentially difficult. Our research demonstrates that taking a co-design approach augmented with value sensitive concerns, at least provides a vehicle for discussion and exposure of these concerns. Tracing how value concerns evolve over the lifetime of the design and deployment of technology is currently relatively neglected area of research in software engineering practice.

Co-design methods need to ensure that future issues of technology can also be evaluated effectively. Unintended consequences of technology can work in multiple directions. For example, the exclusion zone feature offered potential for un-intended use (by this we mean: not the intentional design purpose) for both case workers and young people. Some case workers and magistrates wanted to use location data collected from the exclusion zone to support breaching. Young people suggested that they would like to see features that empower them to deal more competently with the police such as knowledge of stop and search legal rights.

> S3-YP2: "yeah. You could read it on your phone and be like 'you can't do this under this Act'"

5   Conclusions

At the time of publication, the technology, the web portal and the app represent the current state of an accepted solution and further deployments are planned. Our findings suggest that practices of new public management in the use of technology have become embedded in the field of youth justice.Increasingly, young people in the youth justice system, whilst they are significant users of smart phone technologies, are alert to the pervasive nature of governmentality. In particular, they recognise that any sense of autonomy offered by technology only occurs within a constrained sense of freedom. Consequently they offer resistance and actively seek ways of working that can address the power relations that are afforded through the introduction of technology.

Gane's four categories of neoliberal governmentality introduced in section 2, when revisited reveal the following. Surveillance and discipline manifest themselves in the aspects of the app features such as the exclusion zone and curfew alert. By installing the app and allowing these features to be active is sufficient for discipline to be present. Although the app collects data for when a young person may have violated an exclusion zone area, the data is not reported to the case worker. Hence, the intervention when necessary is not operationalised. Surveillance and control, on other hand, require that governmentality agencies or commercial agencies to which there has been devolved power, actively monitor mobile entities and carry out actions arising from the monitoring. Our findings recognised how this could be reified through the MAYOT app but the strict ethical guidelines and our involvement in the deployment of the technology and

control of what data was available to case workers ensured that risk was mitigated.

The governmentality to promote competition category is interesting should software such as MAYOT app or similar become commercialised and supported through existing commercial software providers. In such an event the state creates conditions for the freedom of markets in the provision of mobile apps for youth offending teams and through audit processes (surveillance) evaluates the success of such apps through some defined measures. Further, within the confines of the research presented in this paper, Youth Offending Team managers could engender competition between case workers and measure the extent to which case workers are using the app.

In this paper, we have explored the relevance of Michel Foucault's writings in order to appraise the development of our social technology intended as a vehicle of engagement in the youth justice sector. The research has demonstrated that analysis of software systems from this perspective yields important observations that could ultimately affect the acceptance of new technology. The young people in our study exhibited an awareness of the governmentality agenda and actively sought ways to overcome it. Critically, we have presented a participatory design methodology that has been augmented with value sensitive concerns. This approach has provided an important lens by which we have been able to identify those values that have potential to affect the final use of any proposed technology. The research findings used in this paper suggest that appropriate management of such value sensitive concerns can go some way towards addressing the issues of governmentality.

While we have sought to demonstrate the role of governmentality in the design of technologies that are intended to encourage engagement of young people with their case workers, we acknowledge that our findings are illustrative and exploratory. More research is required to develop techniques and methods that can help software technologists, social policy experts and practitioners collaborate to provide effective tools to work with young people to prevent further offending. Most importantly, these tools should avoid the overt criticisms of governmentality.

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