Agility in crisis management information systems requires an iterative and flexible approach to assessing ethical, legal and social issues

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ABSTRACT

This paper focuses on the assessment of ethical, legal and social issues (ELSI) in relation to agile information systems in the domain of crisis management. The authors analyse the differing needs of a move from a traditional approach to the development of information systems to an agile approach, which offers flexibility, adaptability and responds to the needs of users as the system develops. In turn, the authors argue that this development requires greater flexibility and an iterative approach to assessing ELSI. The authors provide an example from the Horizon 2020 EU-funded project iTRACK (Integrated system for real-time TRACKing and collective intelligence in civilian humanitarian missions) to exemplify this move to an iterative approach in practice, drawing on the process of undertaking an ethical and privacy impact assessment for the purpose of this project.

Keywords

Agile, crisis management, information systems, ethical and privacy impact assessment.

INTRODUCTION

Agility in information systems can be defined as a way to cope with unpredictable change. An agile approach to the development of information systems is a response to a need for the process to be able to consider unexpected changes, vs. traditional models of having a blueprint for a final product and/or system from the start of the project. The development of information systems becomes an agile, flexible and iterative process, rather than having a fixed product and/or system idea that does not change or evolve as the development process occurs. Requirements and solutions evolve through collaborative efforts and agile information system development considers the needs of end users and other stakeholders. Whereas traditional approaches had their requirements defined from the beginning of the project, agile methods focus on quick response to change and continuous

development. Agile approaches therefore offer flexibility and adaptability in response to user requirements, which can be essential within the crisis management domain, which by its inherent nature is fast evolving.

Methods and approaches for the development of agile information systems are gaining greater acceptance in practice. Agility is defined as ""the continual readiness of an ISD method to rapidly or inherently create change, proactively or reactively embrace change, and learn from change while contributing to perceived customer value (economy, quality, and simplicity), through its collective components and relationships with its environment" (Conboy 2009: 340). Change is therefore vital and one of the fundamental differences in comparison to traditional models of the development of information systems. The development process is thus split into smaller increments with constant feedback from the customer, end user and/or stakeholders (Cao et al. 2009).

In this paper, the authors use the example of the European Union (EU) Horizon 2020 funded project, iTRACK[1] (Integrated system for real-time TRACKing and collective intelligence in civilian humanitarian missions), to discuss the ethical, legal and social issues involved in a specific example of an agile information system for humanitarian response. iTRACK is a three-year project focused on improving the protection of humanitarian workers and effectiveness of humanitarian missions with integrated intelligent socio-technical tracking solutions to support threat detection, navigation, logistics, and coordination in humanitarian disasters.

The latest report by Humanitarian Outcomes (2015) revealed that in 2015, 287 aid workers were victims of major attacks, 109 were killed, 110 were wounded and 68 were kidnapped (an additional 11 aid workers that were kidnapped were killed). Such numbers emphasise the need for improved information systems for enhancing the protection of humanitarians operating in conflict zones. As such, the collective intelligence and intelligent systems developed by iTRACK aims to play an important role in boosting protection, safety and security of humanitarians, and efficiency of response. It will do so by providing the means for responders on the ground to acquire valuable information in real-time, to help them self-assess the situation, make informed decisions, and communicate and organise their response. iTRACK recognises the fact that technological innovation can only be successful if it addresses decision-makers' needs, and will therefore also work on policies to reflect work practices and decision-making procedures of humanitarian responders. iTRACK combines technology and process innovation that supports enhanced self-organisation of civilian humanitarian responders. The project results, along with the developed algorithm will be implemented, deployed and tested in simulations with humanitarian practitioners. The results will also feed into pilot applications with the World Food Programme (WFP) and iMMAP. The iTRACK system utilises an agile development process – iterative and reflexive in terms of design and in response to the needs of humanitarian workers and end users.

However, with increased technological capabilities and agility come new, as well as familiar, ethical, legal and social issues (ELSI) to be taken into account. In order to consider these ELSI, one approach is to conduct an ethical and privacy impact assessment (E/PIA). This paper provides an overview of the authors undertaking an E/PIA in relation to one technological solution for humanitarian response developed for the iTRACK project. In this paper, the authors show that undertaking an assessment of the ethical, legal and social issues in relation to agile information systems in the crisis and disaster response domain requires an agile (flexible and reflexive) approach to assessing the aforementioned issues. Projects such as iTRACK therefore not only respond to needs in the humanitarian sphere, but also have the potential to push forward methodological approaches to assessing ethical, legal and social issues in this area, as well as the wider domain of the governance of new and emerging technologies more generally. The example of iTRACK used in this discussion paper is based on work in progress. The position taken by the authors is one that sees the need for future practice in the area of assessing ELSI issues, in relation to technologies and information systems development for humanitarian response and crisis management, as requiring an on-going and continuing assessment of these issues and an embedded approach to E/PIAs. This embedded approach requires researchers conducting the E/PIA to be involved at every stage of the project and/or design of the system. The authors return to this issue in section two of this paper.

The first section of this paper provides a more in-depth overview of agility in relation to crisis management. It highlights that crises are fast moving and unpredictable and therefore require, not only agile information systems, but also agile working environments. Furthermore, this section suggests that the end user, and their needs, must be taken into account in relation to agile information systems. This section moves on to discuss the overall aims of the iTRACK project, as well as providing an overview of the system architecture. The iTRACK system is shown to comprise hardware and software elements for use in a range of humanitarian responses and countries. These elements will combine to form an information system respondent to the needs of end users as the system develops.

The second section of this paper focuses on assessing the Ethical, Legal and Social Issues (ELSI) in relation to

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agile information systems. This part of the paper details the process undertaken by the authors in relation to an ethical and privacy impact assessment (E/PIA) for the iTRACK project. Information systems have the potential to improve humanitarian action, as well as ensuring a higher level of safety for humanitarian workers, however there are also ethical, legal and social issues to take into consideration when designing these systems. In this section, the authors describe the process of assessing a range of issues for the ITRACK project, and how the original approach has been altered in the context of the project, in order to align the E/PIA process with the process of developing an agile information system. This section concludes with the authors' deduction that agility in information systems requires an embedded E/PIA process and an iterative method for assessing the ELSI issues that arise.

CRISIS MANAGEMENT AND THE ITRACK SYSTEM

Agility in crisis management

Conflict zones and environmental hazard areas are highly volatile operational environments that are characterised by high complexity, difficulties in access, and extensive needs of support in staging areas outside of the operational theatre. Further, humanitarian crises, whether resulting from war or from natural disasters, can be unpredictable in how they unfold, multiply, who they affect and what risks they result in. For example, in Syria, the level of violence and disregard for humanitarian action has been unpredictable. Likewise, the crisis in Haiti was described as a humanitarian crisis of unpredictable proportions, especially with the number of victims claimed by the cholera outbreak.[2] It is also apparent that there is a great deal of potential for contexts to change and thus the feasibility of using specific technologies alters. The security situation is highly dynamic and places strong requirements on situational awareness, constant negotiations for access, and dynamic routing and rerouting capabilities.

Further, every crisis is unique in terms of its socio-economic and environmental context. This quality, together with the trait of being unpredictable means that stakeholders struggle to interpret or respond to crises, as they have no relevant and up-to-date frame of reference. New situations require a fast consideration of how they should be conceptually constructed and how to practically respond.

It is therefore the very nature of crises - unpredictable and fast moving - which means that they require agility at an organisational level. However, as argued by Harrald (2006) this agility cannot come at the expense of discipline. For Harrald (2006: 257), those involved in developing systems for crisis response must pay attention to what he refers to as "discipline (structure, doctrine, and process) and agility (creativity, improvisation, and adaptability)". Consequently, agile information systems alone cannot support crisis management efforts; rather there is a need for such systems to be used in an agile working environment. Similarly, for Mendonca et al. (2007: 49), who argue that "the technological systems we design and build must enhance – not impede – organizational agility", information systems need to be reactive and effective. These information systems need to understand the environment that the user is working in. Information systems also need to be interoperable systems, supplying the user with a range of choices of functionality in real-time that they can select to enhance their own operations (Mendonca, et al., 2007). Thus, information systems and the end user must be considered together to ensure reliable and efficient systems.

The iTRACK System

As stated in the introduction, this paper will focus on one particular project – iTRACK – in order to exemplify the need for an agile approach to assessing the ethical, legal and social issues that arise when utilising agile information systems in the humanitarian context. The objective of the iTRACK project is to create an open-source real-time tracking and threat detection system, providing intelligent decision support to civilian humanitarian missions for the purpose of better protection, and more efficient and effective operations. This objective will be achieved by developing technologies that enable information-driven self-organisation and coordination, as well as rapid adaptation to dynamically changing situations and threats. In order to achieve this overall objective, iTRACK has developed six sub-objectives:

I. Extract and analyse organisational and technical system requirements. Design policies for tracking information management (IM), logistics and risk management in humanitarian missions.
II. Automatically monitor locations. Identify, process and assess threats and humanitarian needs in distributed response settings by using heterogeneous data sources.
III. Develop real-time decision support for risk mitigation and protection; navigation, routing and

[2] EU business, *Haiiti facing unpredictable crisis, EU double aid, [online]* http://www.eubusiness.com/news-eu/haiti-cholera-aid.7lh/, accessed 13.1.17

scheduling; coordination based on threats and needs identified continuously updated with live information.

IV. Provide secure and reliable communication in the iTRACK platform and develop secure IM policies.

V. Deploy and validate the iTRACK platform and policies in simulations and real-world settings.

VI. Disseminate project results and build up a network of early adopters. Disseminate training cases for IM in conflicts.

The threats of conflict and disaster place increasing pressure on the humanitarian community to protect those individuals at risk. It is envisaged that the humanitarian community will benefit from the research, namely: agencies, personnel deployed in conflict areas, policy and logistics developers. Moreover, a better, effective and timely humanitarian relief operation has the capacity to save thousand of lives. The recipient countries therefore benefit indirectly from the research as well.

Consortium members of the iTRACK project have described the iTRACK system as a 'system of systems'. As seen in Figure 1 (below), it combines software and hardware development to advance towards an information system for use in a range of humanitarian responses and countries. Furthermore, technology requirements for various locations may differ, highlighting the importance of the modularity and flexibility, which will be reflected in the iTRACK system.

As it stands, the main foreseen technological elements of iTRACK include: on-board cameras, sensors, location devices and threat detection; a mobile app; smart watches and wearable tracking devices; a web app and iTRACK dashboard; and the development of an iTRACK platform incorporating a storage system, social media collection, routing and logistics, and decision support and alerts.

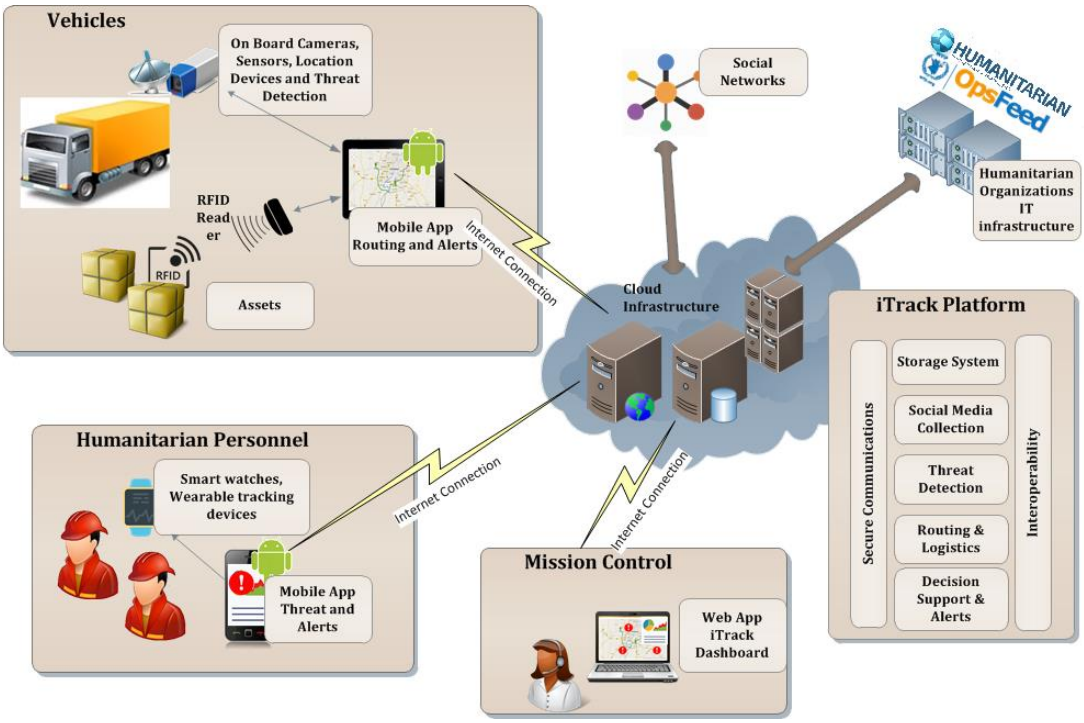

Figure 1: iTRACK System Architecture

As one of the core outcomes of the project is a novel system, it is important to undergo a review of what already exists, what does and does not work and what is needed. To that end, at the outset the project, partners engaged in an analysis of workflows and processes in the areas of humanitarian information management (IM), logistics, and coordination and technology. The results of this analysis, which included empirical research in the form of interviews with humanitarian workers in the field, and those responsible for policy, is a taxonomy of current approaches and solutions as well as existing gaps. iTRACK also focuses on unique relevant operational situations and analyses Syria vs. Iraq as conflict zones, and Jordan as their common support and staging area.

Following on from investigating workflow processes, the technology partners are currently engaging in technology deployment. In the first phase, they are developing the architecture, design and implementing the end-to-end iTRACK platform. In the next phase, they will develop, implement and test the constituting collective intelligence components that provide input to the first phase for the integration, verification, testing and consolidation of the final iTRACK system. This will be followed by use of simulation and evaluations to test the system.

ETHICAL, LEGAL AND SOCIAL ISSUES

Assessing Ethical, Legal and Social Issues in relation to Agile Information Systems

Novel, digital and web-based information and communication technologies (ICT) have the potential to improve humanitarian action. As argued by Meier (2015), big data analysis can, for example, rapidly provide decision makers with a realistic overview of a conflict situation. Such technology is an example of what Vinck (2013) describes as humanitarian technology; in other words, technology that improves the quality of prevention, mitigation, preparedness, response, recovery and rebuilding efforts. However, there are also potential drawbacks; humanitarian technology solutions may "compromise the core principles of humanitarian action and obscure issues of accountability of humanitarian actors towards beneficiaries" (Sandvik et al. 2013: 3). In addition, some of the victims of humanitarian disasters or humanitarian workers may be in a vulnerable position, whereby they are pressured in emergency situations, making them more susceptible to accepting conditions and consenting to situations and/or technologies they may otherwise not have done.

As mentioned in the introduction to this paper, one approach for assessing the ethical, legal and social issues that derive in designing complex information systems is to undertake an ethical and privacy impact assessment (E/PIA). An E/PIA is a systematic process for identifying and addressing ethical and privacy issues in an information system, whilst also considering the future consequences and impacts of proposed actions in relation to ethics and privacy. It can be described as an early warning system that can help expose risks regarding the system under development (Wright, 2012: 55). The term and approach has arisen from work undertaken in the area of privacy impact assessments (PIA). The term PIA emerged during the 1990s. It has been suggested that precursors to the concept of PIA were Technology Assessment (TA), utilised by the Office of Technology Assessment (OTA) in the US, and the concept of an Environmental Impact Statement (EIS) (Clarke 2009). A PIA is a tool for identifying and managing risks to privacy and/or data protection. It is a process that focuses on identifying the impacts on privacy of any new project, technology, service or programme (Wadhwa and Wright 2014: 14). There are, however, a variety of approaches to conducting PIAs worldwide and a number of definitions attributed to the term. Under UK guidance (ICO 2009), a PIA is defined as "A process, which helps assess privacy risks to individuals in the collection, use and disclosure of information. PIAs help identify privacy risks, foresee problems and bring forward solutions". The Office of the Privacy Commissioner of New Zealand defines a PIA as "a systematic process for evaluating a proposal in terms of its impact upon privacy". Following on from work undertaken in the area of PIAs, the term ethical and privacy impact assessment was coined by Trilateral Research and Consulting during the EU FP7 project, PRESCIENT (Privacy and Emerging Sciences and Technologies). This approach draws on additional legislation, regulation and frameworks, such as the: United Nations Convention on Human Rights 1948 (UNCHR) and the European Convention on Human Rights 1952 (ECHR).

iTRACK provides an interesting example for a paper focused on agile information systems. The developers of the system have to adapt to the needs and requirements of end users, but also to the requirements and contexts of the countries in which the system will operate once the project is underway and the system is being piloted. The iTRACK system is being piloted in conflict areas in the Middle East. The project results will be implemented, deployed and tested in simulations with humanitarian practitioners during pilot applications with the World Food Programme and iMMAP in on-going conflict disasters in the Middle East (Syria, Yemen and Iraq). Many countries in this region have limited or no data protection regulation, or Data Protection Authorities (DPAs). Furthermore, human rights legislation containing over-arching ethical principles, such as the European Convention on Human Rights 1952 (ECHR), which one might consider as a first port of call when developing a framework for undertaking an impact assessment in EU countries, are generally lacking in these countries. Although there are examples of international frameworks, such as the Universal Declaration on Human Rights 1948 (UDHR), this is not always adhered to across Islamic States and conflict areas in the Middle East, and has been argued to be in conflict with Sharia Law (the Declaration is not legally binding). Studies suggest that Muslim state leaders have taken issue with several areas contained in the UDHR, such as, for example, equal rights (DeLaet, 2006), and religious freedom and religious minority (Donnelly, 2007).

The iTRACK project is an EU-funded project and takes a European-centric view of ethics and privacy. The framework for the iTRACK E/PIA has therefore been based on what the authors consider to be the 'gold

standard' in terms of privacy and ethics. The principles embedded in the framework for the E/PIA for iTRACK consist of those taken from: the Universal Declaration on Human Rights, the European Convention on Human Rights 1952, the General Data Protection Regulation, and ISO 29100:2011 (Privacy Framework). These principles consist of:

Dignity	Fairness	Justice (right of inspection and redress)	Purpose legitimacy and specification
Autonomy	Security	Solidarity, non-discrimination and benefit sharing	Collection limitation
Informed consent	Responsibility	Reducing inequality	Data minimisation (necessity)
Trust	Avoidance of harm	Consent and choice	Use, retention and disclosure limitation
Accuracy and quality	Openness, transparency and notice	Individual participation and access	Access and correction
Accountability	Information security	Privacy compliance	

Figure 2: Ethical and legal principles

The method used for the iTRACK E/PIA has, and will continue to be developed alongside the project. The original approach outlined in the proposal consisted of: planning a timetable and approach for the E/PIA; a two-day workshop, including 10 interviews conducted at the time of the workshop; and the development of an E/PIA report. The approach specified in the proposal has been amended to include a set of five interviews with technical partners, conducted prior to the E/PIA workshop, to map the preliminary information flows for the iTRACK system. Five further interviews will be conducted throughout the remainder of the project with both technical partners and end users, to feed into the final ELSI report. The workshop was reduced to a one-day workshop due to the research work being undertaken beforehand.

The authors decided that due to the complexities of the ITRACK system it would be beneficial for the partners to be provided with a description of the information flows for each element of the system at the beginning of the workshop. The aim of the interviews, conducted by the authors of this paper with the technical partners, was to gain an understanding of how data would be processed by each element of the system. In turn, the authors provided graphical representations of these information flows during an E/PIA workshop as a starting point for discussion.

The iTRACK E/PIA workshop was held in November 2016 with the partners in the project and an external expert in ELSI within crisis management. The aim of the workshop was to present the information flows to technical partners, end users and other members of the consortium, and to identify and assess the risks that may arise when developing and implementing the iTRACK system. The workshop also incorporated an element of developing a set of solutions to the risks identified. Originally, the authors envisaged undertaking a threat and vulnerability mapping exercise, however due to carrying out an internal practice run of the workshop with technical experts from the partner leading the E/PIA process, Trilateral Research Ltd., it was decided that this mapping exercise would not achieve results in practice, and would therefore be undertaken after the E/PIA workshop. The approach to undertaking this E/PIA was therefore amended due to the nature of the project and the complexity of the iTRACK system.

During the workshop participants were provided with an overview of the information flows and the embedded ethical and privacy principles, and were asked to consider any possible negative consequences that could emanate from using the iTRACK system with regard to ethics and privacy. To kick-start the discussion the workshop facilitator provided participants with fictional scenarios that described humanitarian workers using the iTRACK system. Participants could read these scenarios and try to identify risks related to ethical and privacy principles.[3] They were then asked to think outside of the scenarios and come up with other risks. The discussions were split into groups of around four people, and each group was responsible for one element of the iTRACK system, e.g., the on board camera. After the breakout session the groups presented their findings to all participants.

A number of risks were identified during the workshop. By way of an example, a key concern was the possibility of the system being hacked and the seizure of data. Furthermore, participants identified a lack of connectivity, network and power as potential weaknesses, which could lead to a failure of the iTRACK system and in turn the possible compromising of a humanitarian mission. It was also acknowledged that there might be numerous risks with regard to the multi-faceted surveillance character of iTRACK, in particular if the system captures data from third parties who have not consented to their data being collected, or if it captures data on humanitarian workers who are at the time not engaging in humanitarian work.

Subsequently, breakout discussion groups brainstormed the likelihood and severity of the risks, and discussed possible solutions to mitigate negative impacts to ethical and privacy principles. The individual breakout group discussions were recorded (with consent) and notes were taken during the 'global' group discussions.

Developing the E/PIA approach

The authors have been involved in leading two components for this project (the E/PIA and Research Ethics elements). However, since the project began, they have also joined the consortium calls, originally envisaged only for technical partners, in the remaining parts of the project. Reflecting on this development and what this means for the E/PIA process conceptually, the authors have begun to describe this as 'an embedded approach to E/PIAs'. This means that the E/PIA process has become flexible and embedded at every stage of the design process. Although traditionally, a privacy impact assessment (PIA) process has always run throughout the entire lifecycle of the project, it has also only seen active engagement with stakeholders at given moments throughout the project (e.g. in the form of a questionnaire, interviews, a workshop, or another form of consultation). This generally takes place as a one-off consultation with the results included in a PIA report (see for example, De Hert et al. 2013).

The example of the iTRACK project has shown that the assessment of ELSI issues in relation to information systems is of greater benefit through an approach consisting of continuous advice on and engagement with these issues at every stage of the project and throughout the entire design process of the system. The authors have joined all meetings and discussions on the technical elements of the project, providing a continuous assessment of, and advice on the ELSI issues associated with the system design, thereby embedding a rigorous privacy by design approach into the project (for more on the concept of privacy by design, see for example, Cavoukian, 2012; Kroener & Wright, 2014). This has therefore concurrently further developed the authors' approach to conducting E/PIAs from a methodological standpoint.

The authors have learnt that agility in information systems requires this form of embedded E/PIA process and an iterative method for assessing the ELSI issues that arise. As this was a new addition to the iTRACK project and is still a Work in Progress, it will be further developed as the authors further define and develop their E/PIA approach in future projects.

CONCLUSION

This paper has shown that the fast-changing nature of crises requires continuously evolving technological solutions, able to adapt to the needs of given situations. Agile information systems allow technological solutions

[3] Examples of the scenarios provided:
1. Following an attack on a humanitarian organisation in a conflict area, the organisation counts that 34 of their staff members were killed, and 54 have been injured. The media continue to report that in this conflict the lives of aid workers are ever more threatened. There is a shortage of experienced staff to deliver the aid and the organisation sends out some of its newest recruits. They have not used iTRACK before but are given the opportunity to do so now. Time is of the essence; as well as learning about iTRACK they need to digest a range of other information. The staff are local, from ages 24 - 65 and do not speak English.
2. Humanitarian workers are in an area badly affected by a civil war. With the aid organisation increasingly working in riskier environments their mental health is suffering. Wishing to discuss their experiences with persons in similar situations they begin to communicate via the iTRACK communication system.

to be constantly adapted to the needs of end users and those operating in the area of humanitarian work and crisis management. This shift from a traditional model of information systems development, involving a fixed product/system idea from the outset, to one of agile development, involving a flexible approach that adapts to the needs of the environment, end users, and so on, allows developers to respond to evolving needs and requirements. In turn, this has implications for the assessment of ELSI in relation to technological solutions.

The example of the iTRACK project, provided in this paper, illustrates how one approach to assessing ELSI (in this instance, an E/PIA) has been adapted due to the nature of the development of the information system. The method for assessing ethical, legal and social issues has changed from the proposal stage to the implementation of the project, and will continue to evolve throughout the project's lifecycle and beyond. This development has been termed by the authors as an embedded approach to ethical and privacy impact assessment. The embedded approach entails the ELSI assessment process to be involved at every stage of the project and the system design and development, rather than providing a single snapshot of a project at a certain point in its lifecycle.

The authors have therefore amended the overall approach and method to conducting E/PIAs due to their experience in the iTRACK project to date. The authors have learnt that agile information systems development benefit from the continuous involvement of the person(s) responsible for the assessment of ELSI in the design and development of the technology and/or system. The authors have therefore taken the preliminary lessons learnt from this project to start to develop a more flexible and iterative approach to undertaking E/PIAs.

REFERENCES

Cao, L., K. Mohan, X. Peng and B. Ramesh, "A framework for adapting agile development methodologies", European Journal of Information Systems, 18(4), 2009, pp. 332-343.

Cavoukian, A., "Operationalizing Privacy by Design: A Guide to Implementing Strong Privacy Practices", Information and Privacy Commissioner, Ontario, Canada, December 2012

Clarke, R., "Privacy Impact Assessment: Its Origin and Development" in Computer Law and Security Review 25(2), April 2009, pp.123-135

Cockburn, A., and J. Highsmith. (2001). "Agile Software Development: The People Factor." Computer, 34, 11, 131–33. doi:10.1109/2.963450.

Conboy, K. "Agility from First Principles: Reconstructing the Concept of Agility in Information Systems Development", Information Systems Research, 20(3), 2009, pp. 329-354.

De Hert, P., Kloza, D., Wright, D., Wadhwa, K., Hosein, G., Davies, S. "Recommendations for a privacy impact assessment framework for the European Union". PIAF Project: http://www.piafproject.eu/ref/PIAF_D3_final.pdf

DeLaet, D. (2006). The Global Struggle for Human Rights: Universal Principles in World Politics. Wadsworth Publishing Co Inc.

Donnelly, J. (2007). "The Relative Universality of Human Rights." Human Rights Quarterly, 29, 2, 281 – 306.

Greer, D., and Y. Hamon. (2011). "Agile Software Development." Software - Practice and Experience, 41, 9, 943–44. doi:10.1002/spe.1100.

Harrald, J. R. (2006). "Agility and Discipline: Critical Success Factors for Disaster Response." The ANNALS of the American Academy of Political and Social Science, 604, 1, 256–72. doi:10.1177/0002716205285404.

Humanitarian Outcomes (2015). "Aid Worker Security Report: Figures at a glance – 2016", available at:

https://aidworkersecurity.org/sites/default/files/HO_AidWorkerSecPreview_1015_G.PDF_.pdf

Kroener, I. and Wright, D. "A strategy for operationalising privacy by design", The Information Society, Vol. 30, No. 5, 2014, pp. 355-365.

Meier, P. (2015). Digital Humanitarians: How BIG DATA Is Changing the Face of

Humanitarian Response. London: CRC Press, Taylor and Francis Group.

Mendonça, D., Jefferson, T., and Harrald, J. R. (2007). "Collaborative Adhocracies and Mix-and-Match Technologies in Emergency Management." Communications of the ACM, 50, 3, 45–49. doi:10.1145/1226736.1226764.

Sandvik, K. B., Jumbert, M. J., Karlsrud, J. and M. Kaufmann (2014) "Humanitarian technology: a critical research agenda." International Review of the Red Cross (2014), 96 (893), 219–242.

Soanes, C. (2002). Paperback Oxford English Dictionary. Oxford: Oxford University Press.

Vinck, P. (2013) "Humanitarian Technology", World Disasters Report 2013, International Federation of Red Cross and Red Crescent Societies, p. 20, available at: www.ifrc.org/PageFiles/134658/WDR%202013%20complete.pdf

Wadhwa, K. and Wright, D. "Following best practices in Privacy Impact Assessments" in Privacy Laws and Business, January 2014

Wright, D. (2012). "The state of the art in privacy impact assessment." Computer Law and Security Review, 28, 54-61.