



Journal of Information, Communication and Ethics in Society

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Article information:

To cite this document:

Simon Rogerson, Keith W. Miller, Jenifer Sunrise Winter, David Larson, (2017) "Information systems ethics – challenges and opportunities", Journal of Information, Communication and Ethics in Society, <https://doi.org/10.1108/JICES-07-2017-0041>

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Information systems ethics – challenges and opportunities

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Received 2 July 2017

Revised 2 July 2017

Accepted 12 July 2017

Abstract

Purpose – The purpose of this paper is to explore the ethical issues surrounding information systems (IS) practice with a view to encouraging greater involvement in this aspect of IS research. Information integrity relies upon the development and operation of computer-based information systems. Those who undertake the planning, development and operation of these information systems have obligations to assure information integrity and overall to contribute to the public good. This ethical dimension of information systems has attracted mixed attention in the IS academic discipline.

Design/methodology/approach – The authors are a multidisciplinary team providing a rich, diverse experience which includes professional and information ethics, management information systems, software engineering, data repositories and information systems development. Each author has used this experience to review the IS ethics landscape, which provides four complimentary perspectives. These are synthesised to tease out trends and future pointers.

Findings – It is confirmed that there is a serious lack of research being undertaken relating to the ethical dimension of the Information Systems field. There is limited crossover between the well-established multidisciplinary community of Computer Ethics research and the traditional Information Systems research community.

Originality/value – An outline framework is offered which could provide an opportunity for rich and valuable dialogue across the two communities. This is proposed as the starting point for a proactive research and practice action plan for information systems ethics.

Keywords Information systems, Ethics, Professional practice, Body of knowledge, System failure

Paper type Viewpoint

1. Introduction

Each day society becomes more and more reliant upon information created and communicated using technology. Everybody expects such information to be correct. Central



This paper has been developed from a panel session “The ethics of Information Systems – challenges and opportunities: A panel discussion” by the authors at the Midwest Association for Information Systems conference – MWAIS 2017 in May 2017.

to this evolution is the increasingly disparate array of application information systems. It seems that individuals, organisations and society as a whole have an insatiable appetite for information.

Some argue that as a consequence, society becomes more and more vulnerable to catastrophe. The ransomware attack of May 2017, which caused the closure of many of the accident and emergency units in hospitals in the UK, is evidence of this. With the world in current economic crisis, the headlong drive for efficiency and effectiveness (and resulting profit) is the watchword. Such pressure might have resulted in real gains but has also led to unscrupulous or reckless actions. The tempering of such drive with ethical consideration is often neglected until there is a detrimental event causing public outcry. Such an event will usually attract both media interest and social media postings, which in turn places more and more pressure on the actors to account for the reasons why the event had occurred. This cause and effect map is commonplace.

2. Indicative examples

One such example is the Volkswagen emissions scandal. On 11 January 2017, the [US Department of Justice \(2017\)](#) announced that:

Volkswagen had agreed to plead guilty to three criminal felony counts, and pay a \$2.8 billion criminal penalty, as a result of the company's long-running scheme to sell approximately 590,000 diesel vehicles in the US. by using a defeat device to cheat on emissions tests mandated by the Environmental Protection Agency (EPA) and the California Air Resources Board (CARB), and lying and obstructing justice to further the scheme.

At the centre of the scandal is misinformation generated by on-board software – an information system. This information system was developed and implemented by professionals who must have been party to this illegal and unethical act.

In general, the integrity of information relies upon the development and operation of computer-based information systems. Those who undertake the planning, development and operation of these information systems have obligations to assure information integrity and overall to contribute to the public good ([Rogerson, 2011](#)). The ethical practice of the Information Systems practitioner is paramount. Practice comprises two distinct facets: process and product. Process concerns the activities of information systems (IS) practitioners and whether their conduct is deemed virtuous, which is a deontological perspective. Whereas product concerns the outcome of professional IS endeavour and whether systems are deemed to be ethically viable, which is a teleological perspective. The Volkswagen case appears to have failed on both counts.

By contrast, in a more traditional setting, an example of poor information systems practice is the UK Child Support Agency's system, which overpaid 1.9 million people and underpaid around 700,000 in 2004. Inadequate systems analysis resulted in the introduction of a large and complex information system at the same time as restructuring the agency, leading to enormous operational difficulties ([Essendal and Rogerson, 2011](#)). In terms of IS practice, it appears this was a process failing which could be deemed to be unethical.

3. What it is to be an ethical IS professional

IS professionals have specialised knowledge and often have positions with authority and respect in the community. Their professional activity spans management, development and operations. Thus, they can have a significant impact upon the world, including many of the things that people value. Alongside this power to change the world comes the duty to exercise such power in a socially responsible manner. Six social responsibility principles

(Rogerson, 2004) establish an ethos of professionalism within IS. These principles are as follows:

- (1) develop a socially responsible culture within work which nurtures moral individual action;
- (2) consider and support the well-being of all stakeholders;
- (3) account for global common values and local cultural differences;
- (4) recognise social responsibility is beyond legal compliance and effective fiscal management;
- (5) ensure all business processes are considered from a social responsibility perspective; and
- (6) be proactive rather than reactive.

Overall, professional IS practice must exhibit a balance between rights and justice, and care and empathy. Such ethical responsibilities of IS professionals have been discussed at length in several well-cited works (Mingers and Walsham, 2010; Mason, 1986; Oz, 1992). This section considers four important aspects of these responsibilities, which are both challenges to the professionals, and opportunities to do the right thing. Each is identified using a *bumper sticker slogan* which is a few words that describe the challenge.

3.1 *Avoid obvious evils*

When people think of professional ethics, they often think of the “thou shalt not” aspects: don’t cheat, don’t lie and don’t steal. These prohibitions are important, and can be found in many professional ethics codes, including the code for software engineers approved by the Institute of Electrical and Electronics Engineers (IEEE) Computer Society and the Association for Computing Machinery (ACM) (Gotterbarn *et al.*, 1999). In that code, some of those prohibitions are straightforward: “Reject bribery”. Others are more circumspect, as in this passage about conflicts of interest: “Accept no outside work detrimental to the work they perform for their primary employer”. Either way, the message is clear: avoid doing bad things.

3.2 *Accomplish good deeds*

Although avoiding evil is important, the story of an ethical professional does not end there. Another crucial aspect is that IS professionals should embrace opportunities to do good. Many such opportunities for positive professional action are available to volunteers as well as to professional organisations; the people who organised the Midwest Association for Information Systems conference, MWAIS 2017, are doing a good deed for IS academics. Recently, organisations such as CodeMontage (www.codemontage.com/) and Code for America (www.codeforamerica.org/) have encouraged information technology (IT) professionals (and others) to donate pro bono information processing work to improve the world. Many who volunteer their services to open-source and free software projects do so with altruistic intent (Hars and Ou, 2001).

3.3 *Pay attention to subtle nuances*

Some ethically significant actions are neither obviously evil, nor obviously good deeds. Instead, these actions require careful thought and analysis before an alert professional can decide what the most ethical action is. For example, statistics show that in many countries – though not all countries (Varma, 2010) – women are under-represented in IS. But why? If

this imbalance is a free choice, perhaps there is no ethical problem; but if there is overt, covert or subtle pressure, and unfair practices that keep women out, then there is clearly an ethical issue that should be addressed (Johnson and Miller, 2002). IS professionals have a responsibility to be sensitive to these kinds of issues, and willing to study, discuss and then act appropriately after such an issue has been identified.

3.4 Plan for a complex IS future

The last slogan is related to the previous slogan because slogan three encourages IS professionals to look beyond the obvious. But “pay attention to subtle nuances” refers to current events; slogan 4 encourages IS professionals to think about the future with imagination and resolve to do the right thing. A prominent example of a future area in which IS professionals are likely to encounter a plethora of ethical challenges is artificial intelligence (AI) (Russell *et al.*, 2015). Weapons that kill without a human in the decision loop, AI employees causing broad unemployment for humans and sophisticated machines that mimic human bigotry are just three examples that are already under discussion, and are likely to rapidly gain importance. Since IS professionals have special knowledge about these newly powerful machines, and because they are part of the socio-technical system that brings such machines to society, they have special responsibilities for educating the public about these machines, and for ensuring that the machines benefit, more than harm, humanity.

These four slogans do not trivialise ethical responsibilities in IS, but help people to stay focused on these issues in their professional lives. In many ways, IS professionals are on the ethical front line. The public depends on them to be vigilant.

4. Values-driven data governance

There are many ethical issues which the IS professional faces in the modern, technologically dependent world. The complexities of data governance illustrate the types of challenges to be faced, addressed and resolved.

As business processes are increasingly digitised, and as everyday objects are redesigned to include digital sensors, computing power and communication capabilities, people are experiencing dramatic changes in the scope and volume of data that are generated. The Internet of Things, and associated machine-to-machine communication, machine learning/artificial intelligence – collectively called the *Embedded Infosphere* (Taylor, 2016) – pose many new ethical challenges. In addition to enhanced magnitude of data, the *Embedded Infosphere* introduces many new data types, as tens of billions of everyday objects become equipped with networked sensors (e.g. location-based data or biometric data). Data are increasingly being aggregated and mined, and data analytics has become embedded at the core of business and operational functions (Davenport *et al.*, 2012). The Economist argues that “data are to this century what oil was to the last one: a driver of growth and change” (Economist, 2017, p. 4). The value of user-generated data is growing, and even where data have been anonymised to ensure privacy or anonymity, they may be “re-personalised” via data mining techniques (Schwartz and Solove, 2011; Winter, 2015).

These developments have led to a renewed focus in IS on data governance issues, i.e. how to create, aggregate and manage data and the conflicting values that surround data use. This has revitalised the discourse about responsibilities for security, privacy protections and data integrity (Rosenbaum, 2010), and scholars and policy makers are also beginning to grapple with the ethics of algorithms.

There are two emerging areas related to the ethics of data that are of particular relevance to IS researchers.

First, should big data repositories such as medical claims databases be treated as a public good or “private garden”? For example, in the health domain, big data sets and analytics are seen by management as a “fruitful foundation for innovation, competition and productivity” (Lycett, 2013, p. 381). Electronic health records have enabled massive medical data sets, and big data analytics may “greatly expand the capacity to generate new knowledge” (Murdoch and Detsky, 2013, p. 1351). Where these data are seen as a public good, then such a medical repository can support policy research related to health-care costs, quality, service gaps and disparities, improving health outcomes for various populations, reducing costs and fostering basic medical research. How can multiple value claims about these data resources be navigated to lower the barrier between public and private goods? If big data health repositories are in fact a public good, should access to reasonably secure medical claims data be provided without profit to researchers or citizen scientists? Should they be governed as a Commons – a resource affecting the entire community – rather than held as a “private garden”? (Winter and Davidson, 2017a, 2017b). In the private garden model prevalent today, data are often siloed and treated as private goods by the aggregator. This occurs even when the data collected represent individuals, who may not have access to the data about themselves or the ability to control its use.

A second area of concern is unjust discrimination based on big data analytics (Custers, 2013; Boyd *et al.*, 2014; Winter, 2015). Data about individuals and groups are being increasingly aggregated to make data profiles that can be used to categorise people and even forecast behaviours. Everyday interactions with technologies – internet browsing, travelling in a car, using a “smart” refrigerator, washing machines or television or moving through a public space where cloud-based facial recognition is employed – has led to increasing aggregation and analysis of trace data by corporations. Decisions made based on these analyses pose potential harms. Highly sensitive personal information related to politics, religion or health is collected and may be used to discriminate against individuals seeking housing, immigration eligibility or employment (Winter, 2013). In the USA, for example, a major credit reporting agency/data broker sells “a ‘data enrichment’ service that provides ‘hundreds of attributes’ such as age, profession and ‘wealth indicators’ tied to a particular internet protocol (IP) address” (Angwin, 2015, pp. 5-6). Data brokers such as iD CORE have collected detailed profiles for every American citizen, including personal information such as addresses, property and mortgage records, voter registration and names/contact information of neighbours:

The reports also include photos of cars taken by private companies using automated license plate readers – billions of snapshots tagged with GPS coordinates and time stamps to help PIs [private investigators] surveil people or bust alibis. (Herbert, 2016, p. 3)

These data can be used to forecast health, for example. In a recent case, Microsoft researchers demonstrated that they could predict upcoming diagnoses of pancreatic cancer by analysing web searches (McFarland, 2016, p. 3). These “health surveillance systems” are problematic not only due to privacy and security issues, but there is also great potential, and even incentive, to abuse these data (e.g. sharing with insurance underwriters). The financial incentives for collection and analysis are growing, and big data analytics can enable non-protected “proxy” fields that are highly correlated to any protected by law to be used instead (Barocas and Selbst, 2016).

5. Addressing the ethical dimension

The ethical dimension of information systems has attracted mixed attention in the IS academic discipline. Given issues such as data governance, as discussed above, this is

becoming increasingly problematic. This situation has existed for a considerable period. [Walsham \(1996\)](#), an eminent IS professor, found little published work which directly related IS-related ethical issues to more general ethical theory. [Wood-Harper et al. \(1996\)](#) identified four categories of dilemmas which a systems analyst might face when undertaking information systems development. Two were explicitly ethical: *Whose ethical perspective will dominate the study of the situation and the development of the IS?* and *Will ethical viewpoints be included in the study?* [Rogerson et al. \(2000\)](#) addressed both questions in a review of the popular methodology, structured systems analysis & design method (SSADM). However, the general lack of interest continued ([Bell and Adam, 2004](#); [Bull, 2009](#)). Indeed, there has been limited crossover between the Computer Ethics and Information Systems disciplines. [Warren and Lucas \(2016\)](#) found that there are very few researchers who are active in both fields and that there are very few papers from the computer ethics journals which are cited in the journals of the Association of Information Systems. [Weiss \(2017\)](#) found that there were few papers relating to ethics or corporate social responsibility in top-ranked IS journals although there was some evidence of an increase ([Abbasi et al., 2016](#); [White and Ariyachandra, 2016](#)). Furthermore, there is a tendency for these few papers to adopt a positivist approach, which is contrary to the computer ethics body of knowledge. [Hassan and Mathiassen \(2017\)](#) address the growing interest in creating an Information Systems Development Body of Knowledge. Their proposals focus on traditional techniques cited in the IS literature and so the ethical dimension is sidelined. Overall it seems there has been little progress in the 20 years that have passed since Walsham's paper. This is confirmed by an ethical review of current IS practice which follows.

5.1 An ethical review of current IS practice

To illustrate the importance of addressing ethical behaviour within the IS community, examples are discussed which provide potential evidence of the need to include ethical thinking and ethical analysis processes with the design of information systems and technology in general. Three examples are chosen where technology played a part in some ethical violations. These are Volkswagen emissions cheat, Wells Fargo fake accounts and smart TVs.

The Volkswagen emissions scandal (mentioned above) is most like the most widely known and expensive of the three. So far, the costs of the emissions cheat have approached nearly \$30bn in fines, criminal penalties and restitution ([Eisenstein, 2017](#)). Additionally, employees face criminal charges. The Volkswagen (VW) reputation damage is hard to gauge but is huge and may take a long time to repair. Even loyal supporters of Volkswagen are no longer supportive ([Willems, 2016](#)). In the VW case, someone wrote the software to misrepresent emissions. It would seem, ethically speaking, that someone throughout the process of creating the software would have asked, "Why are we doing this?" The focus of the VW scandal is on someone writing code to circumvent accurate emissions readings. It can reasonably be assumed that this was done from a specification which was developed during a requirements analysis process, was approved by a project manager, and was requested by a stakeholder. The software worked so it was successfully tested and implemented, which most likely assumes more IS/IT employees were involved as well as engineering staff.

The Wells Fargo scandal, which has resulted in nearly \$300m in penalties, fines, settlements and damaged reputation ([Egan, 2017](#)), might not be as apparent of an ethics problem as the VW scandal. However, the violators who set up the fake accounts did so through an information system. The system most likely did exactly what it was designed to do, but, ethically, should the system have had safeguards to not allow the fake accounts? As

reported (Levine, 2016), in setting up the accounts, employees used simple codes to fake information such as a 1234@wellsfargo.com email address and a 0000 PIN. If ethical processes were incorporated within the system design and project management processes, perhaps additional risk considerations would focus on or address the question, “How can this system be used unethically?” and then build in the safeguards to help eliminate unethical use of the system.

The Internet of Things has brought about the emergence of smart devices that are becoming ubiquitous. According to various authors (Barrett, 2017; Schneier, 2015; Vaughan-Nichols, 2017), smart TVs, for example, while looking benign on the surface, and unless users take measures not commonly known or necessarily easy to do, are actively sending information about viewing habits to databases owned by the various television vendors. Many smart TVs also have the ability to listen to and watch viewers via built in microphones and cameras. Many television manufacturers, such as Samsung, Vizio, LG and Sony, have been known to have tracking software and can hear and/or view owners. Trying to apply ethical concepts to the Internet of Things is not a simple right vs wrong consideration. It is convenient and beneficial for smart TVs to have the ability to listen to commands such as changing a channel, suggesting a programme (based on viewing habits) or searching for a particular show or movie. Perhaps the ethical questions that should be asked by the developers of this technology are, “Should we do more to make the user aware of what is being done with their commands?” and/or “Should we be more open about the capabilities of our smart devices and build in easy-to-use features to disable unwanted smart features?”.

Given these examples as background, is enough being done in terms of ethics education and research as it relates to information systems? If popular information-systems-focused conferences and textbooks are indicators of whether or not there is sufficient emphasis on this topic, the news is not good. In reviewing topics covered by several international, national and regional information systems conferences, the topic of ethics is totally missing or minimally represented. A review of popular information systems textbooks reveals again, the topic of ethics is inadequately addressed. There is some positive movement however. The *MSIS 2016 Global Competency Model for Graduate Degree Programs in Information Systems*, developed jointly by Association for Information Systems (AIS) and ACM, does include ethics within the curriculum’s core competencies.

Does more need to be done to integrate ethics methodologies with information systems methodologies? Given the impact of the three examples previously explored, the answer is “Yes”. System failures are often discussed in information systems courses and research but are mostly focused on inadequate requirements definition, uncontrolled scope, lack of stakeholder involvement, lack of management commitment and many other non-ethical issues. While such failures indeed can be costly and damage the reputation of an organisation, they are not the only factors to consider. Ethical failures should be covered as well. Ethics in the real world of Information Systems is a crucial issue which cannot and should not be ignored. It follows that IS education programmes should be fit-for-purpose, addressing the ethical dimension in a timely and appropriate manner. It seems that a global audit of IS education offerings would worthwhile, as it would provide evidence of how serious and widespread is the lack of ethics content and education.

6. Conclusions

From the arguments laid out above, it follows that there is a need to increase awareness, interest and action concerning the ethical dimension of Information Systems both as a discipline and as a practice. There is opportunity for multidisciplinary dialogue which will

promote greater attention to these issues. The overall aim is to act as a catalyst for action within the IS community. As such there are four objectives:

- (1) to encourage wider debate concerning the ethics of information systems;
- (2) to explore current application areas and technological infrastructures to tease out some of the key ethical challenges;
- (3) to consider how current management practices allow or hinder the addressing of such challenges; and
- (4) to suggest ways forward for practitioners which will increase the chance of ethically acceptable application systems.

It is possible to develop an agenda of ethical issues surrounding the development and use of information systems. The agenda could be subdivided into three parts:

- (1) Application Areas: for example, Internet of Things, Cloud Computing, Social Media, Big Data;
- (2) Techniques: for example, Ethics Algorithms, Sentiment Analysis, Public Beta Testing; and
- (3) Holistic Concerns: for example, Privacy, Cybersecurity, Equality of Access, Data and Discrimination.

The success of such an initiative requires all those involved in Information Systems research, education and practice to contribute to the detailed planning of the initiative and to be proactive in its implementation.

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