International workshop on Innovations in Information and Communication Science and Technology, IICST 2014, 3-5 September 2014, Warsaw, Poland

ICT with or against society – what can happen when (interest of) some key stakeholders are omitted?

Małgorzata Alicja Płotka a,b,*

aPolish-Japanese Institute of Information Technology, 80-045 Gdańsk, Poland
bCentre for Computing and Social Responsibility, De Montfort University, Leicester LE1 9BH, United Kingdom

Abstract

Primum non nocere (first, do no harm) these words are commonly known as a part of the Hippocratic Oath taken by physicians and other healthcare professionals. Not many, though, put these words in to practice in ICT. From computer specialists we also should expect professionalism, responsibility and the following of the highest ethics code and standards. One of the most important aspects seems to be working for ethical the best interests of the stakeholders. Firstly, in order to accomplish this, all key stakeholders must be identified and characterised. Subsequently their needs must be represented and addressed. If it is possible stakeholders should be invited to work or at least have the opportunity to give some substantial feedback before development can be incorporated into the mainstream particularly that it regards the most important areas such as: government, public safety, access to labour market, education and health care. This paper aims to present how essential it is to address the issues of all who will be affected by the ICT developments and the potential pitfalls if these are neglected.

© 2014 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/3.0/).

Keywords: collaboration; social-ethical risk assessment; impact on society; stakeholders’ role; interdisciplinary social science

* Corresponding author. Tel.: (+48 58) 683– 59– 87; fax: (+48 58) 682 – 10 – 67.
E-mail address: mplotka@pjwstk.edu.pl / malgorzata.plotka@email.dmu.ac.uk
1. Introduction

The rapid development of Information and Communications Technology (ICT) results in the broader computerisation and informatisation of our life. ICT is taking root in humans’ lives more and more almost with every new application. With every day that passes it is harder to imagine our work, pleasure or private life without ICT. At work we are making international teleconferences, remotely co-working even with people from different countries then we are posting messages with use of one of the social networking sites or blogs, doing online shopping, booking tickets to cinema or for travel and sending electronic letters or sharing photographs with friends and/or family. One does not needed to stand in queue to register to a doctor any more. It is enough go on health centre website and simply book the visit. Traditional books and newspapers have declined in circulation. They are read online or downloaded on one’s computer, telephone, tablet or e-reader. It might be thought that increasing numbers of application should improve humans’ life. Is it really like this? Opposite, increasing the number of application seems to increase the number of problems of developments/ innovations use or/and application. This includes: digital divide [1], data- and surveillance [2], cybercrime/ computer abuse [3], individual rights [4], privacy [5, 6] and intellectual property offence [7].

Above problems of ICT developments and their impact on society are noticed and widely discussed by those who are working in the field of the social and ethical aspects of computing such as: EthiComp (The international computer ethics conference series), IFIP (The International Federation for Information Processing), ACM (Association for Computing Machinery), CEPE (The Computer Ethics, Philosophical Enquiry sponsored by INSEIT - the International Society for Ethics and Information Technology) and IACAP (The International Association for Computing and Philosophy) communities. All them working on establishing relevant:

- law, codes and standards e.g. ACM - Software Engineering Code of Ethics and Professional Practice, UK – Computer Misuse Act 1990; EU – Information Technology, Telecommunications and Data Processing Legislation; PL – Data Protection Act
- risk analysing and reducing strategies or decision supporting tools such as WinWin Spiral Model [8]; VSD – Value Sensitive Design [9]; SoDIS – Software Development Impact Statement Method [10]; ETHOS [11] or EthXpert [12], and

However, discussion alone would be insufficient if there will be not built the bridge between researchers and industry. Therefore projects such as CONSIDER – Civil Society Organisations in Designing Research Governance, TORRII – the Framework for Responsible Research and Innovation (RRI) in ICT and the new one that focuses on RRI in ICT for health and ageing in industry co-financed by the European Union have been and are carried out. Any or all of these activities are aiding in making an observations to collect data (e.g. case studies), analyse, identify and discuss social-ethical issues to drawn some conclusions and provide satisfactory solution(s) to these concerns.

Similarly, analysing case studies collected in research and professional work within IT by breaking them into single concepts in order to build conceptual framework this is what a researcher – the author of this article is doing at the current stages of her study. Helpfully developed this way (from scratch) theory enables us to understand the situation in the ICT together with suggesting methods that would enhance and improve the software requirement engineering process. In this paper two case studies concerning the ICT developments impact on society are presented and briefly analysed. The author puts cases illustrating the positive (in section 2) and negative (in section 3) touch society together to present her findings until now that became her research problem: ineffective stakeholders’ engagement (inadequate addressing) or lack of relevant support and stakeholder input, in general, cause 'surrounding challenges' requirements, not matching stakeholder needs. Section 4 brings a summary of the researcher’s experience and work on the topic including her PhD progress and plans for future. Section 5 closes the article with brief conclusions and recommendations.
2. The ‘positive’ case study: e-experiments in physics (Republic of Poland)

An analysis of following case study (section 2.1) illustrates how proper stakeholder identification (section 2.2) along with social-ethical risk analyse (section 2.3) may have positive impact on society and individuals (section 2.4) as well as project, application and its usability (section 2.5).

2.1. The case description

“e-Experiments in physics” (pl.: “e-Doświadczenia w fizyce”) was an innovative educational project co-financed by the European Union within the ESF an answer for the Polish Ministry of National Education’s call for proposals under the subject “Development and implementation of innovative pilot programs, such as training in mathematics, science and technology and entrepreneurship”. The main aim of the undertaking was to:

“fill the gap in the educational software market, by designing and constructing a set of virtual physics experiments, referred to so-called e-experiments. An application, according to assumptions made by the originator of the project, should allow for building interactive experiments; experiments similar to those that should be conducted in physics laboratories at schools. From the very beginning a famous maxim of Confucius: Tell me and I will forget – Show me, and I will remember – Let me do it, I will understand has been followed. Additionally, the team project members have always repeated: Our task is not to replace reality; we just want to enrich the existing curriculum by the experiments, which – for various reasons – rarely take place during physics lessons. We want to help students learn by practice in accordance with the model of: <<design, build, perform, analyse, present results>>, because we believe that this is the only way they can fully understand the laws that govern the world around us.” [15]

The project was completed in partnership [16]. The leading team was formed of Faculty of Applied Physics and Mathematics (Gdansk University of Technology, Republic of Poland) students and academic staff that previously also studied at the same faculty. To realise project tasks the following positions were created: project manager, assistant manager, coordinator of the subject matter works, 6 subject matter experts, methodologist of physics from one of the best Polish secondary schools and administration i.e. office, legal, technical, financial, monitoring and evaluation specialists, public procurement and IT specialist staff. Implementation (mainly GUI) of the e-experiments was given to a national partner Young Digital Planet SA (YDP). The foreign partner, Dutch educational publishing company (Consultant L.C.G. Malmberg B.V.) reviewed and tested ready-made product(s).

The project development process was planned paying special attention to the details and applying software engineering standards. The subject matter experts under the supervision of a coordinator and assistant manager (subject matter team) took particular care of the mutual understanding of design issues by all stakeholders (developers, contracting authority, users and recipients) along with the users’ experience of the final product. By way of explanation, each of the e-experiments were planned to fulfil stakeholders’ needs and expectations as well as to make teaching, learning or recommending them as a good educational tools an ease and a pleasure. For these purposes the project was started by conducting a nationwide survey of the teaching of physics in secondary schools [17]. The teachers and their pupils were asked about their experiences and suggestions as to what could help improve their mental object¹/image² of how physics education should be. Information gained from the survey reports, together with the current curriculum in force at upper secondary schools provided a starting point for the preparation of the e-experiment scenarios (requirements’ specifications) that were eventually prepared by the subject matter team based on their knowledge and experience gained during their academic work and study. Before finished specifications were sent to YDP they were verified by a methodologist who supplied his amendments and any modifications as required. The YDP team leaders with acquired domain knowledge of the project’s subject matter checked how their understanding of the substance corresponded with received scenario(s) content and assessed the feasibility of the scenario in that domain. Their feedback helped to clarify any misunderstandings and divergence in subject matter and development teams’ mental images of the final product. This was repeated until a perfect match

---

¹ the sum or range of what has been perceived, discovered, or learned [36]
² representation in a person's mind of the physical world (an object, event and so forth) outside of that person [35]
of both objects was achieved. An ultimate verification which would entail that the subject matters and developers understanding of the requirements coincided was accomplished after the preliminary version of the product (implemented with use of the Adobe Air / Alchemy technology) was delivered to the subject matters team that were then responsible for carrying out tests. All critical and major bugs had to be fixed before each e-experiment was put to validation by the users of the project. The next stage consisted of the investigation as to if the good software was built. This was to confirm if the teachers’ mental image of the educational tools properly supports their work matched with the range of facilities provided by e-experiments. Due to the development team members engagements regarding the implementation of the next e-experiments only the indispensable/well-suited adjustments were introduced in this phase of the work, however all feedback was recorded for later use. The e-experiment ended up in the ability of the recipients being able to (which sometimes had been impossible before) conduct physics experiments in the classroom or (what had been never possible with traditional set of experiments) at homes. They also could give their opinion and remarks that were taken under consideration during the product improvement.

2.2. Stakeholders identification

As the project was a pilot study a representative group of 20 upper secondary schools from Pomerania was selected to carry on tests. To ensure that the interest of all key stakeholders was addressed apart from project team other groups of the stakeholders were involved into work [16]:

- Teachers – users of the project from 20 selected upper secondary schools from Pomerania
- Students – recipients of the project, pupils of the teachers
- Customer/ contracting authority – Polish Ministry of National Education, intermediary institutions for the EFS programs implementation
- National Thematic Network for Education and Higher Education – forum of experience exchange and evaluation of innovative projects that may help in popularising and including to the mainstreaming of education
- Science and education circles – opinion making bodies, advisors
- Society – anybody who may be affected e.g. Internet users that accidentally or purposely found e-experiments in search of a good material to prepare to exam, high-school certificate or just to broaden their own knowledge
- Teaching programme – important to remember in case any change should be made

2.3. Social-ethical risk analysis

Gotterbarn in his work [18] observes that along with estimating technical, schedule and budget risk the social-ethical aspects should be taken under consideration. In Table 1 detailed results of this kind of assessment are presented. The full risk analysis was contained in one of the previous papers [16] and project documentation.
Table 1A social-ethical risk assessment of e-experiment in physics (used also in: [15])

<table>
<thead>
<tr>
<th>Concern</th>
<th>RE1</th>
<th>RE2</th>
<th>RE3</th>
<th>RE4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wrongly informed about the product and its capabilities or unprepared teachers who may have limited interest to use e-experiments if product is included in mainstream educational policy</td>
<td>Lack of interest/enthusiasm from students</td>
<td>Incompatibility of e-experiments to the curriculum due to reforms in education</td>
<td>Inadequate training/knowledge of teachers resulting in poor use and ending result</td>
<td></td>
</tr>
<tr>
<td>Likelihood: Unlikely</td>
<td>Unlikely</td>
<td>Possible</td>
<td>Unlikely</td>
<td></td>
</tr>
<tr>
<td>Severity: Critical</td>
<td>Critical</td>
<td>Significant</td>
<td>Critical</td>
<td></td>
</tr>
<tr>
<td>Solution: Populatisation of the project in the educational circles during the conferences, by publication articles, information on project’s webpage and in social networking services; ensuring a high visual and functional attractiveness of the product; soft and hardware multi-platform, and independence.</td>
<td>Ensuring a high visual and functional attractiveness of the product; soft and hardware multi-platform, and independence - available for multiple, differing operating systems and types of computer equipment (desktops, laptops, tablets, etc.) and multimedia boards; creation of the project profile on the social networking services.</td>
<td>Admission in the recruitment process for classes with basic through to extended physics teaching programmes so to ensure the comprehensive testing stages; set preparation of the e-experiments that can be used in different levels of education (e.g. in lower secondary schools or on the first years of studies).</td>
<td>Preparation of the instruction for the users to each of the e-experiments.</td>
<td></td>
</tr>
</tbody>
</table>

2.4. An impact on society and individuals

To ensure popularisation of the project it was demonstrated to the technical, science, professional and educational academics and specialist (e.g. user interaction experts) circles, decision-making bodies, such as National Thematic Network for Education and Higher Education and other interested parties. The project outcome has been well-received everywhere. More importantly, at the end teachers and students during internal and external evaluation [19] were asked about their satisfaction of using e-experiments and an assessment if one of the project goals, increasing interest and understanding (ease of teaching) of physics that resulted in obtaining better grades, was achieved. On Fig. 1 the surveys’ results are displayed.

As shown almost 40% (39.39% altogether) of students admitted that using e-experiment increased their understanding of discussed subject compared to 23.81% who answered “no” or “rather no”. A little less than 30% was not sure and 6.93% did not respond. Surprisingly, slightly more (45.02%) believed that information they obtained during classes with use of e-experiments will be remembered for longer against 20.35% who took a contrary view. But there again almost 30% did not know and 6.49% did not answer.
2.5. An impact on project, application and usability

Firstly, when works on the final product were ongoing, tests conducted by subject matter team help to make e-experiments ‘real’ – as close as possible to reality. As mentioned earlier all critical and major bugs were fixed on this stage. These changes were made to planned schedule and budget. Moreover, until the first e-experiments were ready subject matter team verification proved that to implement a numerical engine of the application it is not just enough only to have strong programming skills but to also have an advanced physics knowledge base. Next products’ engines were coded in C++ by the programming subject matters expert.

Consequently, further feedback about ready-made e-experiments provided by subject matter team and teachers (students’ comments were verified by their teachers and by them reported) enable to make some changes that cost about 10% of planned budget and concerned about 10% of functionality (estimation of project manager in direct conversation). At this stage only just 1% was substantive changes. However all significant indications were considered and introduced. Rest suggestion was to improve usability and new features e.g. way of working and closing up dialogue boxes or extending functionality and moving Oberbeck pendulum from add-on ‘curiosity’ to main part of the application.

Unfortunately because of time and budget limitations not all required changes were made.

3. The ‘negative’ case study: driving history database (United Kingdom)

The researcher still is collecting data to describe in detail this case study. Therefore the following article contains just basic information that have been found up until submission to the IICST 2014 — Fourth Postgraduate Consortium International Workshop. An analysis of following case study (section 3.1) illustrates how omitting proper stakeholders’ identification (section 3.2) and insufficient or lack of social-ethical risk analyse (section 3.3) may have negative impact on society and individuals (section 3.4).

3.1. The case description

From 2014 insurance companies in the United Kingdom are getting access to database of the drivers’ history held by DVLA (Driver and Vehicle Licensing Agency sponsored by British Department of Transport, United Kingdom). The idea behind this project was to “ensure that honest drivers don’t pay more for insurance, while those that haven't been honest about their driving history pay more” because of as shows the Association of British Insurers (ABI) estimation [20] “1 in 5 drivers under-declare or fail to divulge the total number of motoring convictions they have”. The endorsement points are valid for 3 years from the date of the offence after this time they expire. But can only be removed from the licence by application after the 4th year [21, 22] and remain on record even one year more [23]. A single offence such as speeding may result in 3-6 points (usually 3). The premium (fee) is estimated individual circumstances based on, among others, information from the DVLA database. 9 penalty points on driving licence usually significantly increase the fee and 12 disqualifies from driving for at least 6 month [22]. Once per 3 years driver can be offered special course (e.g. Speeding Awareness Schema) but only if he/she drove not faster than 10% above the speed limit, plus 9mph.

By comparison in Poland only building up to 24 (excluding 1st year drivers who may have up to 20) or more points result in referring driver for repeat course and retest. The points are valid for 1 year. A single speeding offence may ensue between 2 and 10 points. Once per 6 months driver can attend re-educational course after that amount of their points is reduced by 6 points. Information about penalty points is stored in Police database that by 2016 is going to be integrated with CEPiK (pl.: Centralna Ewidencja Pojazdów Kierowców, Central/National Evidence of Vehicles and Drivers) [24]. The CEPiK contains information about vehicles (CEP) and drivers (CEK).

3.2. Stakeholders identification – how it could look

After preliminary analyse of the described case the researcher believes that interest of the following groups should be taken under consideration:
3.3. Social-ethical risk analysis - how it could look

By following an example of e-experiments social-ethical risk analysis in this case similar assessment could look like shown in Table 2.

Table 2. A social-ethical risk assessment of DVLA database – how it could look

<table>
<thead>
<tr>
<th>Concern</th>
<th>RE1</th>
<th>RE2</th>
<th>RE3</th>
<th>RE4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaking of data</td>
<td>Allowing unauthorised access or alteration to the data of stakeholder or using data stored in the database for unauthorised purposes</td>
<td>Lack of consist/ national policy allowing each part decide what and how they going to proceed data.</td>
<td>Breaking the contractor refusing employment of somebody who has more than 3 endorsement points on his/her Licence</td>
<td></td>
</tr>
<tr>
<td>Likelihood:</td>
<td>Possible</td>
<td>Possible</td>
<td>Very likely</td>
<td>Likely/ Very likely</td>
</tr>
<tr>
<td>Severity:</td>
<td>Critical</td>
<td>Critical</td>
<td>Critical</td>
<td>Critical</td>
</tr>
<tr>
<td>Solution:</td>
<td>Ensuring proper database protection.</td>
<td>Ensuring that policy of access to database and using data is followed.</td>
<td>The ideal solution would be to limit access just to valid penalty points. But if it is required that companies have access to data for full period of 5 years there should be consistent national policy ensuring that each company interpret data in exactly same way. Perhaps some expired offence could be ignored and companies could take under consideration just these serious ones e.g. when number of points for single offence is more than 3 and/or offence result in 3rd part lost or being injured.</td>
<td>The ideal solution would be to limit access just to valid penalty points. But if it is required that companies have access to data for full period of 5 years there should be consistent national policy ensuring that each company interpret data in exactly same way. Perhaps some expired offence could be ignored and companies could take under consideration just these serious ones e.g. when number of points for single offence is more than 3 and/or offence result in 3rd part lost or being injured.</td>
</tr>
</tbody>
</table>

3.4. An impact on society and individuals

Unfortunately it seems that new DVLA database can work against drivers who were less lucky and obtained more than 3 penalty points within the following 2-5 years e.g. for a speeding offence. To check history of driver is enough to know driver’s licence number, National Insurance number and postcode. All these pieces of information are required in most of job applications. Having more than one offence on account may significantly increase insurance or end in decline to continue one’s cover. As a result it can be really burdensome for somebody who tries to insure his/her private car but for those whose work requires driving (e.g. some utility service jobs) it can be an obstacle in obtaining a job for years. This results from

---

\[\text{One of the issues that could be identified with use of SoDIS Analysis (to read more: [10, 18, 32, 33])}\]
one of the job recruitments, which usually is to have no more than 3-6 points (for insurance purposes) on the licence [25] what in practice means current and expired together. Therefore some companies refuse to hire a person even with 0-3 current and additional 3-9 (up to 9 in totals) expired points based on their insurance companies’ discretion. And the insurance companies reserve the right to increase the premium or even refuse cover altogether. Granted, DVLA cannot be blamed for insurance companies’ policy that does not mean that an interest of big group of stakeholders was not taken under consideration during the DVLA database development.

Instead, in Poland access to databases is limited (with some exceptions) to relevant authorities/executives and people whose data concerns such as vehicle owners [26]. Drivers can check their own penalty history just during they visit on the police station after providing a valid ID. However there are attempts to earn on people who would like to check their points in the Internet by creating website that supposedly will supply required information once paid SMS is sent to website owners [27]. People willing to buy vehicle may check it details if they know its number plates, VIN number and date of registration (in the UK to similar purpose is enough to know number plates). Data of CEP may be also available for commercial, non-commercial and statistics purpose. The researcher does not know yet if in Poland insurance companies will have accesses to new CEPIK database. But at the moment insurance premium may only increase when road offence involves serious harm such as damage vehicle or injured party. And even then the factor behind the increased price may be only losing insured’s no-claim discount.

Interestingly, when in the UK all information regarding driving licence and endorsement points can be found on one government webpage [22] in Poland one source consistent in the information hardly can be found.

3.5. An impact on project, application and usability

At the current stage of study the researcher does not have any knowledge about an impact on project, application or its usability.

4. Stage of the research and plans for future

Described problem illustrated by the ‘positive’ and ‘negative’ case studies is a part of the research aiming in-depth analyses of the problems with inadequate involvement of stakeholders into work on IT projects and insufficient addressing of their issues what requires getting information about people’s “behaviour, daily routine, work process, ... circumstances, job, ... community ... or experiences” [18] by engaging sagaciousness and knowledge from appropriate stakeholders. As a result of the research omissions in requirements engineering such as ‘gaps’ and ‘overlaps’ caused by insufficient information or inconsistent views specifying requirements, from inadequately addressing stakeholders (as explained above) should be filled. Finally researcher will consider how to include suggested solutions in methods supporting the translation of clients’ needs into requirements. The researcher’s project in its context was outlined in EthiComp 2013 proceeding [28].

At the moment the researcher is preparing herself to the formal review that requires prepare “a brief review and discussion of work already undertaken, including a review of relevant sources and methodologies as well as a plan of further work” ([29, p. 3]) and collecting case study to be analysed in order to build theory (research design: building theory from the case study). Her PhD project is conducted in the Centre for Computing and Social Responsibility (De Montfort University, Leicester) and should be finished by October 2018 (according to university practice maximum length of registration can be 72 months for the part-time students). The researcher takes an active role in ETHICOMP Standing Committee that aims in providing “an inclusive forum for discussing the ethical and social issues associated with the development and application of Information and Communication Technology (ICT)” [30] and is a friend with IFIP TC-9.2.: Social Accountability and Computing [31]. She is also an author or co-author of several publications and conference communications of applied computing, requirement engineering and social aspects of computing along with several innovative technical and didactics solutions including an educational project "e-Experiments in physics".
Résumé

The failure to recognise or neglect the important group of stakeholders’ needs may result in the preparation of software that does not meet stakeholders’ needs and (in effect) insufficiently supporting their work and even count against. A neglecting interest of those who have no access to computer with Internet may cause their digital exclusion being good example. To take another, the new DVLA database was developed to protect insurance companies’ interests against those who may falsely declare information and incorrect liability estimation of costs but may also work against some of the insured excluding them from the labour market for years. On the contrary, extensive cooperation with key stakeholders may bring ICT developments closer to people. Collecting, analysing and presenting both positive and negative case studies referring both software hall of honour and shame like these described in following paper may help to build up picture about explored problem and better understand what should be done to improve current situation and drop-off numbers of ICT failures and/or challenges.

Subsequently education of the next generation of the computer scientist seems to be indispensable. Therefore it is important to bring social and ethical aspects of computing to future ICT professionals’ attention during special courses [32, 33] not forgetting to continuously modify program of classes with taking on board latest discussed problems, findings and market needs.

Finally, it is really important that researchers, also the youngest ones, especially those who already started their professional carrier within ICT (like many Polish postgraduate students) have chance to gain required skills and knowledge paying attention to social-ethical aspects [34] and share them with others on all sorts of forums for an exchange of views such as conferences, workshops or meetings with other professionals also in their workplace.

Acknowledgements

The author would like to acknowledge the hard work that her mentors put in her education and supervising firstly her master and now professional along with researcher work, all opinions, feedback and discussion with members of communities such as ETHICOMP or IFIP as well as remarks and comments on the manuscript from Paweł Syty and Gary G Hunt.

References


[12.] M. Laaksoharju and I. Kavathatzopoulos, “EthXpert: The basic structure and functionality of a decision support system in ethics”.


[19.] ASM, “The results of external evaluation carried out on teachers and students (in Polish),” ASM – Centre for Research and Analysis Ltd., on behalf of the Gdansk University of Technology, Kutno, 2013.


