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# The Aanlysis on Value Sensitive Design of Applied Technology

GUO Jianan[a],*; CHEN Fan[b] *

[a]Ph.D of Philosophy of Technology. College of Humanity and Law, Northeastern Universit , Shenyang, China.
[b]Ph.D of Philosophy of Technology, Doctoral Supervisor. Research Center of Philosophy of Technology, Northeastern University, Shenyang, China.
*Corresponding Author.

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## Abstract
The applied technology has made great development in today's society, which were included information technology, nanotechnology, genetic technology, and so on. However, no matter what kind of technology there are still problems that design value demand of technology contradict with human beings, the safety design of technology should not only posses the technical characteristics of the ideal, but give full consideration to the value of the patients demands. Value sensitive design is a kind of theory of technology design method, it pays attention to the technology user's values of society and ethics psychological demands, it can provide guidance and advice for method of security design of applied technology as represented by high technical, which has has an important significance for the design and application of cutting-edge technology of our nation.

**Key words:** Value sensitive design; Applied technology; Safety design technical ethics

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## INTRODUCTION
In order to deal with the information technology progress and development in the field of human-computer interaction that affect the shift between roles and interests, the value sensitive design is the design approach that closely related with value goal and privacy protection, in other words, information and communication technology can not only provide information, but know how to design in the initial stages of design. The professor Pattaya Friedman, who was appointed by information college of university of Washington, United states, he puts forward a design method to solve the problem of ethics in the early stages of information technology. The Value sensitive design method adopts triple comprehensive methodology: first of all, the conceptual approach, which apples further research and philosophical explanation for involving human value problems; secondly, empirical methods, on the basis of the concept research, the designer can using observation, interview, investigation, experimental operation, documents collection, Human acts with or without technical artefacts may be assessed morally (Achterhuis, 1995), the user's behavior and human physiology and the quantitative and qualitative methods to evaluated a particular technology design results; finally, technical investigation method, this method can study the existing technical performance and the related mechanism how to support or hinder people's value, and use system concept research initiative designed to support the value of the consideration. The moral discussion is about how they are to be used, about the ends that may be realized with the means, not about the means themselves (Latour, 2002).

Value sensitivity design includes the each step of technology development, technology transfer and technology used, what kind of technology policy research have been adopted, what kind of moral principles are established, which is the key of the technology management research. The question we started off with is framed in a wrong way when it is assumed that technical

artefacts by themselves and human beings by themselves do not exist because they co-constitute each other (Floridi & Sanders, 2004).

## 1. THE RELATIONSHIP BETWEEN APPLIED TECHNOLOGY AND SCIENCE

The domestic and foreign scholars are not unified with the understanding of the relationship between science and technology, a kind of opinion suggested that technical invention and technology application can be conscious application of scientific knowledge, it can also be the result of accumulation of experience. Another opinion considered that the application of technology must be scientific though the role of science and technology are different in degree, the famous technological philosopher Bunge considered that "Technology is the application of science", on the research object, scientific research is a thing-in-itself, technology research is for me. On the value idea, scientists think it is worth to studying all the concrete object but not to the value problems, otherwise, technical experts tend to think that all things need to be considered from the perspective of utilitarianism. They are the "hidden and despised social masses who make up our morality (Priemus & Peter, 2008).

The relationship between the science and technology is quite complicated, which is not only in different historical period of ancient times, modern times and contemporary, but there are differences between scientific and technical areas. Generally speaking, philosophers can analyze the universal principles of the differences and relations between science and technology, which is possible and necessary. Rapp said, technology is a kind of historical phenomenon, which make its conceptualization only in the specific historical context. Therefore, people can divided applied technology into different times, At every stage, the task of technology is different. Science's mission is to find and increase people's knowledge wealth and spiritual wealth, Technology's mission is to use natural and control the nature, which is used to create artificial nature and coordinate the relationship between human and nature. The purpose of Technology is to invent something, thus increase the material wealth of human and make human life better. From the point of the problem to be solved, the main answer of scientific object is "what" and "why", The purpose of science is relatively simple, which does not involve more value problems, but technology is just the opposite, The research object of technology is what to do and how to do it, the technical problems are often quite complex, it often involves many discipline knowledge, as the computer technology for example, scientists tend to consider the principle of the computer is whether reasonable, the calculation speed whether meet the needs of people. but technical experts tend to consider the cost of computers and the problems of spare parts supply, they can considered How well do the computer operation is convenient, safe and reliable, and so on.

Friedman wrote, historically speaking, technology achievements get no benefit from scientific, they developed themselves through the activity itself or general experience. Although modern science has a great influence to applied technology, but the people never think technology would cling to the science, just as Scottsdale said that it is time to people study science in order to solve the technical problem in many times. The Canadian technology philosopher Javey also thinks the technology as the application of sciences is actually a kind of discrimination and prejudice of technology. No matter which kind of view, they stated their theory view are all admitted the basis of technical and scientific distinction, which causes the two sides reached a consensus on the research object and purpose of technology: Technology is different from science.

In a word, pepole deny science is equivalent to application technology, which is not ignored the effect of modern science that applly in technology, especially the role in the development of high technology, But that is not logical premise of appllied technology as one branch of science, after all, they are the issue of two properties.

## 2. THE NECESSITY OF VALUE SENSITIVITY DESIGN ON APPLIED TECHNOLOGY

The development of modern applied technology has developed by leaps and bounds, which is including information technology, Nano technology, gene technology, etc. Among them, especially the development of information technology is profoundly changing the world, and this change is irreversible. The pace of the information revolution has been far beyond the scope of the expected, in the second study report about the information storage and flow of Lyman and Varian, they wrote that in 2002s, only storage medium of printing, film, tape had been produced 5 exabytes, the 5 exabytes information quantity means 37,000 new national library collection, the whole human history only need 12 exabytes that can save it. In 2001s, the number of people who use computer up to 600 M units arround the world, the information technology had became the main kind of applied technology arround the world, The world and the human society has created the new entity, which has made the unprecedented phenomenon and the experience come into truth, it provides a powerful tool and methodology for people. In so far as we can make sense of the notion of technical artefacts having meanings, they have these meanings only in relation to human beings; meanings are attributed to technical artefacts by human beings (Wright, 1963). However, there has a large number of people who as computer expert rely on their professional knowledge,

and they should perform the corresponding social responsibility. The computer skills can be abused, or to be used carefully, even can be the used in good and bad, what would require the use method of value sensitivity design, which can adjust the directivity of technical purpose in early stage of technical design, the core issue of Information ethics is social value and policy issues, for example, the problem of privacy and property rights. The value sensitivity design requires one can ask "why", Why the computer expert role possess social responsibility, how to explain why and in what degree the vocational role of the individual should responsible for the impact of their work, these problems involve all citizens, and it is not just a computer professionals.

As a kind of application technology, information technology has been widely used in the medical field, however, doctors and other stakeholders accept (or even welcome) security defense measures is often conflict in order to ensure the safety of equipment in the technical mechanism and the patients: the equipment that technically feasible are often not accepted by patients. Value sensitive design tries to analysis stakeholder groups whose interact most tightly with IMDS security system, which bridge the gap between the technical system and effective deployment. IMDS was very different from devices such as mobile phone, computer, what this technology is implanted into patients' body, and the patient body is an integral and necessary for the user's health technology. The value sensitive design claims that the future of security design of IMDS should not possess both technical characteristics of the ideal, but also should give full consideration to the value of the patients demands. Information security includes three aspects: the confidentiality (confidentiality), it refers to the information not be leaked; Integrity (integrity), it refers to the information not to be illegal modification; Availability (the availability), it refers to the information is not damaged. From system process and control point of view, information security is in the process of storage, processing, distribution and transmission in order to maintain the confidentiality, integrity, availability, traceability and nonrepudiation of system with identification and control, strategy and process.

In addition to the above two application technologies, large data also shows the necessity of value sensitivity design. Since the information revolution, the data is everywhere. The network was connected with one by one: It was not only get together and communicate with each other, but can be designed by the cloud, which contribute to a wider range of search. The reason why people called this technology "Big Data" is that human beings can analysis and use of data in a large increase, human can discover new knowledge, and create new value through the exchange of data integration and analysis, which can bring big knowledge, science and technology, big profits and development. A surge of data means that human records range, measurement range and the scope of analysis is widening, the boundary of knowledge became extented continuelly. However, as the rapid development of Internet, personal information security has also been suffered a serious threat. At the beginning of April, 2011, the world's largest email marketing company Epsilon had suffered the most serious hacker intrusion in the history, which leaded to many customers list and E-mail address were leaked, the first capital group, marriott hotel, bank of America,and so on. On the other hand, In the era of big data life, people's life in the online can be traced, the life can be tracked even offline. A report of IDC estimates that the stored information reaches 0.8ZB in 2009, the data information of global storage reaches 35ZB, what includes most of customer information.

**Table 1**
**The Annual Budget Information Collection**

| **The Federal Government Information Collection Burden on the Budget in 2005-2009** (Units: millions of hours) | | | |
|---|---|---|---|
| **Fiscal year** | **Federal government's ministry of finance** | **Other agencies** | **Grand total** |
| 2005 | 6434.99 | 1805.52 | 8240.51 |
| 2006 | 6965.63 | 1957.87 | 8923.50 |
| 2007 | 7630.70 | 2011.70 | 9642.40 |
| 2008 | 7785.02 | 1928.80 | 9713.82 |
| 2009 | 7747.88 | 2176.29 | 9924.18 |

Description: a department budget of the federal government treasury accounted for 80% of the total budget of information collection, this is because each family needs to declare dutiable goods and refund.

Some people think that open information and the method of simple to set up are not enough to ensure the customer's network privacy, The Canadian information and privacy commissioner Cavoukian suggested the conception of design privacy, which is the use method of value sensitivity design, who advocate the take the conception of protecting privacy add to all kinds of organization, whicn included all activities and products.

For example, Yale university professor F. J. Anscombe is the pioneer of the era of large data, he specifically elaborated the graphics in an irreplaceable role in the study of statistics. He proposed the "quartet" theory, it is 4 group of data that appear in front of you at the same time, When you browse the four groups of data, you'll feel most of their value between 5 to 11, then make a little contrast, you will find (Xu, 2013):

$X1=X2=X3$

$X4$ value, except one, all equals to eight.

$Y1\neq Y2\neq Y3\neq Y4$

If further statistical calculations, it is easy to get the following results:

The average value of $X1$, $X2$, $X3$, $X4$ all equals to 9, the variance is equal to 10.

The average value of $Y1$, $Y2$, $Y3$, $Y4$ all equals to 7.5, the variance is equal to 3.75.

Four groups of data all comply with linear regression: $Y=3+0.5X$.

**Table 2**
**The First Set of Data**

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *X*1 | 10.0 | 8.0 | 13.0 | 9.0 | 11.0 | 14.0 | 6.0 | 4.0 | 12.0 | 7.0 | 5.0 |
| *Y*1 | 8.04 | 6.95 | 7.58 | 8.81 | 8.33 | 9.96 | 7.24 | 4.26 | 10.84 | 4.82 | 5.68 |

**Table 3**
**The Second Set of Data**

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *X*2 | 10.0 | 8.0 | 13.0 | 9.0 | 11.0 | 14.0 | 6.0 | 4.0 | 12.0 | 7.0 | 5.0 |
| *Y*2 | 9.14 | 8.14 | 8.74 | 8.77 | 9.26 | 8.10 | 6.13 | 3.10 | 9.13 | 7.26 | 4.74 |

**Table 4**
**The Third Set of Data**

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *X*3 | 10.0 | 8.0 | 13.0 | 9.0 | 11.0 | 14.0 | 6.0 | 4.0 | 12.0 | 7.0 | 5.0 |
| *Y*3 | 7.46 | 6.77 | 12.74 | 7.11 | 7.81 | 8.84 | 6.08 | 5.38 | 8.15 | 6.42 | 5.73 |

**Table 5**
**The Fourth Set of Data**

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *X*4 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 19.0 | 8.0 | 8.0 | 8.0 |
| Y4 | 6.58 | 5.76 | 7.71 | 8.84 | 8.47 | 7.04 | 5.25 | 12.50 | 5.56 | 7.91 | 6.89 |

No one wants to see the privacy policy, if the enterprise can spend a small amount of money in order to protect privacy from the outset, It's not only can prevent data leaks and brand image damaged, but still can save a lot of money (Xu, 2013).

## 3. THE VALUE CONSIDERATION OF APPLIED TECHNOLOGY DESIGN

The professor Jeron van den Hoven sugessted that ethicsuse the standard of good or bad and right or wrong to solve the problem, it is not just study the results of intrinsic value of inherent technology system, but also includes that how to design them to avoid the ethical dilemma when people use technology translate it. For example, a person who knows the power of the nucleus in advance, then he would oppose atomic weapons. If someone wants to research ethics requires us to profound analysis of a topic, and who needs to find what kind of value can contained (Pitt, 2000).

First of all, the value designer should consider autonomy of applied technology and social cognition. For example, ICD open access path for any medical personnel check and modify the data and implement the function of the emergency that is not subject to consent by the patients themselves during emergency situations, the patients said that the function violate the patient autonomy and informed consent of the individual seriously. Therefore, the application of medical equipment should be tested a large number of clinical trials in advance, the hospitals should bought a lot of medical equipment at the same time and need to apply technical training for staff, it is very

important to give fully respect for the patient's individual aspiration (Hutchby, 2001).

Secondly, the convenience of applied technology was related closely with personal aesthetic (Pitt, 2011). On the basis of the concept research, the applied technology designer should collected and analyzed the value of the patients' needs and evaluated all kinds of security technology mechanism through the observation, interview, investigation and other methods, they should get rid of technical functions that The technical users don't like. In the aspects of Technical safety designing, this technology should apply tangible information security and absolute security of the personal safety for technology bearer, in addition, the designers should respect patient privacy and self-esteem in order to avoid disclose the personal privacy of users. Technical design should be so beautiful that reduce and avoid unnecessary alerts and alarm, technical performance should keep lasting stability in order to ensure that the patients informed consent right.

Admittedly, value sensitive design gives a fully understanding and screening of patients with the personalized needs of stakeholders through the method of "value inhibition and guidance" (Kripke, 1980), which is trying to solve the contradiction between the personal value pursuit of technology users and the security issues of application technology, it is important to providing new and effective guidance for the future design and use of applied technology, and expanding the field of human-computer interaction research on high technology.

## CONCLUSION

Value sensitivity design is one of the types of technical design theoretical method, its purpose to explaining human value that throughout the design process in an overall and comprehensive view of the principle of method, which made of the method of concept, experience and technology. It asked technical designers to put issue of privacy and security in the scope of the ethical considerations from the beginning stage, which would realize technology protection for personal health data and privacy protection by moral and responsibility design. This approach is not only the necessary requirement of technology research and application, but also become the inherent requirement of innovation responsibility.

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