

APPROACH TO LEGISLATION FOR ETHICAL USES OF AI ARTEFACTS IN PRACTICE

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ABSTRACT

AI artefacts, how ethical they are by design and development, must be ethically used in practice in order to keep the coming AI society ethical. This study insists on the necessity of an approach to find practical use cases of AI artefacts requiring legislation against unethical use. The concept of the Mixed World is introduced in order to make it easier to find the corresponding cases in the real world that are related to cases requiring legislation. In order to find AI artefacts used in practice, definitions of AI based on functions but not on technology and related parties are proposed. Four factors that are useful to describe and estimate use cases of AI artefacts are also proposed, and they are applied to some popular systems on the Internet. Finally, all these proposals are applied for making sample regulations to protect and foster sound minors from harm caused by AI artefacts.

KEYWORDS: use-ethics, mixed world, legislation, AI artefact, minor protection.

1. INTRODUCTION

Artificial intelligence (AI) technology is one of critical technologies that drastically transform the modern society. Its penetration to the society and the economy could change every facet of our lives into the bad as well as good directions. AI technology can be applied for diverse regions. In this sense, it is one of the general purpose technologies (GPTs) of Bresnahan & Trajtenberg (1995). There are a wide variety of regulations related to every GPT (e.g., farming, steam engine, internal-combustion engine and electric power) so that the society and the economy can be kept ethical. AI technology must be added to such GPTs. The purpose of this study is to propose an approach for efficiently and systematically finding unethical use cases of AI artefacts and composing regulations effective in preventing them.

Ethics principles or guidelines of AI and AI artefacts were discussed by public and private initiatives and quite a few reports have been published. See for example, European Committee (AI HLEG, 2019), Japan (the Conference toward AI Network Society, 2017) and IEEE (the IEEE Global Initiative on Ethics of Autonomous and Intelligent Systems, 2017). Refer to survey papers such as Floridi and Cowles (2019) and Leikas et al. (2019) for more information. R&D and production of AI artefacts are expected to comply with these ethical requirements and supply only ethical products and services on the market. This is labelled as 'supply-ethics'. Supply-ethics can only be complied with in the context that is supposed during the process of R&D. Therefore, regardless of how firmly supply-ethics were complied with, any technological artefacts can be

used both ethically and unethically. This is because the context where a technological artefact is used in practice can be different from the supposed one. In order to keep the coming AI society ethical, unethical uses of AI artefacts in practice must be surely prohibited. This is labelled as 'use-ethics'. This is why regulations on practical uses of AI artefacts are necessary. Thus, we need to find unethical use cases of AI artefacts and compose some regulations to prevent them.

In the next section, a concept of the 'mixed world' is introduced. It will help to find situations where some regulations might be required. In section 3, we briefly look into the regulations that seem to have been effective for keeping the motorization society ethical. The inquiry discovers four factors important to describe situations or contexts where some regulations are needed. Section 4 is devoted to define AI artefacts and parties related to practical uses of AI artefacts, and some cases are listed to show effectiveness of the definitions.

As an example application of the approach proposed in the sections 2 to 4, section 5 investigates protection of sound minors from unethical uses of technological artefacts. Firstly, a set of regulations for protection of minors in the real world is investigated and then some ideas for protection of minors from application of AI artefacts targeting at their mental vulnerability.

2. FROM THE RW TO THE MW

Our living space is sometimes labelled as the real world (RW). It is the physical world we live and recognize. Information systems (ISs) composed of computers and relevant technologies also exist therein. The Internet and various information network systems are included in ISs. Diverse data, information and knowledge about the RW, and also data, information and knowledge which describe diverse ideas created by human are stored and distributed on ISs in various forms such as numbers, characters, pictures or animations. They are all stored as digital data and electro-magnetic existence in the RW. We call them simply "data" hereafter.

However, once a person understands and perceives the meaning of data, it is related to some things or some creations in the RW. The things or creations related to the data are images emerged from understandings of the data by the person. Such images are existence in the person's mind. The space composed of such images in the person's mind is labelled as the cyber world (CW). Note that the CW of one person differs from those of the others.

These two worlds have been separated in the sense that the CW was at the outside of the RW, i.e. our everyday life. We only "used" objects in the CW in order to add interests to our lives. This is why ethics in the CW have not been worried about up to recently.

The Internet and mobile devices have changed the situation. It seems not rare now that an individual consumes a few hours a day to communicate with social network services, roll playing games, smart speakers, etc. The CW has become an inevitable part of our everyday lives. This situation is described by the HM Government (2019) as "the power and influence of large companies has grown, and privately-run platforms have become akin to public spaces". Newport (2019) describes this transition as follows: We added new technologies to the periphery of our experience for minor reasons, then woke one morning to discover that they had colonized the core of our daily life. Thus, our living space has become a mixture of the RW and the CW. The new space is named the mixed world (MW).

The coming AI society would be ethical, only if the MW is ethical. For example, the purpose of the Act on the Protection of Personal Information of Japan is the protection of the rights and

interests of individuals in the RW who are linked to individuals (in the CW) described by personal data used practically. Thus, the protection of personal information should be understood as an extension of the protection of privacy in the RW into the MW.

Remember that the currently existing law and regulation barely keep the RW ethical. Because the MW is an expansion of the RW into the CW, it seems reasonable to expect some extension of the existing regulations would be effective for keeping the MW ethical, too. When there are some regions or groups especially requiring ethical considerations or protection against application of technological artefacts in the RW, i.e., if there are some regulations concerning such regions and groups, necessity of similar regulations against application of AI artefacts causing similar harm should be investigated. This view is one of our proposals here.

3. LESSONS FROM THE RW: USE ETHICS OF MOTOR VEHICLES

Developers of an AI artefact suppose its use context in order to specify technological requirements. A resultant AI artefact might not be used in the supposed context, but often used in different contexts. The supply-ethics by R&D is effective only in the supposed context, and the AI artefact used in practice can happen to have unethical effects on the MW.

The situation of the traditional technological artefacts such as motor vehicles and services based on them was similar. Some regulations have been necessary for motor vehicles to be ethically used even though they are ethical in the context supposed by R&D. Thus, there exist diverse regulations so as to make motor vehicles to be ethically used in practice even when the scope is restricted within road traffic. To survey them exhaustively is out of the scope of this study, so only those related to Road Traffic Law (RTL) in Japan are briefly investigated below.

RTL concerns the usage of motor vehicles mainly on roads, although it does a little R&D and production of technological artefacts related to motor vehicles. This is very contrastive to ethics principles and guidelines which deeply refer to R&D and production but little to usage.

First, we look into the regulations that set the prerequisite conditions of RTL. Vehicles are used to transport people and things. Road networks are also used for the same purpose. Individuals and businesses are users of vehicles. An individual user may be a driver as well as an owner of a vehicle. Typical businesses are the passenger or freight transportations. It is common among transportation businesses to own necessary motor vehicles and employ their drivers.

All these imply that some regulations to control roads and their networks, transportation businesses, owners and drivers as well as vehicles are necessary in order to comply with use-ethics. Because the knowledge of traffic rules and driving techniques is necessary to drive motor vehicles, some rule of driver's licenses is also required. Moreover, some regulation about the test and maintenance of finished vehicles are necessary too, because it is also necessary to keep the quality of vehicles above a sufficient level of safety. Table 1 shows some of such and regulations with brief explanations.

Table 1. Examples of Regulations Related to the RTL.

Law and Regulation	Brief Explanation
Road Transport Vehicle Act	Determines matters related to possession and maintenance that are necessary for securing safety and preserving environment such as prevention of pollution and etc., including determination of the range of road traffic vehicles, obligation for registration, procedure of registration. Determines also maintenance of roads where road transport vehicles run and placement of traffic signs.
Type Designation Rule of Motor Vehicles	Determines implementation details of the RTL such as procedure of type designation, criterion of inspections and format of certificate of completion inspection.
Road Act	Determines matters related to promoting development of road networks such as route designation and accreditation, administration, formation, maintenance, cost division, etc.
Road Transportation Act	Determines the taxi and bus businesses as passenger transportation by motor vehicles, and the exclusive road business of motor vehicles.
Consigned Freight Forwarding Business Act	Aims at the sound development of consigned freight forwarding business and to ensure the smooth provision of freight forwarding business that meets the needs of higher and diversified demand of users in the field of freight distribution through ensuring the fair and reasonable management of the consigned freight forwarding business, thereby contributing to protection of the users' interests and their convenience.
Road Traffic Law Enforcement Decree	Determines maximum and minimum speeds, point system for traffic violations and accidents, etc.

Source: self-elaboration

Type Designation Rule of Motor Vehicles concerns R&D of motor vehicles. Because of this rule, automakers must execute a certificate of completion inspection at the time of transfer of every motor vehicle of their products after a successful inspection by a certified inspector who approves the motor vehicle satisfies the quality standard of its designated type. This makes it possible to comply with supply-ethics.

Road Act is aimed at realizing the compliance with supply-ethics of roads where motor vehicles run. Businesses that are operated with utilization of roads are regulated by Road Transportation Act and Consigned Freight Forwarding Business Act.

RTL is aimed at preventing road hazards and otherwise ensure the safety and fluidity of traffic, as well as contributing to preventing blockages arising from road traffic (Article 1). It determines the obligations of drivers, businesses employing drivers, motor vehicle owners and the functions of the Public Safety Commission and the Police concerning regulation and management of road traffic. Articles on the maximum and minimum speeds also exist, and they are complemented by Road Traffic Law Enforcement Decree. Vehicles available for road traffic are restricted within road transport vehicles, and the rule is complemented by Road Transport Vehicle Act and Type Designation Rule of Motor Vehicles. There are articles concerning proper labour management when passenger transportation businesses by motor vehicles and consigned freight forwarding businesses employ drivers. RTL determines that a driver must get a driver's license and carry it while driving. It also determines requirements for driver's license of each type of road traffic vehicles. In addition, it determines traffic rules of pedestrians and motor vehicles.

We have briefly observed that use-ethics of motor vehicles is complied with by a set of regulations. Act on Punishment of Acts Inflicting Death or Injury on Others by Driving a Motor Vehicle, etc. is applied to especially poor driving. Moreover, technologies necessary for enforcing these laws and regulations are developed, e.g. automatic speed control devices.

As for legislation for ethical uses of technological artefacts such as motor vehicles, note that RTL quotes a set of related laws and regulations in order to specify circumstances of practical uses, and at least the following four factors are specified for clear description of use situations: types of artefacts to be regulated (such as motor vehicles and roads), relevant parties (such as drivers and businesses), intended functions of use of the artefact (such as individual travel and business), and the purpose of use such as maximization of benefit implicit in articles related to labour management.

4. A METHOD TO DESCRIBE USE SITUATIONS OF AI ARTEFACTS AND APPLICATIONS

The result of the preceding section shows that AI artefacts and related parties must be defined visibly for effective regulation. Establishing a method to do it is the objective here.

4.1. A functional definition of AI artefacts

AI in this study implies a system which can autonomously change its outputs or the way to determine its outputs through its operation, based on “learning etc.” of data. Learning etc. here includes learning of data, inference based on data, exploitation of data obtained during its operation, etc. Data to be explored can be obtained from responses of its users or through interactions with its circumstances by sensors, actuators, etc. The way of determining outputs includes recognition, inference, judgement, decision making, etc.

This is almost the same as the definition of “AI system” in the Conference toward AI Network Society (2017). It is not much different from the definition of A/IS in the IEEE Global Initiative on Ethics of Autonomous and Intelligent Systems (2017) and the definition of AI by AI HLEG (2019).

The importance of this definition is the fact that it is possible to estimate whether AI is used in a system only by observing if it autonomously makes intellectual decisions or judgements on the basis of accumulation of data or communication with its circumstances, and without wondering its algorithm.

4.2. Composition of AI artefacts and relevant parties

The following are the definitions of terms shown in Figure 1.

“Learning etc. data” are those that are used for learning etc. of AI. One type of learning etc. data is teaching or training data of machine learning. Another is data to be explored as noted in the definition of AI. Metadata is also included.

“Outcome data” includes data obtained as the result of learning etc. and changes outputs and the way to determine outputs of AI. Outcome data also includes the basic forms of algorithms that determine outputs of AI, i.e. the ways of recognition, inference, judgement, decision making, etc. The algorithm(s) affected by the result of learning etc. determine(s) outputs of AI. It also includes metadata.

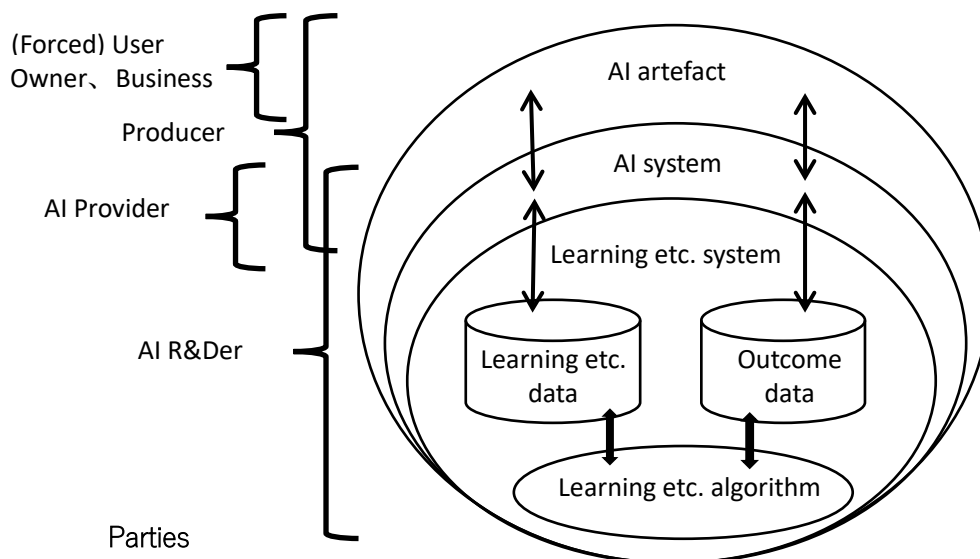
“Learning etc. algorithm” is one that performs learning etc., and originates the intellectual and adaptive function of AI. It may be a composition of plural kinds of algorithms such as machine learning, statistical analysis, optimization, etc. If there are some parameters used to adjust learning etc., they are also included.

“Learning etc. system” is one that is composed of the above three components and some interface to outside systems. When the learning etc. algorithm refers to a part of or all of the outcome data of preceding learning etc., the outcome data is supposed to be stored as parameters of the learning etc. algorithm, too.

“AI system” is one that has at least one learning etc. system and some components which add functions necessary to interact with both its learning etc. system(s) and other components of artefacts utilising it. That is to say, AI system is one made by adding application programming interfaces to its learning etc. systems. One AI system could be utilized by plural artefacts in parallel, because it is an IS. This implies that an AI system enables artefacts using it to apply the function of its learning etc. system. As a whole, AI system is identical with AI.

“AI artefact” is one that cannot function without at least one AI system. Its AI systems might work independently, or work in corporation with each other as a network.

Figure 1. Composition of AI artefact and relevant parties.



Source: self-elaboration

An AI artefact may be either an IS, or a physical system which utilizes at least one AI system. Example ISs are SNSs like Facebook and Twitter, search sites like Google and Yahoo, on-line shops like Amazon and Rakuten, etc. Example physical systems are AI speakers and intelligent robots.

Because AI systems are ISs, if a learning etc. system (or an AI system itself) is on the cloud, every artefact that utilizes it through the Internet is an AI artefact. The current IS devices such as smartphones, tablets, personal computers, etc. are all AI artefacts in this sense. Likewise, AI artefacts are ubiquitous now.

Parties relevant to AI artefacts are shown on the left side of AI artefact in Figure 1. AI R&Ders are designers and developers of AI systems and their APIs. AI providers provide their customers with functions of AI systems as services. Some producers of AI artefacts would operate AI systems by themselves and do not need services by AI providers. Owners of AI artefacts would use them for various purposes. If an owner is an individual, the owner is at the same time a user, e.g. AI speakers. If an owner is a business, the business would use an AI system in order to realize a service to others, i.e. customers. Examples are SNSs and online shops. Customers of such services are inevitably applied outputs from AI artefacts. Then, customers of such services would be called forced users.

An AI artefact might use plural AI systems, and their effect on ethics in the MW can be different from each other. Therefore, when the effect of an AI artefact on ethics is assessed, each AI system must be separately evaluated. This is another of our proposals.

4.3. A method to describe AI artefacts in practical use and example applications

Referring to the case of legislation for ethical use of motor vehicles in section 3 and the definitions in the preceding subsection, the following four properties must be estimated in order to clearly describe the situation of practical use of an AI artefact: function of AI system (i.e., results of recognition, inference, judgement, decision making, etc. by the AI system), AI artefact that uses the AI system, owner/business, and user/forced user. Based on such description, necessity of some regulations for preventing unethical use can be investigated.

AI artefacts estimated and listed in Table 2 are those that offer services or additional functions to services mainly on the Internet. A surrogate variable named “values of” in Table 2 is used for owner/business, because AI systems of such AI artefacts are used to acquire the values of owner/business. Likewise, the label “Example” is used for services offered by AI artefacts that use the corresponding function, and “Targeted to” for forced users.

Table 2. Examples of AI Systems used in services.

Function	Targeted to	Values of	Example	Learning etc. data	Issue
Use incentive	Individual user (User group)	Service provider	Like!, Share, Retweet	Use record, Individual response record	Vulnerability
Item sale	Individual user (User group)	Service provider	On-line game, Social game	Use record, Personal data	Vulnerability
Ads targeting	Individual user	Service provider/ Advertiser	SNS, EC	Use record, Personal data, Ads specs	Vulnerability
Recommend	Individual user	Service provider / Seller	EC	Use record, Personal data, Goods data	Vulnerability
Input assistance	Individual user (User group)	Service provider	Auto complete	Input record	Filter bubble
Display order	Individual user	Service provider	Search Engine	Personal query record, Personal data	Filter bubble
Medical diagnosis	Diagnostician	Appropriateness	Heart disease on ECGs	Medical data, Diagnosis record	Moral hazard
Propriety judgement	Applicant	Business	Loan, Employment	Applicant data, Judgement record	Fairness

Source: self-elaboration based on literature such as Alter (2017), Cooper (2017) and Vlahos (2019)

Table 2 has two additional columns: “Learning etc. data” is important because it shows the source of the corresponding function, “Issue” because it is useful for investigating necessity of legislation. The values in cells of Table 2 are estimated from author’s understandings of cited literature and experiences because details of AI systems have not been made public, and would be neither exact nor precise. For example, the AI system that determines display order can happen to use query record of all users as well as personal query record and personal data, or it can aim at acquiring values of business compromised with estimated user values.

Note that Table 2 does not refer to the algorithmic side of AI systems at all. Then, how these systems estimated that they use AI systems? It is because these systems make different outputs to each target objects (i.e., each forced users) or at each occasion. The fact fits to the definition of AI in 4.1. Because of this nature, this study does not conflict with its stance to promote AI technology. Use-ethics does not concern technology itself, but usage.

5. PREVENTING UNETHICAL USES OF AI ARTIFACTS TO MINORS

An example of application of the proposed approach is described below. First some regulations in the RW that prevent unethical uses of technological artefacts on minors in Japan are explained. Three types of methodology of prevention are indicated. Second, considering the protection of minors in the RW, some of the cases in Table 2 seem to require legislation against unethical uses in the MW. Finally, tentative plans of legislation are proposed by applying one of the three methodologies.

5.1. Regulations to protect minors from traditional technological artefacts

Minors are those less than 18 years old in Japan. Minor Protection Ordinance is provided by each prefectural government for the purpose of arranging a good local circumstance adequate for protecting and fostering sound minors. This ordinance regulates use of traditional technologies to minors.

There are some laws protecting minors such as Drinking Prohibition Act for People Underage, Smoking Prohibition Act for People Underage, Child Welfare Act, Child Prostitution and Child Pornography Prohibition Act, Child Abuse Prevention Act, etc. These acts also define punishment for violation of prohibitions, and they are sometimes applied to cases of violation of Minor Protection Ordinance.

Children in the above acts are the same as minors. People underage are those less than 20 years old in Japan. The purpose of these acts is typically stated in Article 1 of the Child Abuse Prevention Act that it aims to serve protection of child’s rights and interests. In other words, they aims to prevent harms to users (or forced users) caused by technological artefacts or services offered by using them, or to compensate immaturity and insufficiency of people underage.

Looking into these regulations, the methodologies used can be classified into three below:

[Prohibition, restriction] Prohibit use of artefacts to child, minor or people underage or restrict place, occasion and/or age group of use, in accordance with nature and function of artefacts. Examples are cigarettes, drink, (adult) movies, motor vehicles, firearms and swords, etc.

[Business permission, registration] Obligate license and/or registration of business to sell service provided by using technological artefacts (such as gambling) as well as technological products (such as firearms, swords)

[Possession registration, use license] Obligate possession registration and/or user license for artefacts with high risk to harm others such as motor vehicles, craft, planes, powder, drugs, firearms and swords.

The fact that the meaning and effect of use of technological artefacts varies depending on circumstances and user properties is surely recognized in the RW, and there are a variety of regulations in order to comply with use-ethics for the purpose of making it possible both to protect minors and to foster them soundly.

5.2. Regulation against AI artefacts capitalizing on vulnerability of minors

It has become evident that mobile devices and use of SNSs cause really harmful influence on minors from remarks by CEOs of giant IT companies like Nadella (2019) and by software engineers developed SNSs like Bowles (2018) and from some studies like Carr (2017) and Moscaritolo (2018). Such harmful influence seems especially strong where AI systems capitalizing on vulnerability of (forced) users are applied against minors. Examples of such application are shown in the first four rows in Table 2. Remember that minors are one of most vulnerable parties.

Considering that they are ubiquitous already, investigation of legislation against such uses is an urgent issue for compliance with use-ethics. There have already been some movement toward this direction in Japan as shown by the following two examples:

Act on Development of an Environment that Provides Safe and Secure Internet Use for Young People revised in 2017 promotes use of filtering software for devices that are possessed by minors and used for the Internet surfing. ISPs are obligated to supply filtering software and explain about it to minors and their curators. Minors and their curators are obligated to set up filtering software. Effectiveness of the act depends solely on the quality of filtering software and the action took by curators.

There have been increasing incidents where minors are requested to send their selfies by correspondents on SNSs and get harmed as a result. To prevent such incidents, some prefectures have revised Minor Protection Ordinance.

Another important issue is brain drain or brain hijack. It harms human intelligence, especially of minors. See for example Carr (2017), Kawashima (2018) and Sakurai (2019). It seems that brain drain is strengthened by the use of AI systems in some services such as those shown in the first four rows in Table 2. Sociality that is thought a unique human ability develops mainly up to 9 year old, and it is also harmed.

This study proposes three regulations that are formed by applying the first methodology resulted from 5.1 on use cases of AI systems observed in Table 2.

- (1) Prohibit AI systems from using personal profile data for use incentive, items sale, ads targeting, and recommendation directed to minors.
- (2) Prohibit applications like SNSs opened to minors from implementing AI systems for

strengthening use incentive like validation feedback (e.g. Likes!, Share, Retweet).

- (3) Obligate service providers to set the lowest allowable age on each application and content, and to implement a mechanism to prevent minors below the age from using them.

The age of users must be identified to enforce these regulations if they are legislated, because they need to classify users into minors and the others. This is not possible currently. The three regulations can be legislated with a deadline for enforcement, as it was the case of the control of exhaust gas.

6. CONCLUSION

This study proposed an approach to legislation against unethical uses of AI artefacts. The approach is based on the idea to utilise regulations for preventing unethical uses of traditional technological artefacts in the RW and extend them into regulations in the MW against unethical uses of AI artefacts. This study also proposes a functional definition of AI, and applied it for defining AI artefacts and relevant parties. The functional definition was used to analyse and estimate practical use cases of AI artefacts on the Internet. As an example application of the proposed approach, some regulations against unethical uses of traditional technological artefacts to minors were investigated and three methodologies were induced. One of the methodologies was applied to use cases that capitalize vulnerability of minors and three sample regulations were formed.

The proposed approach made it possible to estimate effect of AI systems on user's thought and mind without referring to technological properties, and to find focal points requiring some regulations in the MW.

When the proposed approach is applied to protect workers affected by practical use of AI systems in the business scene, some reliable methods to evaluate actual changes emerged from introduction of AI systems must be established. The interpretive approach (Orlikowski, 2000) seems promising. The approach proposed here is reactive and fragmental in contrast to the proactive and comprehensive one used for the study of ethics principles and R&D guidelines. An Approach that complements these two is strongly expected to appear.

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