

A Philosophical Analysis of Risks in Technology Market*

Kojiro HONDA

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1. Introduction

After the industrial revolution, many scholars have argued about the social impact of technology. Among their arguments Marx's one is famous. He focused on the function of technology in the factory. He mentioned that machinery acquired its independence from workers and achieved domination over the labor process, and then it started to be disincentive for workers to form organized groups. Because technological products, such as production machinery or experimental instruments, were blocked in the factory or the laboratory until the 19th century, it was reasonable for Marx to argue about technology within the realm of labor process in the factory.

After the 20th century technological products became unlimited to means of labor or experimental instruments. For example, engine got to drive not only spinning machine, but also locomotive or steam vessel. Finally it started to go into circulation as consumable goods with being embedded in automobile. The newest apparatus of science also overflowed from the laboratory with the shape of the tools of ordinary life. For instance Bernal pointed out that modern TV set was the cathode-ray tube devised to measure the mass of the electron. As above the apparatus of science penetrate into our daily life in contemporary scene. Techno-

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1 See Marx [1976], p. 526, 545.

2 Cf. Giedion [1969], Part II. If you are interested in social impact of commodities or historical studies of commodities, see Ishikawa [2004], [2006], and [2008].

3 See Bernal [1954], p. 37. There he mentions that scientific apparatus fulfils either two major functions: as scientific instruments and as scientific tools.

logical products are getting more and more familiar for our life than before. In almost all developed countries we reap the direct benefits of them. This penetration of scientific apparatus into daily life should be more focused on. The discussion about social impact of technology cannot be treated only as a problem of labor process.

This article explores risks which civil society takes without knowing them in the situation where technological products go into circulation. The latest apparatuses of science appear against us in the similitude of commodities, and affect our life. Then what kind of risk will be generated with the situation? We get those apparatus in our home because of their convenience. Whereas the example of factory labor process is accompanied by negative image such as the affront to humanity, consumption of home electric appliances or automobile is accompanied by positive image. But behind the convenience, there is new type of risk such as the accident because of faulty product. In a manner to be described we will sketch out the new type of risk that is enhanced by the conspiracy between the feature of scientific apparatus and the one of market economy system.

2. Thing Knowledge and Inherent Oblivity of Technological Artifacts

Technological artifacts could be characterized as black box into which is stuffed know-how of controlling physical and chemical phenomena. We only need to know the inputs and the outputs to use this black-box. For instance, we are not necessary to bother about electronics or information theory for using personal computer, or about thermodynamics or engine mechanism for driving a car. Because the accumulated knowledge and the mechanism are hidden behind the convenience, consumers begin to skip them. It is sufficient for them only to know the function of the black box.⁴

In his philosophical analysis of measuring instruments, Baird makes the point that scientific instruments have “Thing Knowledge”⁵ built-in. By looking back on the history of modern science which has been developed on the basis of instrumental development, we can understand that modern science is not only the stock of theoretical knowledge for representing of the nature, but also the stock of method and skill for controlling nature. The scientific instruments

4 See Latour [2002], p. 251. There he argues about “fundamental opacity of technology”.

5 See Baird[2004], p. 116. There he argues as following: “. . . Measuring instruments present a third kind of material epistemology. They encapsulate in their material form not only both model knowledge and working knowledge but also, in many cases, theoretical knowledge and functional substitutes for human skill. In their material form, measuring instruments integrate all these different kinds of knowledge into a device that is at once both an instance of materially encapsulated knowledge and a source of information about the world.”

convert the historical thickness of modern science into tangible form. It could be said that the latest measuring instrument, such as NMR-CT, encapsulates the bypast theoretical knowledge as well as the bypast “model knowledge”⁷ which is material model transposed from scientific translation of natural phenomena, and the bypast “working knowledge”⁸ which is material agency generated not thorough our words but thorough our crafts.⁹

Should the Baird’s argumentation of thing knowledge be confined to the realm of scientific instruments? As Bernal mentioned about TV, scientific instruments devised for purely scientific measurement would be diverted to scientific tools with frequency. There is no essential difference as thing knowledge between scientific instruments and scientific tools. Hence the concept of thing knowledge could be applied to technological artifacts circulating in our society. Stated differently, we could consider that most of technological artifacts have built-in their own historical accumulation of theoretical and practical knowledge as the shape of thing knowledge.

Here we return to the black-box of hi-tech artifacts. Can we open the black-box easily? No. Technological artifact fills up a lot of thing knowledge in it. It is almost impossible for a general consumer to know all of the historical accumulation of knowledge and skills for controlling the natural phenomena physically or chemically. To open the black-box, it is necessary to receive long-term instruction. But it is too difficult for one person to know any and all of knowledge and skills which support contemporary technological society. One could only be an expert of narrow confine. We live in the era of division of labor both productively and intellectually. If so, how do we utilize others’ knowledge and skills? It is easy. All we need to do is to buy them. In our consuming society, we can utilize the advantageous effects or the fruits of others’ knowledge and skills by buying thing knowledge built in technological artifacts. Whereas ancient people should have boosted up their own knowledge and skills by studying or training to make instruments and use them proficiently, contemporary people are allowed to leverage only the outputs of integrated thing-knowledge which someone or other developed. This allowance is accentuated in our technological society.

Technological artifacts give us convenience of life by simplifying a lot of trouble to accom-

6 =Nuclear Magnetic Resonance Computed Tomography.

7 See Baird [2004], chapter 2.

8 See Baird [2004], chapter 3, especially p. 47.

9 Baird points out that there are three kinds of thing knowledge : such as model knowledge, working knowledge, and encapsulated knowledge which is integration of the former two. He says, “The three kinds of thing knowledge presented in chapters 2–4 are the essential components of the instrumentation revolution, in which characterization and control, encapsulating subjective human knowledge and skill in material—instrument—form, is a fundamental component of contemporary scientific-technological knowledge”. (See *ibid.* p. 117)

plish our objective, or extending and supporting our physical ability. But, in compensation for receiving the convenience, they make the consumers skip all the process that should accompany accomplishing objective. That is to say, they put all the knowledge and skills, which are black-boxed in the chassis, out of the consumers' mind. This oblivion does not mean empty head with reference to consumers' disposition. While it is in principle possible to figure out know-how, mechanism, and epistemic background of technological artifacts, it is realistically impossible to do so. To gain the expert knowledge and skills, it is necessary for us to receive high-level education with taking plenty of time. Therefore if someone wants to be familiar with all of technological artifacts, except a few geniuses, he/she needs infinite time and huge cost. It is almost hopeless for all the consumers to be experts of multi-realm. It could be said that oblivion of provided thing knowledge in the shape of technological artifacts, is fate pathway of technological society. The oblivion is collective, structural, and not ingenerated from individual negligence

The oblivion also has another moment. If we introduce a new technological artifact, thanks to the convenience of it, we can get to skip wisdom of living or some skill that have accompanied accomplishing objective until then. For example, the invention of match made consumers forget how to use flint and steel, and the invention of lighter also made some consumers forget how to use match.

As above, a new technological artifact provides us the convenience of life as well as the dependency on others' knowledge and skills, and oblivion of wisdom of living. We would like to call the double moment of oblivion¹⁰ "Inherent Oblivity" of technological artifacts. We would introduce this concept as one of the characteristic assigned to technological artifacts. In what follows, we would try to apply the new concept to the discussion for contemporary social risks.

3. Irreversible popularization of technological artifacts

When technological artifacts penetrate into our life via market economy system, they become not so much accessories as foundation of our life. As Ihde and Verbeek indicated, because of their ability of technological mediation, technological artifacts can reconstitute our perception of world and our pattern of practice. They could constitute "forms of life"¹³ which

10 The author coined this word inspired by Husserl [1970], section 9.

11 Cf. Ihde [1990].

12 Cf. Verbeek [2001]. And Verbeek [2006], pp. 363–368 is a good summary of his point.

13 Cf. Winner [1986], Chap. 1.

environ our life just like the second nature.

We are the entities delivered in the midst of the second nature. What can we extract from this situation in connection with the inherent oblivity of technological artifacts? As mentioned before, we are directed to be substantially empty-headed about technology despite frequent exposure to it, so much so that all we can do is to buy maintenance service or substituting goods when something goes badly with our artificial environment. Thanks to the inherent oblivity, it is difficult for us even to evaluate adequately whether there are defects which could be in the mechanism of a technological artifact. The inherent oblivity makes our attitude against artifacts too passive. It could be said that consumers at large should give up their honorific title of “homo faber” ironically in this technological society.

Even if we take notice of the vulnerability of this technological society, and we also want to refuse our artificial environment, we will merely accept it in the end. Everyone has few chances of refusing all technological artifacts by the root. Because, seeing that we are born in the milieu where technological artifacts have ever been developed, we don't know about the forms of life prior to the introduction of the artifacts. If we omit daily technological goods without recapturing how to use old tools or street wisdom, we cannot go well. For instance, if we omit cell phone from our life without recapturing how to use rotary dial phone, we have got to have a lot of trouble in daily communication. We cannot throw away the existing technology easily, since recapturing all the prior forms of life needs infinite time and huge cost, too. We are almost impossible to do so realistically. It is very difficult for us to get back to old life.

We are liable to accept the updated technology as well as the existing technology. The point is that technological artifacts are trafficked and circulated in the market economy system. After majority of consumers accept a newest technological artifact, it is difficult for minority to deny it. Because minority has got to pay a new cost called “opportunity cost” to do so. The diffusion of cell phone in Japan is a good instance here. The popularization of cell phone has expelled many telephone rooms from all over the town. In this situation, if someone who denies cell phone takes an hour to find a telephone room, he takes loss of time and hourly pay in addition to cost of a call. He has got to pay opportunity cost owing to the persistence to the old technology.¹⁴ The emergence of the opportunity cost would be incentive for consumers to accept new merchandises. We could not have immunizing power against the latest technological products provided from high-tech companies.

Described above, diffusion of technological artifacts is irreversible. The cause of irreversi-

14 Cf. Morita [2006].

bility is the inherent oblivity of technological artifacts and the system of market economy. It could be said that at least indirectly we are subject to compelling force of technological environment. Then what kind of risk do we accept under such force?

4. Thinking about risks in technology market

Here, we would like to contend that it is necessary to combine the risk of technology and the risk of market system when we assess the emergence of new technology. This combination would be successful if we correlate the inherent oblivity of technological artifacts with the market economy system. Why does new technology appear suddenly without any prior notice, and make us faced with the decision-making of acceptance without plenty of time to think about the risk? What are the potential risks in relation to the fact that technological artifacts are trafficked and circulated via the market economy? To approach these problems, we need to reexamine the function of technology in the market economy system.

The first contention about these problems is that the inherent oblivity of technological artifacts is source of wealth. The reason for consumers to buy a newly developed technological artifact is that the artifact helps them accomplish the new objective that cannot be accomplished with their already acquired knowledge, tools, and skills. Stated differently, the higher the inherent oblivity rises in a new artifact, the more valuable the artifact could be for consumers. Hence the company, which invests its money in R & D, needs to concentrate more advanced and more sophisticated technique in the mechanism of the artifact, and to create a highly-confidential black box which could hardly be open, so that it can protect its own profit from rival companies. And information concerned with R & D should be kept in by definition, lest it is compromised. It is not without ground that new technology with high capacity always pops up suddenly.

The second contention is that diffusion of technological artifacts means diffusion of oblivion. Technological artifacts are mass-produced and diffused via market economy system, whereas they have been kept as black box for common men except implementers. For that reason, the bigger the market size becomes, the bigger the size of collective oblivion becomes. That could be a factor of social anxiety.

Notice that the first contention and the second one are directly opposed to each other. Technology is source of wealth as well as cause of social anxiety. On the one hand, to protect company earnings, inherent oblivity should be preserved, but at the same time, to protect social safety, inherent oblivity should be reduced. As it now stands, the general public delegates

the technical decision about technological artifacts to scientists and engineers. They trust the safety of artifacts, so much so that they accept an updated technological product as if it gives us only the convenience. In their opinion, the first contention is prior implicitly than the second. But we should agree that there are so many failure cases concerned with technology. It seems that the second contention is to be more noticed before we trust technological artifacts without check. That is to say, we need to articulate clearly the figure of risks which we take implicitly in the technological society.

Here we would like to propose three concepts of risk such as ‘Asymmetric Information Risk’, ‘Anonymity Risk’, and ‘Scale Risk’ by abstracting the features of technology and market system. These concepts would provide keys to think about special role and special responsibility of engineers, as well as consumers, in the market-oriented economy system.

The ‘asymmetric information risk’ is a risk derived from the gap of information and knowledge about technology between implementer and consumer. Generally consumers don’t have plenty of knowledge about science and technology. By that very fact, they buy commodities and services which were produced through the use of know-how and skill of scientists and engineers. But by that very lack of knowledge, they cannot evaluate the safeness of artificial commodities or other risks, such as the environmental destruction which would be caused by the product process of the commodities. This means that the inherent obliquity of technological artifacts is the risk in itself. But the obliquity must not be vanished. If it is vanished, then technological artifacts reduce their marketable value. The asymmetric information risk is a kind of dilemma accompanied by the inherent obliquity.

It is said that markets are impersonal and inclusive whereas communities are personal and exclusive. To put it plainly, anonymity is guaranteed in modern economic system. This means everyone who has money can participate freely into market for trade without condition (age, sex, nationality etc.). In fact they don’t need to have personal relation between seller and buyer. This may sound good, but this anonymity might be used wrongly. In the nature of thing bad commodities are excluded from the market automatically, because they don’t buy them. The market system has in nature such an autopurification. But in the technology market, the circumstance is a little bit different. Thanks to the inherent obliquity, consumers cannot evaluate clearly the quality of commodities. That means the monitoring function which should be equipped to market doesn’t go well. In addition to that, thanks to the market rule of ano-

15 See Dasgupta [2007], p. 47. If you want to research the purely theoretical view about the character of market system, see Urai and Yoshimachi [2004] and [2005]. A lot of ideas which the author discusses here were popped up through the discussion with Dr. Yoshimachi.

nymity, sellers need not image the faces of buyers. This situation where the anonymity is guaranteed and monitoring function goes badly tempts to ingenerate misconducts of sellers or implementers. This is the second market's potential risk which we would like to call 'anonymity risk.'

'Scale Risk' is a risk derived from the mode of production called mass production. Because the mission of company is to maximize the benefit, almost all companies intend to realize mass production which leads to cost-cutting. In cases where consumers accept a faulty commodity through the influence of the inherent oblivity, it is impossible to deny the possibility that the commodity has already been widespread before the discovery of fault. That is to say, there would be time-lag between the inception of sale and the discovery of fault. In such a case, the bigger the size of market is, the greater the scale of risk is. This is the third market's potential risk which we would like to call 'scale risk.'

These three risks appear in public when we command a view of both the inherent oblivity of technological artifact and the rules of market economy. The three would not encompass all of the risks in technology market. But they could be milestones for thinking more deeply about the risks.

Market system functions very well when we trade something simple such as fresh vegetable or fresh fish which anyone can evaluate its quality. Since, in that case, autopurification of market goes well. By contrast, when we trade some complicated goods, which are accompanied with the inherent oblivity, the situation is a little bit different. The rule of market could increase the potential risks or camouflage them.

Civic society should take more attention to these distinguishing risks of technology market. Industrial world always gives us a positive image of technology, conspiring with advertising world. They emphasize only the convenience given by technological artifacts. Even if we are not sure about the safety of a technological artifact, we are often liable to accept it. But the eventual outcome of technological project is generally uncertain, and that is assumed as true by engineers themselves. At one time, Schinzingler and Martin defined technological activity as "social experiment"¹⁶. That is a very pertinent statement.

When do we decide to participate in the social experiment of the newest technological artifact? The starter of the experiment is, without dispute, the implementer. And it can be said that we decide to participate in the experiment when we buy the product. Schinzingler and Martin accentuate the importance of "Valid Consent (which means informed consent in the

16 Cf. Schinzingler, R. and Martin, M. W. [2000], chapter 3.

broad sense of the term)¹⁷” about technological activity between the implementer and the consumer. As they make a point, the seller of technological product should afford the consumer plenty of information about the product. And the given information must contain the information about safety.

But it seems to be difficult to put the valid consent in practice as they think. In general, a product appears in the result of investigation. At that stage of distribution, the firm is put in debt. Therefore, for recovery of development funds, the firm would not provide to consumers the information of safety such as warning sign, which could give negative image. Someone may say that the firm should provide the information of safety before investigation. Even then it is also difficult to do so. Suppose the firm provides information of safety before investigation, the rival firm automatically can get development project of new product. So, for protection of firm profitability, the firm would not provide to consumers the development project as well as information of safety. Thereby, the risks of technology market remain unresolved.

In fact, it is almost miracle, that technological development has been continued, that new products has been overflowing in the market, and that the civil society has been consuming all the technological products, without giving an eye to such risks. It could be said that the civil society should reflect about following : by whom this social experiment is done, for what purpose the experiment is done, and by what kind of authority the experiment is lead.

5. Concluding remarks

We have confirmed the double moment of oblivion which is accompanied by technological artifacts. For making full use of technological products, it is sufficient to know the inputs and the outputs of the products, and not necessary to take attention to the encapsulated contents such as thing knowledge, theoretical knowledge, and skills. In the process of consuming the technological products, the convenience of them makes us forget the historical accumulation of knowledge and skills prepared to create such products. We fall into the dependency on others' knowledge and skills by consuming the technological products. By the same token, the wisdom of living and daily skills, which have been necessary until the introduction of the convenient products, is also forgotten. We have named this technological ability of double oblivion “Inherent Oblivity.” This inherent oblivion is distributed through the flow of goods, so that social oblivion of technology is drastically prevailing. And that could become the genesis of social anxiety.

17 *Ibid.*

Then, by analyzing the scene where the inherent obliquity and market mechanism go together, we argued about the potential risks of technology market. We introduced three concepts of risk, such as “Asymmetric Information Risk”, “Anonymity Risk”, and “Scale Risk”. These concepts were derived from the inherent obliquity and market rule. We mentioned that these risks are not easily resolved. Since the inherent obliquity of technological artifacts can become the cause of risks as well as the source of welfare in the market system, we cannot get rid of the inherent obliquity from technological products in principle. That is the reason why the risks of technology market remain left as they are.

At the technology market, there is a great gap of information between seller and buyer. In such case, it is reasonable that seller (that is to say, implementer) should have more responsibility concerned with the safety of products than buyer. In fact, it would be said that engineering ethics education was established for teaching future engineers about their special responsibility. That kind of education is not dispensable in our technological society which has always potential risks.

For the risk aversion strategy, is it enough to change the consciousness of the engineer? We can imagine another strategy of changing the consciousness of the consumer. As mentioned in the main discourse, it is very difficult for minority to refuse the commodities which majority has already accepted. Hence, the choice of a commodity is concerned not only with one's satisfactions of wants but also with the social choice about artificial environment. In the market economy, the consumer's choice means acceptance like casting a ballot. On occasion when one consumer chooses a new technological product, he/she may choose new artificial environment of his/her belonging society. Thinking in this manner, all the consumer is responsible to reflect about the safety of the technological product, and the good relation between human being and the technological artifact, when he/she purchases technological product.

To bring up autonomic consumers, it goes without saying that the education system of scientific literacy should be amplified. In addition to that, it is necessary to teach the “consumers' responsibility” for social choice of technological artifacts. It could be said that we need to discuss the content of “consumer ethics education.”

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