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Introduction

In this introduction I clarify some general matters of this essay. The Background and Motivation section puts this PhD study in context, including the historical context, the current state of philosophy of technology and some personal background. The General Approach section explains some general aspects of methodology. The Structural Overview section lays out the general structure of the essay.

Background and Motivation

Historical Context

In five centuries Western modernity has expanded to many parts of the world and it has dominated humanity for the past two centuries. Modern science and technology, as one pillar of Western modernity, have been well accepted almost everywhere on the globe without much resistance. But it's not the case with capitalism and democracy, other pillars of Western modernity. The acceptance of capitalism and democracy is uneven among the traditional cultural spheres. They have taken root in India after centuries of British colonization, although with some cultural resistance. They have been welcome in the traditional Chinese cultural sphere mostly recently, except Japan as the pioneer, which achieved fast modernization in the 19th century. South Korea, Taiwan, Hong Kong and Singapore are newcomers whereas mainland China has started to adopt capitalism to a certain extent. But in the Muslim world the resistance is tenacious, with religious conflict with the West as a major reason.

With the decolonization after the Second World War and the globalization at the turn of century, human history has entered a new phase. Instead of a few power or superpower nations dominating the international stage, more and more nations are playing more and more important roles. As we enter the new millennium, humanity is bundled together more than ever before. We have to work together to face our common challenges. This has become obvious in handling the recent global financial crisis and global warming. G-8 has to be replaced by G-20. That's symbolic. As the world moves to being multi-polarized, nations are becoming more and more conscious of keeping their own cultural identity and protecting their own cultural heritage. Certainly most nations want modernization (no matter how they interpret it), but they just don't want to copy everything from the West. The recent Afghanistan and Iraq wars clearly showed how difficult it is to export democracy by force. This could well be the death toll of an age of hegemony and unilateralism.

The concept of alternative modernity gains much significance in this context. The West has led humanity into modernity. This has become an irreversible trend. No matter what the interpretation is, modernity has been primarily associated with progress. But Western modernity is probably not the only way to modernity. In fact, from Marx through the Critical Theorists to post-modernists Western intellectuals have brought up much criticism of Western modernity. And from the Critical Theory has evolved the contemporary alternative modernity theory, represented by Andrew Feenberg's philosophy of technology. Criticisms in many cases are accompanied with proposed solutions. Therefore, alternative modernity is not just a concern of non-Western cultures. The Western societies themselves also strive for some reforms.

Most of the criticism made by Western intellectuals has been done from within the Western culture. Instead, this essay is intended to provide a cross-cultural perspective. It tries to propose a

strong alternative modernity theory in contrast to a weak one. To achieve that, it has to examine Western modernity from a comparative perspective. Specifically Chinese culture is used as an important reference. The characterization of Western modernity is done in comparison with Chinese culture.

The State of Philosophy of Technology

Modernity is undoubtedly intertwined with technology. On the one hand modern society is unimaginable without the support of modern technology. If any major technology was taken away, modern society would malfunction, in the worst case even collapse. On the other hand technology also has been heavily shaped by modernity. Traditional technology encompassed a wide range of methods. But modern technology has been more and more intertwined with modern science. Traditional technologies that cannot be incorporated into the scientific worldview are often abandoned, or at least suspected. This close relation between modernity and technology is reflected in a new phenomenon, the dominance of modern technology in modern society.

Early criticisms of Western modernity recognized the important role of modern technology, but it was not treated as a target. For instance Marx's main target of criticism was capitalism. He didn't see any big problem with modern technology, although the capitalist economy was built on large scale production with machines. Modern technology became an issue in later criticisms of Western modernity. It's evidenced in Heidegger, the Critical Theorists and Ellul, among others. This can be counted as the starting point of modern philosophy of technology. A distinct feature of these early theories of technology was that they treated modern technology as a general entity in the large context of Western modernity. Due to the rapid development of the field, this is already called "classical philosophy of technology." Contemporary philosophy of technology is developed out of some major complaints about classical philosophy of technology. Brey summarizes them into three criticisms, which accuse it to be pessimistic, deterministic and too general and abstract, respectively (Brey 2010: pp. 38-39).

The transition from classical to contemporary philosophy of technology has now been recognized as an "empirical turn." This title is primarily related to the third criticism above. "Empirical" is said against "general" and "abstract." A common feature of contemporary philosophy of technology is attention to details. Technology is no longer treated as one so-called "with a capital T." Philosophers are more and more interested in specific technologies and specific aspects of technology (design process, engineering knowledge, etc.). With this change of general approach the other two aspects are also affected. Attention to details obviously makes the theories less pessimistic and deterministic. However, different theories are affected in different degrees. Borgmann was included in *American Philosophers of Technology: The Empirical Turn* (Achterhuis ed. 2001), but the general tone of his theory is close to classical philosophy of technology. His view of modern technology is to a large extent still pessimistic and deterministic. A significant part of the contemporary philosophy of technology is still concerned with the relationship between technology and society or culture. Brey calls this society-oriented approach. A more radical revolt against classical philosophy of technology is the engineering-oriented approach. This approach focuses on engineering processes, components and products themselves and emphasizes description rather than evaluation of technology with reference to its social context.

Compared with classical philosophy of technology contemporary theories of technology generally have less concern with modernity issues. Among the major contemporary philosophers of technology Borgmann and Feenberg have direct concern. Dreyfus's critique of artificial reason is closely related to the scientific worldview, which is an essential part of Western modernity.

Modernity issues already find little place in Ihde's new phenomenology. The engineering-oriented theories go further to play down all normative issues. Even the recently developed ethics of technology pays much attention to moral issues on the micro level and tends to ignore the general context where modern technology is developed and applied. All in all we see a gap between the micro and macro approaches yawning wide. The conflict was vehemently demonstrated in Winner's charge that social constructivism opens the black box and finds it empty (Winner 1993). Recently Brey also expressed the concern that the society-oriented and engineering-oriented approaches might drift apart (Brey 2010: p. 45).

Effort has been made to close the gap. The anthology *Modernity and Technology* (Misa et al. eds 2003) is an important part of it. The approach suggested by Brey is methodological. Particularly he advocates four types of interlevel analysis: decompositional analysis, subsumptive analysis, deductive analysis and specificatory analysis (Brey 2003: p. 68). These methods are intended to bridge the micro-macro gap. Feenberg's approach is conceptual instead. For him the gap between technology studies and modernity theory is not one involving different levels, but different concepts of technical rationality. Modernity theory maintains a differentiation of rationality from society. Technology studies reject this conception and reveal the social context of technical rationality. However they "lose part of the truth when they emphasize only the social complexity and embeddedness of technology and minimize the distinctive emphases on top-down control that accompanies technical rationalization." (Feenberg 2003: p. 74) Therefore a synthesis of technology studies and modernity theory calls for combination of both fields. On the one hand the concept of technical rationality in modernity theory should be "revised to free it from implicit positivistic assumptions." On the other hand we should "preserve modernity theory's insight into the distinctiveness of modernity and its problems." (*ibid.*: p. 75)

This essay also attempts to combine technology theory with modernity theory. It generally adopts Feenberg's approach, although both theories contained in it are different from his.

Personal Background

I came from China and was educated in both computer science and philosophy. Then I went to the US to continue my study in both fields. Once I lived in the US I had the chance to put Chinese and American cultures side by side and reflect on them. On one side is an eastern culture in the early phase of modernization and on the other a Western culture with a fully developed modernity. The stark contrast could be felt in many aspects of society. As China was undergoing modernization, modernity was already a big concern for me when I was in college. But the life in the US gave me the opportunity to have a direct experience of a modern society and make some deeper reflection on it. On the other hand my Chinese background provided me a different perspective when I was pondering on Western modernity. I sort of had a view from outside.

In the first decade of the 21st century the Chinese society went through dramatic change. More and more I felt the urge to go back and have a direct experience. The general impression was that material life there was getting closer to the American society. Supermarkets filled with all sorts of goods, a big net of expressways and private vehicles were just several examples. Chinese students studying in the US today would definitely feel much less cultural shock than my generation. However, as the initial excitement faded away, I could feel the fundamental difference again. Anyways, Chinese modernization is still a theoretical problem to be tackled.

The plan to live in Europe for some time came out long time ago. I had been well aware of the difference between the American and European societies. Again I wanted a first hand experience. I believed this was necessary for me to formulate a less biased modernity theory. In any event

Europe is where modernity was born. After ten years of work in the IT industry I thought it's time to concentrate and write down years of thinking. My background in computer science and philosophy made the choice of philosophy of technology rather natural. And as discussed above technology is also closely related to modernity. Finally a PhD study in the field of philosophy of technology in Germany met my various needs well. From the life in Germany I did experience some important differences between the American and German societies. Among them the most prominent are a strong environment consciousness, a comprehensive welfare system including free education and governmental support of museums, theaters, etc. This definitely broadened my view of Western modernity. If we regard the modernity embodied in the American society as a reference, the German society displays an alternative modernity in some important aspects.

About a dozen years ago a prototype was already in shape. It has undergone significant development since then. Compared with the prototype I now have something much richer. This essay draws much from my personal background. The modernity theory presented here is based on my life in the Western modern societies, especially the US, and reflections from a comparative perspective. The technology theory benefits from my work in the IT industry. The philosophical training I received enables me to handle philosophical issues at ease. As an enthusiastic amateur photographer I even incorporate my experience from photography practice into the essay.

General Approach

Western Modernity as a Theoretical Concept

The difference between modern and traditional societies is easily discernible. A major task of modernity theory is to characterize modern societies. Unfortunately this is not an easy task. Modernity is such an elusive concept that consensus is difficult to reach. Each major modernity theory picks a different feature set to characterize modern societies. Brey clearly distinguishes two types of modernity theories: the cultural-epistemological theories and institutional theories (Brey 2003: pp. 36-37). The former focus on cultural forms and modes of knowledge, whereas the latter on social and institutional structure. Generally this is a distinction between cultural and social theories. Related to the different focuses on modern societies is disagreement on the beginning of modernity. The cultural theories tend to regard Renaissance in the 15th-16th century as the beginning of modernity. In contrast the social theories normally put the starting point at the Industrial Revolution and political revolutions in the 18th century.

Various complicated factors cause this lack of consensus. First, the transition from traditional to modern society in the West was a gradual process. In addition, the development of different areas of society was uneven. Ideas are always easier to formulate than institutions. Culture always advances faster than economic and political structure. Second, major Western modernized nations had their own particular situations and followed different paths of modernization. So they may bear particular characteristics. Third, what makes things more complex is that, these nations have realized problems in modernity and made reforms in various forms. Some have deviated from certain principles of Western modernity.

Under these circumstances the modernity theory proposed in this essay is not intended to be an accurate characterization of Western modernity. Rather it represents a particular perspective. Specifically this is a comparative perspective. Western modernity is examined in a cross-cultural context. For one thing, when Western modernity is viewed from within Western culture, it's more like a dramatic breakaway from the past. But when it's viewed from outside of Western culture significant continuation from the traditional Christian culture is detectable. From this general

perspective the following approaches are adopted in characterizing Western modernity. First, modern society is considered as a whole and all the areas including culture, economy and politics are taken into account. Ideas are treated on the same footing as institutions. Second, the American society is given higher priority. Due to its unique history the American society on the one hand inherited many elements from Western Europe, but on the other hand it also freed itself from some traditional constraints. The result is that it has carried the spirit of Western modernity to a powerful extreme. Third, the reforms in Western societies are recognized. These new elements are treated as deviation rather than part of Western modernity. The notion of postmodernity adopts similar approach, but it at the same time assumes that Western modernity is the only possible form of modernity. That's why it calls deviation from Western modernity "post*modernity*." In contrast this essay holds a broader notion of modernity (cf. Part I). It takes deviation as an alternative instead.

Generally Western modernity is a theoretical concept. It's an abstraction that may not match any specific modernized Western society perfectly, including the American society. Besides, it only corresponds to a particular historical period. So it's normal to see deviation in contemporary Western societies. But just like concepts such as straight line and plane in geometry this abstract concept captures essential aspects of a historical condition, which has become so significant for the whole humanity. Its focus is put on how the traditional society was transformed. So it provides a good model and reference for societies to build a viable alternative, both for the non-Western cultures and the Western as well.

Combine Micro Technology Analysis with Macro Modernity Issues

Modernity is just one subject of this essay. The other is technology. On the background of the current state of philosophy of technology, this essay contains an effort to combine technology theory with modernity theory. The technology theory proposed in the essay is built on various contemporary theories. The spirit of the empirical turn is carried to a significant extent. The theory is based on an analysis of technology into three elements. Many details of technology are included in the analysis. Specific technologies are also used as examples to illustration the ideas. The theory's view of modern technology is neither pessimistic nor deterministic. The key ideas of the culture-ladenness of technology and the limit of technology from contemporary theories are incorporated. On the other hand, the determination of technology is also recognized to a certain extent. And more importantly, the instrumentation of technology is revived in a special way. These are key ideas from the two traditional theories, technological determinism and common sense instrumentalism. Generally we have a theory which is a synthesis of major traditional and contemporary theories and is based on detailed analysis of technology.

However, the modernity issues in the classical philosophy of technology are not ignored. Instead of the deterministic view of modern technology, the dominance of modern technology is recognized as a basic phenomenon of modernity. First, as classical philosophy of technology claimed, this is the direct cause of many modern malaises. Second, this phenomenon needs to be explained. But it cannot be explained by modern technology itself, as classical philosophy of technology maintained. Instead it has to be explicated in a large cultural context. Here is where the technology theory and the modernity theory can work together. Specifically, the technology theory explains why technology dominates in such and such a cultural context and the modernity theory explains why such a cultural context becomes reality in modern society. In this way the two theories are combined.

Further, micro technology analysis and macro modernity issues are combined with a technology theory about the relationship between technology and culture that are sensitive to both. Micro

analysis and macro issues don't have to be independent of each other. If we consider modern technology as a box, then classical philosophy of technology treats this as a black box and is mostly concerned with the relation between the box and its large context. On the contrary, contemporary philosophy of technology opens the black box and discloses what's inside. Nevertheless it tends to overlook the large context, although it also pays attention to the area near the periphery. There is no reason why we cannot have a integrated picture that includes both the inside and outside of the box.

Focus on Technology

With a subject as broad as modernity, how to control the scope of the essay is always an issue. In a dissertation one can only handle a limited number of topics. However the modernity theory I want to propose involves general characterization. Leaving out any part would damage the integrity. So the best choice is to include all the parts and outline the basic ideas. Compared with modernity technology is a much more specific subject. Due to the limit of scope, this essay has to focus on technology. The core question this essay tries to answer is, what should we do with modern technology? In this way the modernity theory has to be kept sketchy. But it's necessary for answering the core question, for the simple reason that modern technology cannot be well understood without modernity as a whole. The modernity theory provides the historical and cultural context for a theory of modern technology. Generally a sketchy modernity theory is treated as a framework, in which a full-scale technology theory is proposed in this essay.

The wide range of modernity is demonstrated in the many topics involved. As we will see, almost all the major areas of philosophy are touched, from metaphysics through philosophy of science to political philosophy. Yet the issue of modern technology provides a nice piece of glue to stick all the various thoughts and ideas together. It's just impossible to include sufficient argumentative support for each of the ideas. But positions directly related to the core question are based on solid arguments. In this way the essay keeps focused, but on the other hand it also brings up many topics for further development in the future.

Structural Overview

After a general proposal of an alternative modernity theory, the essay gets into details about the interaction between technology and culture and then how technology should fare in that alternative modernity. Finally Chinese traditional society and modernization and the specific fields of medical and information technologies provide good case studies. So the whole essay is divided into four parts.

In Part I a preliminary alternative modernity theory is proposed. On the basis of a historical survey of Western modernization, some essential features of modernity are extracted from the key events or movements in Chapter 1. In particular individualism and industrialization are identified as the two general essential features of modernity. Roughly individualism covers the political and cultural areas and industrialization covers the economic area. They jointly distinguish a modern society from a premodern one. Chapter 2 talks about an alternative modernity. An alternative modernity is said against the Western modernity, which is treated as a model and reference. The essential features of modernity are extracted from Western modernity. An alternative modernity also needs to be based on Western modernity. In order to clarify what can be counted as an alternative, essential and peculiar features of Western modernity need to be identified. These are scientism, capitalism-commercialism and democracy. A common thought behind them egalitarian universalism is also unveiled. So a form of modernity has to go beyond these features in order to

be an alternative to Western modernity. This is a strong alternative modernity compared with Feenberg's weak one.

Part II is a preparation for the technology theory of this essay. Several major existing theories of the relationship between technology and culture are examined. The examination is carried out on the basis of an analysis of technology, which is the task of Chapter 3. Specifically, built on the dual characterization of technical artifacts, technology is analyzed into three major elements, the scientific, design and functional elements. These three elements are not separable components of technology, but just different aspects of the same entity. However the analysis makes the examination of the existing theories clearer and easier. The theories are grouped into the traditional and contemporary theories, along the neutrality vs. culture-ladenness dichotomy. Chapter 4 deals with the traditional theories. It's demonstrated first that the general foundation of neutrality is the scientific element of technology. For this purpose the neutrality of science in a certain sense is defended against historicism, post-modern criticism and constructivism. Technological determinism and common sense instrumentalism both claims the neutrality of technology. The former regards technology as an autonomous determining power, whereas the latter treats it as an instrument that fits into a straightforward functional slot. The contemporary theories of technology are discussed in Chapter 5. Similarly, the design and functional elements of technology are shown as the foundation of its culture-ladenness. This is a relatively easier task. Then three major theories are examined. Feenberg's theory of underdetermination is derived from the constructivist theory of technology. It claims that technical factors themselves cannot determine the design of a technology. So it has to do with culture-ladenness in terms of design. Ihde's ambiguity theory reveals that the function of a technology is ambiguous without a particular cultural context. The same technology could have quite different functions in different cultural contexts. This is in fact a theory of culture-ladenness in terms of function. Finally Winner's politics of artifacts theory can be deemed as having to do with culture-ladenness in terms of both design and function.

Part III is the core of this essay. It develops a synthesized theory of technology on the ground of the existing theories and then combines it with the modernity theory to provide an answer to the core question. What should we do with modern technology? On the one hand we should embrace it with all the benefits and progress it brings. On the other hand we should control it in order to avoid the problems it causes. Generally speaking this is an embracing-controlling-stance on modern technology. This may appear to be a common sense. But the thinking behind it is far from trivial. First an inspiration for the embracing-controlling-stance can be obtained from the field of photography. Chapter 6 spells out that inspiration. Photography carries the combination of technology and art. Although photography equipment is loaded with cutting edge modern technologies, technology can only facilitate photography practice to a certain extent. Of the four basic elements of photography works technology may help with exposure and focusing, but can contribute nothing directly to composition and attractiveness. These latter two are the art part, which is the core of photography. So the general message about technology in photography is that, it helps but falls short of the core.

The following two chapters handle the two aspects of the general stance in turn. To defend the embracing stance the dystopian substantivism of modern technology needs to be rebutted. This is one major task of Chapter 7. Specifically four influential substantivist theories of modern technology are examined. They are Heidegger's Ge-stell as a new ontology, Ellul's predominant efficiency, Marcuse's one-dimensional thinking and Borgmann's device paradigm. They all treat modern technology as a substantial part of culture that shapes the whole culture. For each of the theories the feature it picks is explained in the general cultural context. The goal is to show that modern technology is not the real culprit of the various problems in modernity. Instead we need

to find the root cause in the cultural context behind modern technology. Once modern technology is proved innocent it can be whole-heartedly embraced. The main theory of the essay is introduced in the second half of the chapter. It's a technology theory called cultural instrumentalism. Its central claim is that technology is a culture-laden instrument of the core of culture. A key idea is to divide culture into material, lower and higher cultures, so that the subtleties in the relationship   between technology and culture can be better captured. It turns out that all the major existing theories become a part of this synthesized theory. Then this theory and the modernity theory are combined to interpret the phenomenon of modern technology. A primary prescription for the modern malaise is also suggested. It's no other than going for an alternative modernity.

Chapter 8 deals with the controlling stance on modern technology. A three step approach is adopted. The first step of control is to recognize the limit of technology. The focus here is the strong Artificial Intelligence (AI) and Dreyfus's critique of it. But they are both put in a larger context. The strong AI, which is supposed to create human intelligence with computers, is put in the materialist worldview of modern science. And Dreyfus's critique of artificial reason is interpreted as an important step on the path leading to a new worldview. That can be called organizational naturalism. In the materialist worldview everything can be reduced to its matter. On the contrary, organizational naturalism recognizes organization as another dimension of the world besides matter. Further natural and cultural evolutions have generated an organizational spectrum containing five major levels of organization. With this organizational spectrum a variety of existing fundamental dichotomies can be reconciled, including that between rationality and meaning, a basic issue in the modernity theory. Generally speaking, the limit of modern technology is due to the materialist worldview it adopted with modern science. Hence it falls short of meaning and high values. The second step of control is to show that even within its limited scope modern technology needs to be further controlled owing to its unprecedented power. Without appropriate control irreversible damage could result. The focus here is the environmental problem. The power of modern technology has greatly increased the scope of human actions. A certain kind of new ethics is needed to cope with this new situation. The third step is about a direct control of modern technology. That is the recent development of technology assessment and regulation. The assessment is performed by professional institutes on specific technologies and the regulation is carried out by the government mostly in the form of established laws. So this is a direct control compared with environmental ethics. When a direct control is carried out properly it can be much more effective and high values may be directly embedded in it.

After the central embracing-controlling-stance on modern technology is defended, it's applied to four cases in Part IV. The cases are traditional China, Chinese modernization, medical technology and information technology. The former two cases are relatively general, whereas the latter two more specific. The four chapters in this part handle these cases in turn. Chapter 9 is about traditional China. The interest in it still lies in its technology. Needham's famous study has revealed the fascinating world of Chinese technology. Although technology was well developed in traditional China, it never dominated culture. What stood in the center of Chinese traditional culture is a unique type of humanism. On the one hand technological innovations were highly encouraged, but on the other hand technology only played a subordinating role. In general traditional China offered a perfect historical implementation of the embracing-controlling-stance. When history entered the Modern Age the situation became quite different. Modern science and technology has overshadowed the once advanced Chinese technology, and China has been forced unto the path of modernization. Chinese modernization is the topic of Chapter 10. The path that has been trodden is apparently dominated by the adoption of modern science and technology. This can be seen in the three major phases. But the modernization of such a unique and enduring

culture cannot be as easy as a direct adoption. Given China's successful past, important elements from Chinese culture are extracted and suggested to be contributive to an alternative modernity. For China itself its modernization can only be a synthesis of its tradition and modernity. Before Western modernity Buddhism had no less impact, but Chinese culture had managed to handle that successfully by adaptation and assimilation. The way to meet the new challenge should be essentially the same. In terms of technology a new implementation of the embracing-controlling-stance in the Modern Age is urgently needed. If China can achieve this new synthesis, it will be automatically an important contribution to mankind.

The last two chapters deal with two specific technologies, medical technology and information technology. They have the same structure. Together they show how the embracing-controlling-stance may be applied to specific technologies. Chapter 11 first makes a historical survey of modern medical technology. Its philosophical foundation is the mechanical view of the human body. Under this view modern medicine has made big progress. Advanced surgical technologies and pharmacy have improved and saved many people's lives. Therefore modern medical technology should be warmly embraced. But on the other hand the overdependence on modern medical technology has made people overlook other factors of health and the abuse of it has even caused more health problems than it actually cures. Further, recent advancement in medical technology, especially in the area of reproduction, has brought about fundamental ethical issues. How to use the technology in an appropriate way is a question worth considering. Similarly Chapter 12 makes a brief review of the several-decade history of information technology first. People have been talking about an information revolution. Although it's debatable to claim that information revolution has a parallel scale with the Industrial Revolution, it does greatly improve automation and communication, which are actually two basic components of the Industrial Revolution. Perhaps only the so-called virtual world generated by software simulation is something new. In this information world made possible by computers a kind of degradation gradually shows up. Books are first turned into magazines and then magazine articles are turned into scattered multi-sentence paragraphs, containing frequent grammatical errors. Another aspect is the out-of-control of information. Under the principle of freedom of speech, all kinds of information are suddenly put on the universal internet and become accessible for everyone. The loss of organization and control represents the core of degradation. Therefore the need of control is more straightforward in information technology.