

Index

1. Introduction	7
2. Research objectives	10
3. Theoretical frame & Literature review	11
3.1 The definition of cybernetics and the research status in China	11
3.1.1 “The narrow cybernetics”	12
3.1.2 The research status of cybernetics in China.....	13
3.2 Basic concepts of cybernetics	14
3.2.1 Input	15
3.2.2 Processes	15
3.2.3 Output	18
3.2.4 Feedback	19
3.2.5 Reflexivity	19
3.3 The history of cybernetics in New China.....	20
3.3.1 Planned economy period (1956-1983)	20
3.3.2 The revival of cybernetics to the new “first year of an era of AI” (1983-2023).....	21
3.4 Disembedding reflexive.....	23
3.4.1 Definition of disembedding reflexivity	23
3.4.2, Disembedding and coupling.....	27
3.4.3 Subjectivity, the identity of labor and power.....	28
4. Methodology	32
5. Delimitations, Limitations, Assumptions	36
6. Presentation of the research content or of the case study	37

6.1 The practice of applying cybernetics at the local level in China	37
6.1.1 Cybernetics for population policy	37
6.1.2 Game theory model of the causes of local government debt risk..	47
6.2 Case study: Internet public opinion that breaks the urban-rural dual structure, "anti-expertism" and reflexivity.....	48
6.3 Countermeasures Study: Cybernetics system design in organizational structure, economic calculation and process management local state-owned enterprises.....	52
6.3.1 Model overview.	52
6.3.2 Organizational structure	55
6.3.3 Economic calculation.....	57
6.3.4 Process management.....	57
7. Results & Findings	60
7.1 About cybernetics.....	60
7.2 About China's local level	62
8. Discussion	65
9. Conclusions	70
10. Recommendations for future research.....	75
Glossary	77
Bibliography	78
Annexes.....	81

Abstract

Cybernetics is an important component of control theory, which is a systematic theory integrating engineering, natural science and social science. This thesis introduces the history, current applications and future prospects of cybernetics and its development in local development in China, present a disembedding reflexivity, compare it with the previous second-order cybernetics (Heinz von Foerster, 1949) and autopoietic systems (Humberto R. Maturana and Francisco J. Varela, 1972), evaluate the advantages and disadvantages of the disembedding and coupling. Regarding the future applications of disembedding reflexivity, as an example, taking the hot events of public opinion at local governance and local development in China, discusses whether "anti-expertism" will emerge and what impact it will have. The countermeasure research takes China's state-owned enterprises that control the industries at the local level as the main object, design cybernetics system in the field of organizational structure, economic calculation and process management, explores how to build multi-level and full-process democracy in a top-down management system through reflexivity. The last part, there are different opinions with the concept of "posthuman" in "How we became posthuman" (N. Katherine Hayles, 1999) based on China's national conditions.

Key words: Cybernetics, disembedding reflexivity, anti-expertism, state-owned enterprises, China, posthuman

Extended summary

La cibernetica è una componente importante della teoria del controllo, che è una teoria sistematica che integra ingegneria, scienze naturali e scienze sociali. Questa tesi introduce la storia, le applicazioni attuali e le prospettive future della cibernetica e il suo sviluppo nello sviluppo locale in Cina, presenta una riflessività disembedding, la confronta con la precedente cibernetica di secondo ordine (Heinz von Foerster, 1949) e i sistemi autopoietici (Humberto R. Maturana e Francisco J. Varela, 1972), valuta i vantaggi e gli svantaggi del disembedding e dell'accoppiamento. Per quanto riguarda le future applicazioni della riflessività disembedding, ad esempio, prendendo gli eventi caldi dell'opinione pubblica sulla governance locale e sullo sviluppo locale in Cina, si discute se emergerà "l'anti-esperto" e quale impatto avrà. La ricerca sulle contromisure prende come oggetto principale le imprese statali cinesi che controllano le industrie a livello locale, progetta un sistema cibernetico nel campo della struttura organizzativa, del calcolo economico e della gestione dei processi, esplora come costruire una democrazia multilivello e a processo completo in un sistema di gestione dall'alto verso il basso attraverso la riflessività. Nell'ultima parte, ci sono opinioni diverse con il concetto di "postumo" in "Come diventiamo postumo" (N. Katherine Hayles, 1999) in base alle condizioni nazionali della Cina.

Parole chiave: Cybernetics, disembedding reflexivity, anti-expertism, state-owned enterprises, China, posthuman

PREFACE

Since the 1990s, with the beginning of the third information revolution, the end of the cold war and the emergence of post-Fordism, the interest in new and sustainable development dynamics and models have closely followed humankind into the new century. Besides the well-known 2030 Agenda, in the economic field, the demand for a mixed economy is continuously growing, for instance, Jean Tirole's work on "market power and regulation", winner of the 2014 Nobel Prize in Economics, is a strong evidence of this trend. I am from China, born and raised in an industrial city established during the planned economy era. Zibo - petrochemicals, natural gas, military industry even the original city plan of 1955 was drawn up by Soviet designers. It can be said that for a significant period of time state-owned enterprises and participation in the state-owned economy is the lifeblood of Zibo's development. In reality, Zibo can be regarded as a "slice" of the planned economy in China: state-owned enterprises have played a pivotal role in China's economy, despite the privatisation reforms of the 1990s many state-owned enterprises still remain, and their control over the lifeblood of the economy and over a particular industry is one of the key features that distinguishes the socialist economic system with Chinese characteristics from neo-institutional economics and neo-interventionism.

Therefore, how to improve state-owned enterprises and the state-owned economy has always been an important theme in China's local development, especially for industrial cities like Zibo, and it is also a "deep-water zone" that China's reform and opening-up is still exploring in the past 40 years. Personally, the reform of state-owned enterprises under the socialist economic system is neither as moderate and eclectic as the mixed economy advocated by Paul A. Samuelson, even if his "Economics" and Suggestions for China's future development are still the first impression of modern Western economics for a considerable number of Chinese economics researchers; it is also not so much like Vladimir Popov's excited about China's economic achievements in *Mixed Fortunes: An Economic History of China, Russia, and the West*, even though I agree with his rather optimistic view of centrally planned economies.

Cybernetics has always been an important topic in the field of control theory and automation since it was first introduced in 1948. After decades of development, cybernetics has become more than just "the science of control and communications in the animal and machine" as Norbert Wiener first mentioned in *Cybernetics or Control and Communication in the Animal and the Machine*. and communications in the animal and machine. (Norbert Wiener, 1948), it gradually became a cross-discipline spanning engineering, military science, mathematics,

information science, neuroscience, biology and social science. And its potential for continued and wider and deeper application to local development in the future has been amply demonstrated in a range of successful and unsuccessful practices from the United States to the Soviet Union to China, from anti-aircraft artillery to biology to family planning. Not coincidentally, the development of neural networks and machine learning, important components of modern large systems control theory, in the information sciences, especially artificial intelligence and supercomputers, has seen the possibility of obtaining leapfrogging technological conditions. So, a theoretical foundation already exists, the technical conditions are gaining completion of the system, if not applied to the domestic economy, especially in the Five-Year Plan has a specific operational and development goals of the state-owned enterprises instead is difficult to understand.

Certainly, as Wiener and Heidegger feared, the advent of cybernetics is itself an extremely intrusive possibility for traditional humanistic philosophy and liberal humanism. Will the complex relationship between the government, which distributes public power, the machine, which uses the 'black box principle,' the experts who possess the technology, and the general public encourage 'expertism' or stimulate distrust of the machine in the public, which in turn will lead to 'anti-expertism' in the public? Will the complex relationship between the machine, the technology, experts and the general public encourage 'expertism' or stimulate distrust of the machine in the public, leading 'anti-expertise' to the dangerous brink of anti-intellectualism? Will be there the electronic sheep as a historical repetition of 'Sheep are eating men' (Sir Thomas More, 1516)? Moreover, for sociology, man and machine, man and artificial intelligence is consistent a serious but uncertain topic, and even with the boom of literature, film and games, "cyberpunk" and "cyborg" have become a common theme among Generation Z like a household name.

This is one of future, at least.

1. Introduction

This thesis focused on cybernetics, especially the political and socio-economic influences that cybernetics plays on local development in China, as its theme, and has two main research objects, reflexivity and cybernetic systems for local state-owned enterprises in China, with the geographical boundaries of the research objects all in China. According to the timeline, the study is divided into two parts: historical-present and future. Historical-present includes the evolution of cybernetics and its development in the new China, especially the impact of population control policies on the local level. The future focuses on reflexivity and countermeasures research for the establishment of cybernetic systems in local state-owned enterprises in China, with strong and obvious theoretical and suggestive attributes. The aim of this thesis is to provide proposals with cybernetic ideas for the reform of local state-owned enterprises in China and so working on enriching cybernetic research with the interests of reflexivity & cybernetic system design. In the same time be responded to the development of the “new quality of productivity” (Xi Jinping, 2023) represented by Artificial Intelligence. In the Last is provide the concept “posthuman” (N. Katherine Hayles, 1999) different insights, even be called the ‘Chinese solution’.

It must be pointed out that because "Cybernetics or Communication and Control in the Animal and the Machine" was first published in 1947, and Norbert Wiener had a period of work experience in the Department of Electrical Engineering of Tsinghua University in Beijing from August 1935 to June 1936, and there were two Tsinghua University researchers, Li Yurong and Gu Yuxiu, who were also involved in the research of computers and cybernetics (Chen Guanrong, 2022), but the People's Republic of China had not yet been established at that time (1949), so in order to clarify the study boundaries, "New China" was specifically used in the title.

Critically speaking, this thesis does have an "impede" in empirical research. Due to the specificity of the research object: state-owned enterprises, the direct dynamics in reform for state-owned enterprise is determined in policy, especially within its top-down model. This leads in fact that if the thesis' proposal for a cybernetic system were to be really adopted, it would not necessarily be possible to use the history of previous state-owned enterprises reforms as an illustration to make a direct link, in the same way that the transform from a planned economy has been described as a suddenly “historical turning point”. At the same time, however, this implies that the “impede” is not lethal, also because the uncertainty of policy dynamics does not negate the feasibility of the proposed turnaround, even the

reflexivity as a feedback cannot be proved in advance of practice. Thus the research on reflexivity in this thesis focuses on the theoretical level, and the design of cybernetic systems for local state-owned enterprise is more of a proposal attribute.

The most important aspect for this thesis is the re-integration of cybernetic ideas with the latest results in the social sciences since the 'New AI Year' (2023). Just as Systems Theory, Information Theory, Cybernetics, and Marxist Epistemology, published in 1991, combined cybernetics and the development of computer technology with Marxism, the official ideology of China, so if such a combination emerged in the era of the first personal computers, it would be only abnormal not to have such a combination and crossover in the age of Chatgpt.

Another important aspect is how cybernetics corresponds to China's national conditions, especially to China's local state-owned enterprises, which is the "deep water zone of reform" (2014). This is still a new idea, or even a new path for China's state-owned enterprise reform.

Therefore, even if this can be still regard as a kind of theoretical fantasy, as well as need to meet the "impede", compared with the immeasurable prospects of artificial intelligence, the combination of artificial intelligence and cybernetics is exciting enough. So, starting from this point, the goal of this thesis is to explore the field of cybernetics with China's national conditions, especially the reform of local state-owned enterprises in China, and put forward new ideas, especially to combine reflexivity with China's reality, discuss how to implement it in the context of socialism with Chinese characteristics, and applicate reflexivity in "the whole-process people's democracy" (Xi Jinping, 2019), put forward potential problems such as "anti-expertism" and "technocracy", try to provide a Chinese perspective and Chinese solution for "Posthuman"(N. Katherine Hayles, 1999).

After all, as described in the preface, the state-owned economy has a special function and status in the socialist economic system with Chinese characteristics: state-owned enterprises, especially centrally managed enterprises, dominate the main industries and key areas related to national security and the lifeline of the national economy, and are an important pillar of the national economy (Xi Jinping, 2015). For traditional industrial cities, state-owned enterprises and whether/how to participate in the state-owned economic system, whether state-owned enterprises need to be reformed, and if so, how to reform, all have a significant impact on factors such as per capita income, commodity supply, employment rate, unemployment rate, and even maintenance. Even no less than the family planning policy, the last time China put cybernetics into practice on a large scale, the impact on local development.

After all, as described in the preface, the state-owned economy has a special function and status in the socialist economic system with Chinese characteristics: state-owned enterprises, especially centrally managed enterprises, dominate the main industries and key areas related to national security and the lifeline of the national economy, and are an important pillar of the national economy (Xi Jinping, 2015). For traditional industrial cities, state-owned enterprises and whether/how the local participate in the state-owned economic system, whether state-owned enterprises need to be reformed, and if so, how to reform, all have a significant impact on people's livelihood, including per capita income, commodity supply, employment rate, unemployment rate and other factors. Even no less than the family planning policy, the last time China put cybernetics into practice on a large scale, as well as the tax-sharing reform, the local finance that broke away from the central planned economy (Vladimir Popov, P.139, 2014), had an impact on local development.

2. Research objectives

This thesis has one argument, one hypothesis and two assumptions: the one argument is to prove that cybernetics does bring political and socio-economic influences at the local level in China. The first assumption is to try to propose reflexivity with the characteristics of disembedding (Karl Polanyi, P. 15, 2007), which is different from previous second-order cybernetics (Heinz von Foerster, 1949) and autopoietic systems (Humberto R. Maturana and Francisco J. Varela, 1972), and is different from Coupling (N. Katherine Hayles, 1999). The second is to try to suggest a cybernetics system designed for local state-owned enterprises in China, mainly used for organizational structure, economic calculating and process management, also including disembedding reflexivity. The one hypothesis is to present different opinions on the concept of "Posthuman" based on China's national conditions and China's solutions.

Of course, as a theoretical system that involves assumptions, the lack of data is currently an insurmountable gap. But just like "Advantage of Backwardness" (Alexander Gerchenkron, 2010), the assumptions based on the summary of many theories and practices since the publication of cybernetics since 1948 is not without benefits. Moreover, compared with the progress in artificial intelligence in the fields of machine learning and neural networks, it is necessary to also try to explore it with social sciences in any case.

3. Theoretical frame & Literature review

3.1 The definition of cybernetics and the research status in China

Norbert Wiener defined cybernetics in his book *Cybernetics or Control and Communication in the Animal and the Machine* as: "the science of control and communications in the animal and machine." (Norbert Wiener, 1948). From an etymological point of view, the word cybernetics comes from the ancient Greek word "κυβερνητης", which originally meant "steersman" (Norbert Wiener, P.11, 1948). But cybernetics was not the first time be used before Wiener in the field of science. French physicist and mathematician André-Marie Ampère proposed the term "Cybernétique" in "Essai sur la philosophie des sciences, ou exposition analytique d'une classification naturelle de toutes les connaissances humaines. Tome 2. (Essay on the philosophy of science, or a natural exposure analytical classification of all human knowledge, Part II)" as a classification of "relatives aux moyens par les quels les gouvernements veillent à la sûreté extérieure des Etats et font régner dans leur sein l'ordre et la paix (relating to the means by which governments ensure the external security of States and ensure order and peace reign within them)" and called it "l'art de gouverner en général (the art of governing in general.)" (André-Marie Ampère, p.141, 1843). However, it is also interesting from an etymological perspective that Norbert Wiener believed that the first work on feedback mechanisms was "On governors" published by British physicist James Clerk Maxwell in 1868 (Norbert Wiener, P.11, 1948), and both "governors" and "cybernetics" can be traced back to an older common Greek root "κυβερνάω", which in turn points to a common Latin variant "gubernator". To some extent, it can be said that "cybernetics" is a revival in cognate with "governors".

Cybernetics originated from a series of research results on information measurement, feedback mechanism, automation and signal system in the 1930s and 1940s. The breakthrough in information theory provided an important foundation in natural science. Especially include the Shannon-Nyquist Sampling Theorem (Harry Nyquist, 1924), the Nyquist stability criterion (Harry Nyquist, 1932) and Claude Elwood Shannon's "A Mathematical Theory of Communication", which is regarded as the cornerstone of information theory, and the concept of "information entropy" proposed in the book (Claude E. Shannon, 1948). After all, War is itself a complex system (Hu Xiaofeng, 2013). The World War greatly promoted the integration of the electronics industry, aviation industry and information system that are directly related to the above theories. For example, the feedback theory and filtering theory proposed by Norbert Wiener in the book "Cybernetics or Control

and Communication in the Animal and the Machine" are precisely based on the research and design of thermostats, automatic gyrocompass ship-steering systems, self-propelled missiles, automatically controlled oil-cracking stills, ultra-rapid computing machines, and artillery, especially anti-aircraft guns and aircraft guns.

3.1.1 "The narrow cybernetics"

"Cybernetics is often thought of as a grim military or industrial science of control" (Andrew Pickering, 2011). Even Norbert Wiener made pessimistic estimates of the future application of cybernetics to other fields, especially social sciences, in "Cybernetics or Control and Communication in the Animal and the Machine" and the subsequent "The Human use of Human Beings: Cybernetics and Society", such as "It is the mode of thought of the mice when faced with the problem of belling the cat." and "excessive optimism" (Norbert Wiener, p.162, 1948).

So, in order to respect Norbert Wiener, the founder of cybernetics, for his pessimistic attitude towards the future application of cybernetics to social sciences (Norbert Wiener, p. 25, 1948), in this thesis it is defined as "narrow cybernetics", that Norbert Wiener's cybernetics and its applications in the military and engineering fields according to fields cybernetics be used. But for China, this thesis tends to follow what Qian Xuesen mentioned in "Engineering Control Theory": "It is not 'overly optimistic but realistic' to extend and apply these engineering technology methods to the social field" (Qian Xuesen, 1983), and adhere to its cross-disciplinary attributes with economics, sociology, political science, biology, psychology and other disciplines.

However, unlike Norbert Wiener's anxiety to defend liberal humanism (N. Katherine Hayles, 1999), this thesis argues that the problem with using cybernetics in social sciences is caused by an important disagreement: should the researchers directly use this tool, which is usually used in military and engineering, in its original positioning or even "graft" it into the fields needed by social sciences, such as demography and paleoanthropology that uses the FitCoal model (Li Haipeng, 2023) to predict the population size of ancient humans; or use cybernetics as an ideology, just like Martin Heidegger claimed in an interview with the German magazine Der Spiegel in 1966 that cybernetics would replace philosophy (Martin Heidegger, 1966), to create a new positivist research method, emerging discipline, or even thought or philosophy brought about by technological progress led by cybernetics? Even a new form of "death of men" (Michel Foucault, 1966).

3.1.2 The research status of cybernetics in China

From a chronological view, the first work that comprehensively introduced Cybernetics in new China was “Engineering Cybernetics” by Qian Xuesen. This work was first published in 1954, reprinted in 1983 and 2008, and is still one of the basic textbooks for engineering and control theory in Chinese universities. It is usually believed that Norbert Wiener's cybernetics is part of control theory and is a mark of classical cybernetics in the history of control theory.

In addition, Song Jian, the main scientist who promoted China's family planning policy, Song Jian's "Population Control Theory" is also a classic work of Chinese cybernetics. From this work, the "Song Jian-Yu Jingyuan" two-line analysis model (Song Jian, Yu Jingyuan, 1985) directly promoted the decision-making of China's family planning policy in the 1980s. In the social sciences, Feng Guorui's "System Theory, Information Theory, Cybernetics and Marxist Epistemology" expounded the necessity of establishing interdisciplinary disciplines and cultivating interdisciplinary talents, as well as the connection between system theory, information theory and cybernetics and Marxist epistemology and Mao Zedong Thought (Feng Guorui, 1991).

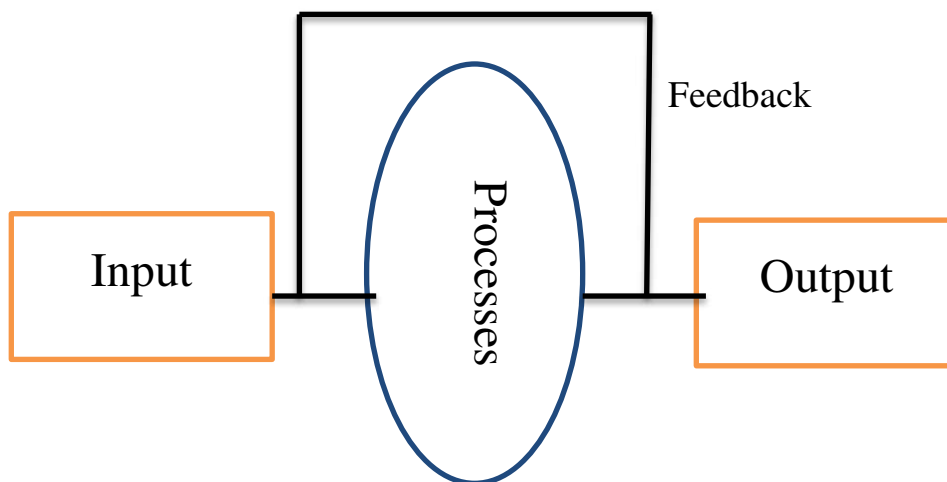
It is worth mentioning that the current research frontier of modern control theory in China is mainly in the two fields: fuzzy control theory and large system control theory, especially in machine learning and neural networks. Their researches also continue to extend to artificial intelligence, automation, information science, neuroscience etc., becoming an important part of "new quality productivity" (Xi Jinping, 2023). Among them, Li Shiyong's "Fuzzy Control, Neural Control and Intelligent Control Theory", the beginning and representative work of Chinese fuzzy control theory research, introduced the basic theories of fuzzy control theory and intelligent control such as thinking science, intelligent simulation, fuzzy logic, rough sets, neural networks, genetic algorithms, artificial life, chaos theory and resistible sets, and proposed a variety of intelligent control designs such as multi-level intelligent control, expert control, fuzzy control, neural control, human-like intelligent control, intelligent control based on pattern recognition, multi-mode variable structure intelligent control, learning control, chaos control and extension control (Li Shiyong, 1998). In the field of large-scale system cybernetics, there is the work "Large-Scale System Cybernetics" written by Tu Xuyan, Wang Cong and Guo Yanhui in 2005, which introduces the disciplinary framework of large-scale system cybernetics, the theoretical basis of large-scale system cybernetics including generalized modeling, multi-layer state-space model, multiple generalized operator model, controller model and intelligent model, including large-scale system structural analysis such as interoperability, reliability, controllability, coordination, stability and economic structural

analysis, as well as the application of large-scale system cybernetics in practical problems such as most economical control, expert systems, intelligent autonomous distributed systems and collaborative intelligent information networks (Tu Xuyan, Wang Cong and Guo Yanhui, 2005). In addition, there is a term called "New Three Theories" and "Old Three Theories" in Chinese academic circles. The "Old Three Theories" include system theory, cybernetics and information theory, which are basically based on classical thermodynamics (entropy). The new three theories means dissipative structure theory, synergetics and mutation theory, that are based on bifurcation theory and mainly conduct nonlinear analysis.

3.2 Basic concepts of cybernetics

Qian Xuesen pointed in Engineering Cybernetics that the basic method of cybernetics is to study the system from the two aspects of information and control, that is, the role of the control system is to extract necessary information from the outside world in a certain intelligent way, process it according to certain rules, and then generate new information and react to the outside world to achieve a certain purpose. That is, input-processes-output-feedback. The input and output variables can not only represent behavior, but also information. In addition to affecting practice, feedback can also use second-order cybernetics(Heinz Von Foerster, 1949) to continue input-processes-output-feedback on the feedback process, which means reflexivity.

Figure 1: The basic structure of cybernetics.



Source: Self draw.

3.2.1 Input

Input is a process of collecting information by intelligent means. In addition to information, behavior can also be considered as an input. Also, producing equivalent behavior, then, counts as producing an equivalent system (N. Katherine Hayles, 1999). Modern cybernetics often uses fuzzy control theory, machine learning, and self-learning theory as new directions for researching input, and cooperates with artificial intelligence, big data, and large systems for research. However, in Heinz von Foerster's view, "not only an epistemology of cybernetics, but any epistemology claiming completeness will be some form of cybernetic theory." (Heinz Von Foerster, p.230, 1949).

3.2.2 Processes

Thus, the three concepts of regulation, entropy retardation, and computation constitute an interlaced conceptual network which, for me, is indeed the essence of Cybernetics (Heinz von Foerster, p.194, 199).

The black box method (Norbert Wiener, 1948) is a common method for processing processes in cybernetics. The terms "black box" and "white box" come from the Theory of random signals and noise in signal science and non-linear electric circuit in electricity, as well as Norbert Wiener's book "Nonlinear Problems in Random Theory" (Norbert Wiener, 1958). "Black box" refers to a nonlinear system that has not yet been analyzed, while "white box" refers to a known structure that has been determined. The relation between "black box" and "white box" will be constructed as a kind of network: "In this manner we are able to construct a multiple white box which, when it is properly connected to a black box and is subjected to the same random input, will automatically form itself into an operational equivalent of the black box even though its internal structure may be vastly different" (Norbert Wiener, 1948). If mathematical expressions are used, the simplest first-order system mentioned by Qian Xuesen in "Engineering Cybernetics" using differential equations is obviously the best example:

$$\frac{dy}{dt} + ky = 0$$

Assume that the system has no driving function and k is a real constant (spring constant),

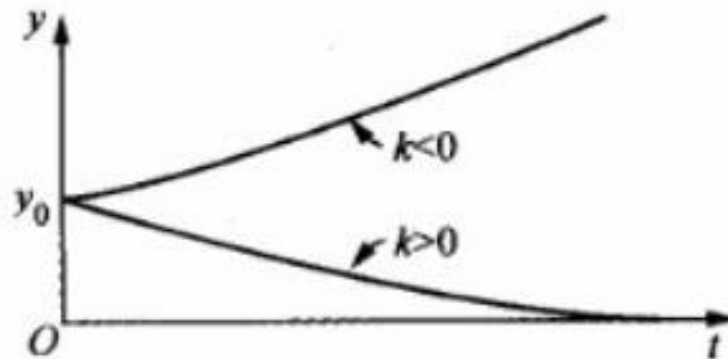
If $y=0$

It will be:

$$y = y_0 e^{-kt}$$

$$y(0) = y_0$$

Figure 2: The function curve of a white box.



Source: Qian, X., Song J. (1983), Engineering Cybernetics, Beijing: Science Press, p.2.

This is a typical, simplest white box.

The black box is a little more complicated.

As a nonlinear system, the system is affected by the driving function and produces a non-real constant perturbation y.

$$\frac{dy}{dt} + f(y) = 0$$

Integrating this equation:

$$t = - \int_{y_0}^y \frac{d\eta}{f(\eta)}$$

$$\frac{d^2 y}{dt^2} + \frac{df}{dy} \frac{dy}{dt} = 0$$

$$\frac{d^3 y}{dt^3} + \frac{d^2 f}{dy^2} \left(\frac{dy}{dt}\right)^2 + \frac{df}{dy} \frac{d^2 y}{dt^2} = 0$$

.....

Let y_1 be the zero of $f(y)$, and $f(y)$ is regular at y_1 , so all derivatives of $f(y)$ with respect to y are finite at y_1 .

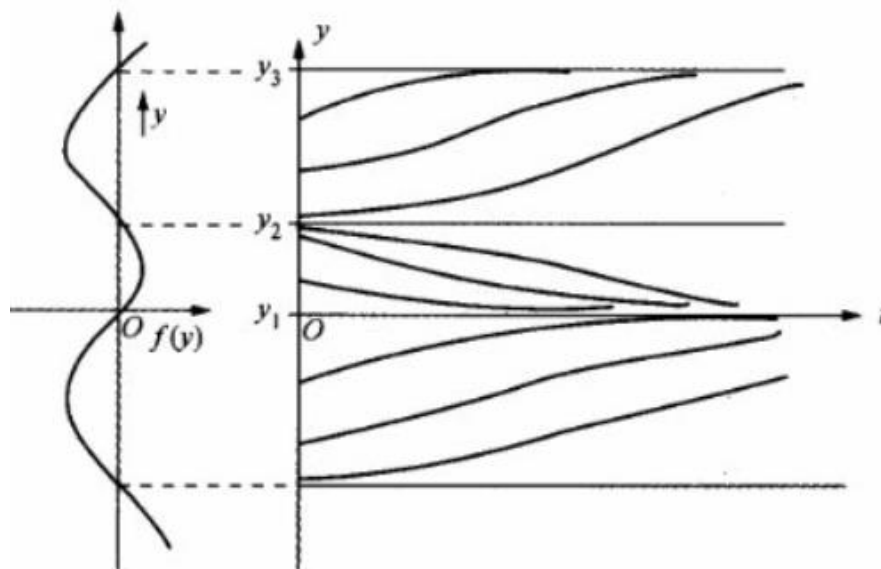
When $y = y_1$, $\frac{dy}{dt} = \frac{d^2y}{dt^2} = \frac{d^3y}{dt^3} = \dots = 0$, then y approaches y_1 .

If $y_0 > y_1$, 且 $f(y_0) > 0$, they will eventually be y_1 .

If $y_0 < y_1$, 且 $f(y_0) < 0$, when $t \rightarrow \infty$ 时 y will still be y_1 .

If y_0 coincides with a zero point of $f(y)$, then y will not change with the change of t , and each zero point is an equilibrium point. However, when $\frac{df}{dy} < 0$, the system that loses its equilibrium point will produce y_2 and y_3 under a slight disturbance.

Figure 3: The function curve of a black box.



Source: Qian, X., Song J. (1983), Engineering Cybernetics, Beijing: Science Press, p.5.

This is right a black box.

However, the black box and the white box are not opposite to each other. Norbert Wiener conceive that the black box as a piece of “apparatus” and the white box as “network”, and tried to "build in the relation between input and output potentials in accordance with a definite structural plan for securing a previously determined input-output relation" (Norbert Wiener, 1948). In modern cybernetics, the task of quantifying and constructing the "white box" is given to fuzzy control theory. In the more macroscopic view of large-scale system control theory, the "white box" can become a part of machine learning, especially self-learning, based

on neural networks, and can be automatically encoded through the relevant technologies of fuzzy control theory.

In order to establish a system model, it is necessary to introduce state variables that are only related to the system, so that two sets of equations may be used to describe the system. One set is called the transfer equation (also known as the state equation), which is used to describe the evolution law of the system; the other set is called the action equation (also known as the output equation), which is used to describe how the system interacts with the outside world. Let x be the input vector, y be the state vector, z be the output vector, t be the time variable, and Δt be the time increment. The mathematical model of the system can be expressed as:

$$y(t + \Delta t) = f(x(t), y(t), t)$$

The first is the transfer equation:

$$z(t + \Delta t) = g(x(t), y(t), t)$$

The second equation is the action equation.

Laplace Transform

The most common tool for converting linear equations to nonlinear equations is the Laplace Transform (Pierre-Simon marquis de Laplace, 1812) proposed by Laplace in “Theorie analytique des probabilités”, which is also the basic formula of cybernetics. The Laplace transform can transform a function with a parameter real number t ($t \geq 0$) into a function with a parameter complex number s :

$$F(s) = \int_{0-}^{\infty} f(t) e^{-st} dt$$

$F(s)$ is the image function and $f(t)$ is the original image function.

$$F(s) = L[f(t)]$$

3.2.3 Output

Output is the result of the system operation. Like input, behavior and information can be regarded as output, such as being output as some kind of orthogonal function in circuit analysis (Norbert Wiener, 1948). Norbert Wiener believes that the relation input-output is a consecutive one in time and involves a definite past-future order (Norbert Wiener, p.43, 1948).

If it is connected with philosophy, it is like the subsequent "belongs to the Gibbsian statistical mechanics rather than to the classical Newtonian mechanics" (Norbert Wiener, p.44, 1948), that is, cybernetics believes that the world can be observed. Of course, limited by the philosophical level of this thesis, the connection between cybernetics and philosophy, as well as the philosophical world and philosophical significance of cybernetics can only be discussed here.

3.2.4 Feedback

Feedback is the process by which a cybernetic system adjusts its input according to its output. Through feedback, a cybernetic system can modify its behavior according to its output to achieve a specific effect or maintain a stable state. In engineering and mechanics, Norbert Wiener believes that feedback should be in the chain of the transmission and return of information, which can be divided into human link, such as signaller, and purely mechanical feedback system, such as the governor of a steam engine by Clerk Maxwell (Norbert Wiener, p.96-97, 1948). By studying human finger joints, Norbert Wiener proposed the concept of "postural feedback", namely: regulate the performance of a task through the observation of the amount by which it is not yet accomplished needs the backing up of other feedbacks (Norbert Wiener, p.107-108, 1948).

When studying nonlinear feedback, Norbert Wiener presented the example of "organ pipe", using linear and nonlinear models to study how the organ pipe vibrates. Through this example, Norbert Wiener showed that the linear model believes that the amplitude of oscillation is completely independent of the frequency, that is, the vibration of the organ pipe is a completely uncertain conservative system; while the nonlinear model believes that in the latter, there is generally only one amplitude, or at most a discrete set of amplitudes, for which the system will oscillate at a given frequency, as well as a discrete set of frequencies for which the system will oscillate (Norbert Wiener, p.108-109, 1948).. The two can also be transformed into each other under the influence of certain factors, such as the following formula:

$$A \sin(Bt + C) e^{Dt}$$

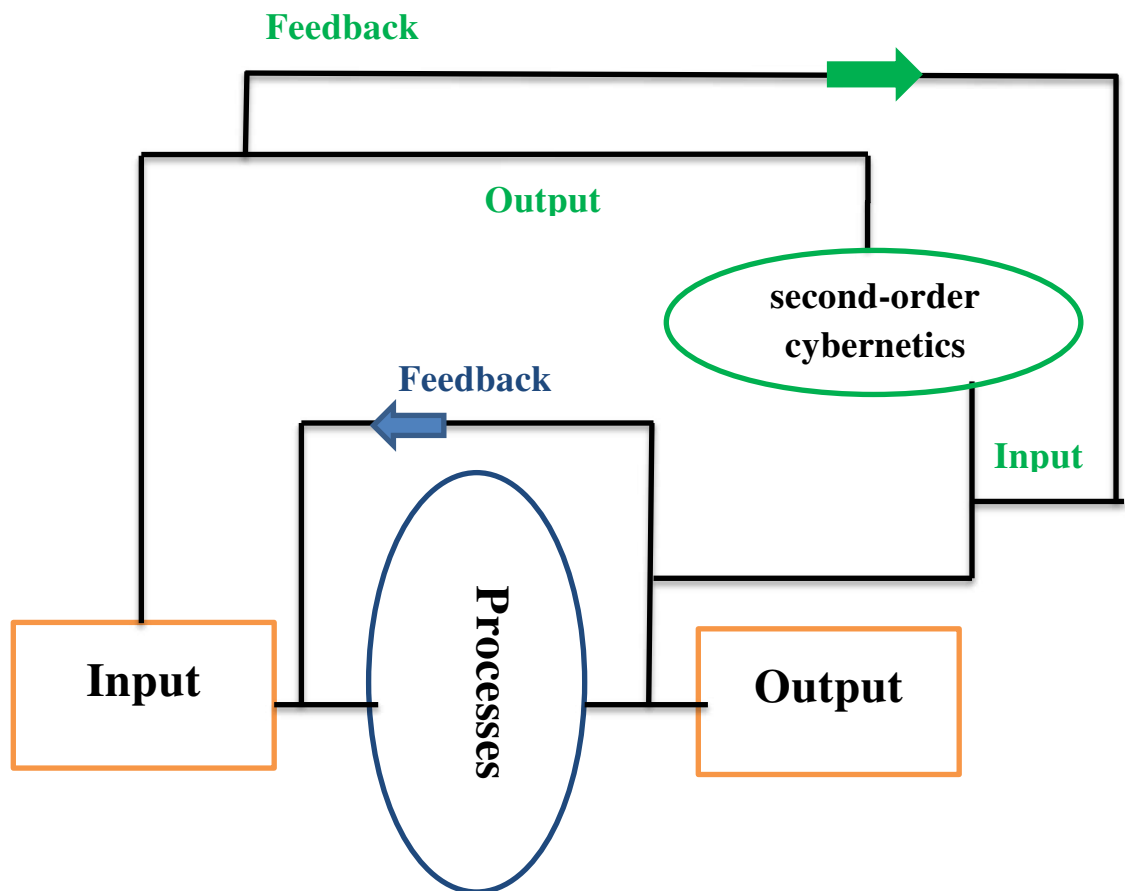
3.2.5 Reflexivity

In fact, reflexivity was not proposed by Norbert Wiener. Heinz von Foerster gave the definition in "Understanding Understanding Essays on Cybernetics and Cognition": "I submit that the cybernetics of observed systems we may consider to be first-order cybernetics; while second-order cybernetics is the cybernetics of observing systems." (Heinz von Foerster,

p.285-286, 1949), that means "cybernetics of cybernetics" - second-order cybernetics. And before that, Heinz von Foerster had already submitted the term "second order observer" (Heinz von Foerster, p.244, 1949) for epistemology.

This thesis agrees with N. Katherine Hayles's categorization in "How We Became Posthuman Virtual Bodies in Cybernetics, Literature, and Informatics", and classifies second-order cybernetics as reflexivity for research (N. Katherine Hayles, 1999).

Figure 4: The basic structure of second order cybernetics.



Source: Self draw

3.3 The history of cybernetics in New China

3.3.1 Planned economy period (1956-1983)

Cybernetics used in military, engineering, signal and automation fields, right as "narrow cybernetics".

Both China and Soviet Union are socialist countries, adopt similar planned economic systems, however the development of cybernetics in China and the Soviet Union "missed each other".

In 1958, although the "Biological Cybernetics" by Д.Н.Меницкий had been translated, due to

the influence of the "Lysenko affair", the Soviet academic community rejected the "Second Industrial Revolution" and "Science and Technology Revolution" as concepts that glorified capitalism. In the early 1960s, with Khrushchev's "thaw", the Soviet scientific community urgently needed a sufficiently new and "future" power to explain the Soviet Union's economic and technological achievements. Therefore, the development of cybernetics was promoted. At this time, China and the Soviet Union had fallen into "Sino-Soviet hostility". Between 1959 and 1960, Khrushchev withdrew all the experts who had assisted in China's construction, and the scientific and technological exchanges between China and the Soviet Union stagnated. That is to say, although China and the Soviet Union came into contact with cybernetics almost at the same time (even earlier if we go by the time when Norbert Wiener came to work in China and the contributions of his two assistants Li Yurong and Gu Yuxiu), there is no clear information to prove that there was any more direct communication between China and the Soviet Union except for sending scientists to participate in international conferences at the same time (such as the first IFAC World Congress held in Moscow in June 1960).

The first edition of Qian Xuesen's "Engineering Cybernetics" was published in 1954, marking the application of cybernetics in the engineering field in New China. It is speculated (due to the lack of relevant details) that it was first used in the military, especially in the field of weapons and equipment research and development. In fact, due to the limitations of equipment and computing power, China's actual application of cybernetics was far behind the United States and the Soviet Union at the time. After all, in the research of China's atomic bombs, missiles and hydrogen bombs, a considerable part of the ballistic and engineering calculations were done manually.

It is worth mentioning that although China has lagged behind in the application of cybernetics, it has always tried to keep pace with the world's advanced level. Qian Xuesen was the first Chinese representative to IFAC and participated in many IFAC meetings with scientists such as Yang Jiachi, Lu Yuanjiu, Tu Shancheng, and Song Jian. Later, Yang Jiachi became the founder of the field of automatic detection in China.

3.3.2 The revival of cybernetics to the new “first year of an era of AI” (1983-2023)

Although China's expansion of cybernetics in the cross-fields of economy, society, psychology, biology, etc. was much later than that of the United States and the Soviet Union, Chinese scientists have never given up the expansion and application of cybernetics to other fields. Due to the extreme lack of relevant information, it can be inferred from the relevant time of the publication of the second edition of "Engineering Cybernetics" and "Population

Control Theory" that the expansion of cybernetics to other disciplines occurred around the late 1970s and early 1980s. In March 1986, the "National High-Tech Research and Development Program" (863 Program) was approved, and automation became one of the seven most important fields.

The next period of rapid development of cybernetics was from the late 1990s to the first decade of the 21st century. With the development of modern cybernetics and information technology, a large number of works on modern cybernetics appeared in China, the most famous of which are Li Shiyong's "Fuzzy Control, Neural Control and Intelligent Control Theory"(Li Shiyong, 1998) and "Large-Scale System Cybernetics" (Tu Xuyan, Wang Cong and Guo Yanhui, 2005)written by Tu Xuyan, Wang Cong and Guo Yanhui, which pioneered research in China's large system theory, fuzzy cybernetics and machine learning, respectively.

Almost at the same time, the "new three theories" (dissipative structure theory, synergetics and mutation theory) based on bifurcation theory and the uncertainty principle began to be gradually accepted by the Chinese academic community, which marked that cybernetics was gradually completing its historical mission.

In addition, it is worth mentioning that "new quality productivity" (Xi Jinping, 2023) is now becoming a popular concept in China's academic circles, has gradually replaced the "Industry 4.0" (BMBF, 2013) that was popular 10 years ago. Its definition is: New quality productivity is the concrete embodiment of productivity modernization, that is, new high-level modern productivity (new type, new structure, high technology level, high quality, high efficiency, sustainable productivity), which is a new type and structure of productivity that has never existed before. Compared with traditional productivity, its technology level is higher, quality is better, efficiency is higher, and it is more sustainable.

The main concepts are: New quality productivity is innovation that plays a leading role, breaking away from the traditional economic growth mode and productivity development path. It has the following three characteristics:

- a. High technology
- b. High efficiency
- c. High quality

It is considered to be in line with the new development concept of advanced productivity quality, and is spawned by revolutionary technological breakthroughs, innovative

configuration of production factors, and deep transformation and upgrading of industries. With the leap of laborers, labor materials, labor objects and their optimized combination as the basic connotation, and the substantial improvement of total factor productivity as the core symbol, the characteristic is innovation, the key is quality, and the essence is advanced productivity (Xi Jinping, 2023).

Although it has strong political insights, the sociological and philosophical potential behind it cannot be ignored:

It can be said that "new quality productivity" represents a kind of productivity that plays a transformative role, and this transformation is not only at the technical level, but also at the institutional level. In abstract terms, "new quality productivity" is an advanced productivity that can make the current system backward, and it is an advanced productivity that can promote the transformation and transformation of the current economic and social development system. Admittedly, it has a certain color of "technological determinism" and "economist model", but it has laid a strong political and social foundation for innovative technologies such as artificial intelligence, 3D printing and even artificial wombs.

3.4 Disembedding reflexive

3.4.1 Definition of disembedding reflexivity

About disembedding reflexivity, it is defined as:

Disembedding reflexivity is the reflexivity that, maintains the cybernetic system under the public ownership economic system for being fully autonomous in the linear process (white box), and usually be simulated.

a. Exclusiveness.

The primary goal is to ensure the "disembedding" of cybernetics, that is, to maintain the existence and normal operation of the linear white box network and exclude unnecessary political and social "embeddedness".

It is worth noting that exclusiveness and simulation are mutually sufficient and necessary conditions.

b. Simulation

Disembedding reflexivity is not really "disembedding" with politics and society. On the contrary, disembedding reflexivity relies on the strength of the socialist system with Chinese

characteristics to ensure its maximum "disembedding" within the cybernetic system and get rid of unnecessary political and social interference. Its essence is simulated, and it may also be considered as a deeper "embeddedness" (Karl Polanyi, 2007).

c. Public ownership

Disembedding reflexivity and the cybernetic system that uses it are defined and designed as part of China's local state-owned enterprise reform. They are only applicable to state-owned enterprises that play a controlling role in a certain industry or have a specific task (such as ensuring that state-owned assets are not lost), not to the whole society. To the greatest extent possible, avoid the anxiety similar to Wiener that cybernetics will undermine or even destroy liberal humanism.

d. Identity.

It is both the identity of internal and external supervision and the identity of labor and power. The identity of internal and external supervision means that disembedding reflexivity is part of internal and external supervision and the whole process of people's democracy. There are both internal designs for the reform of organizational structure and process management, and external attempts at public opinion supervision. The identity of labor and power means that disembedding reflexivity is both a compulsory labor for its undertakers that is not for the purpose of making a living and a power to input into the cybernetic system. There are no full-time "disembedding reflexivists", but everyone can participate in "disembedding reflexivity".

And its characteristics and concepts will be summarized in "Conclusion".

In "the Great Transformation", "embeddedness" is definite to describe a state in which the economy and the market are not independent and autonomous, because subordinate to political, religious and social organizational structures (Karl Polanyi, 2007); just as the word "embeddedness" originally refers, Ore (such as coal) embedded in a mineral deposit can be imagined. In contrast, "disembedding" definite the economy, that break and disengage the order of political, religious and social organizational structures, so as to the market can absolutely autonomously regulate itself.

Karl Polanyi pointed that "disembedding" has a paradoxical fatal flaw (Karl Polanyi, 2007), that is, it is destructive and unsustainable to the natural environment and social organization in the long run, and took the selling and buying activities of merchants and producers as an example:

Karl Polanyi believes that merchants who sell artificial products will have no impact on the social organizational structure regardless of whether they can find buyers. But if merchants buy raw materials and labor, that is actually point nature and people. Then this behavior can be regarded as transforming the natural nature of society and the essence of people into commodities. (Karl Polanyi, p.36, 2007) Commoditizing nature and people will inevitably come at the cost of environmental destruction. Then, this economic system will hardly survive sustainably and may fall into deeper embeddedness. For example, the rapid liberalization represented by "shock therapy" combined with the inability of the Russian Central Bank to respond to subsequent financial policies has a catastrophic impact on the Russian economy and social organizations (Vladimir Popov, P.85-94, 2014).

Politics, society and economy are still a black box manipulated by multi factors, and "embeddedness" is the norm and relative steady state of these complex and grand human activities. Ironically, the threatened to this nonlinear system, which is influenced by political, social, religious and other factors, is instead defamed "disorder"(Karl Polanyi, P.255, 2007), like the revolution in Soviet Russia and the Soviet Union's planned economic construction, although the panic brought by revolution cannot be reconciled because of inevitable violence when broken the private ownership. Till today, when behavioral economics and chaotic and dynamic models such as Complex Adaptive System are becoming more and more popular in academia, take the weight function in Prospect Theory (Daniel Kahneman, Amos Tversky, 1979) as an example, which describes how people assign weights to events of different probabilities. Even when the probability is known, people often do not make decisions according to the true probability, but according to some psychological weight. In other words, this is a situation where people actively choose the black box when they can choose the white box.

$$\omega(p) = \frac{p^\gamma}{(p^\gamma + (1 - p)^\gamma)^{1/\gamma}}$$

Where $\omega(p)$ represents the psychological weight of the event. p represents the real probability of the event. γ describes the nonlinear perception of probability.

Another example is religion. Religion always likes to do some very strange things: fasting, vegetarianism, food that needs to be approved or certified by clergy before consumption, food that cannot be consumed because of doctrine or clergy prohibition, and even some kind of

ritual implements made of special raw materials. The pilgrimage and offerings of believers have created a unique economic activity. They are also a firm consumer group of candles. Yes, their beliefs require them to buy and use candles, even in rooms with modern lighting.

In that case, "disembedding" can be seen as a white box. Because Marx can give an accurate formula for economic development, and Stalin can actually implement it completely:

$$W = c + v + m$$

In these formal, c is constant capital, v is variable capital, and m is surplus value. $v+m$ is the new added value and the newly created value.

$$\frac{\Delta v + \Delta m}{v + m} = \frac{m'S'}{(\frac{c}{v} + 1)}$$

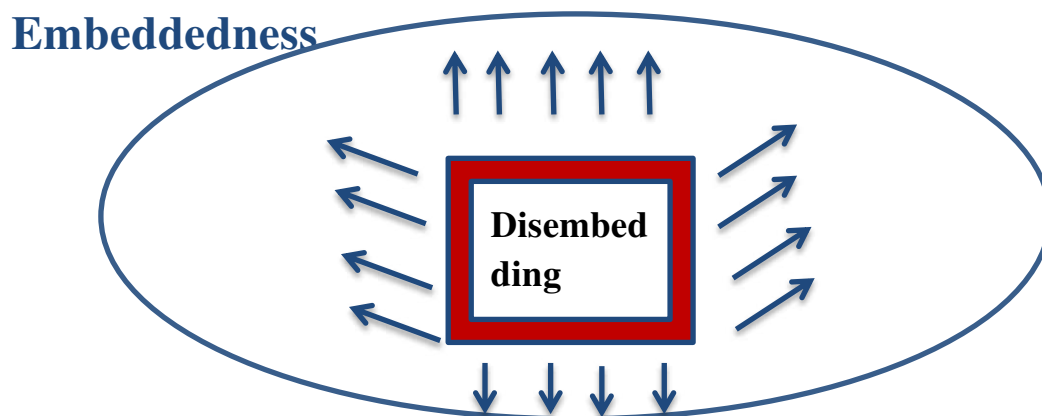
As human society has developed to today, except the strictly planned economy, nearly no possibility exist that a economic system can output a result that is linearly unrelated or linearly related to politics, society and religion. But "disembedding" is also able to be "simulated", just like people can use electrical signals to simulate percussion instruments and orchestral instruments, but this is only feasible where there is a power supply. The first case of this simulated "disembedding" is the planned economy, because it transforms the political, economic and social foundations that previously "disembedding" would be only stuck in self-contradictory; the second is the production plan of special industries such as the military industry during war. But as we all know, war is nothing more than the continuation of politics by other means (Karl von Clausewitz, 1832), and no country will fight for the war itself, otherwise war will become a video game or a sports competition like the limbo world (Bernard Wolfe, 1996).

This also explains why the first five-year plan (1953-1957) of China almost coincided with the "three major reforms" (1953-1956) to change the old, private-owned economic system, and also had to be completed after the land reform (1946-1952). This is because China's planned economy needs to germinate in the soil where public ownership is absolutely dominant.

Then, we can make such an assumption: "embeddedness" means that the economy is controlled by political, social and other factors, and cannot achieve "autonomous" and autonomous market regulation. So, since politics and society can control the operation of the economy so profoundly and powerfully, can we artificially simulate an "autonomous"

environment? Even if it does not rely on its autonomous regulation? Is this a kind of "disembedding"? The Soviet Union proposed a "commodity shell theory" during the planned economic construction, proposing that the exchange of means of production between state-owned enterprises is not a real commodity exchange, but only retains the shell of the commodity. For example, the tractor at the tractor station is not a commodity, but a production tool with a "commodity shell". This theory originated from Bukharin's "Economics of the Transition Period" (Nikolai I. Bukharin, 1920), and was also recognized in Stalin's (Joseph Stalin, 1952) "Problems of Socialist Economy" and practiced in the Soviet Union's planned economic construction. So can a certain deliberate "embeddedness" maintain a "disembedding" "shell"? How to eliminate unnecessary political and social interference? Even as Karl Polanyi worried, attempts at "disembedding" may lead to a deeper "embeddedness" (Karl Polanyi, 2007).

Figure 5: How to simulate a "disembedding".



Source: Self draw

3.4.2, Disembedding and coupling.

Disembedding and coupling solve each other's prerequisites.

Coupling was originally a physics definition, referring to the phenomenon that two or more systems or two forms of motion influence each other and even unite through interaction. It is widely used in circuits, communications, computers, biology and other fields. This thesis adopts Karl Weick's "loose coupling" introduced into the concept of management by R.B. Glassman in "Educational organizations as loose coupled systems", and believes that coupling is a kind of "connection" and "interdependence" (Karl Weick, p.3, 1976), and puts forward the concept of "loose coupling". Loose coupling advocates that organizations are connected by common beliefs, norms and institutionalized expectations. In contrast, tight coupling

advocates that organizations are connected by standardization, strong interdependence and centralized management.

Then, disembedding has artificially and deliberately stipulated whether there is a connection between the two, or what kind of connection there is. In this case, you can choose a loose or tight mode, or technical or authority coupling according to the needs of specific matters, that is, one is centered on tasks and technology, and the other is centered on positions, management organizations and powers (Karl Weick, p.4-5, 1976).

Coupling has already distinguished the elements in the system in advance, waiting for disembedding to determine whether there is a connection between them, just like "its ability to highlight the identity and separateness of elements that are momentarily attached" (Karl Weick, p.4, 1976).

In other words, disembedding is used to determine the connection and then select the mode of organization of each element, while coupling is used to "elementize" the system and make it differentiated.

3.4.3 Subjectivity, the identity of labor and power.

“In man as a social being, therefore, all actions, however individual as expressions of preferences or rejections, constitutively affect the lives of other human beings and, hence, have ethical significance ” (Humberto R. Maturana and Francisco Varela, 1972) 。

Disembedding reflexivity is a special kind of labor, as a power to input into the disembedding reflexivity system.

This particularity is manifested in:

a. It must be based on a cybernetic system, and it loses its meaning and value if it is separated from the cybernetic process and system.

Unlike Khrushchev's limited reforms that tried to make the planned economy "flexible" with "free" measures, that is, to recognize and expand commodity relations within the economies of these countries (Louis P. Althusser, p.150, 2019), the significance of this cybernetic system is to maintain the control of state-owned enterprises over the industry in the context of commodity economy, so as to achieve a state of balance similar to "mixed economy". This is similar to the "market power and regulation" described by Jean Tirole in "The Theory of Industrial Organization" (Jean Tirole, 1997). Therefore, this background and use determine

that the boundaries of disembedding reflexivity and this cybernetic system are often state-owned enterprises and state-owned assets, rather than the whole society.

b. Workers must be human.

“Hans Moravec proposed that human identity is essentially an informational pattern rather than an embodied enaction” (N. Katherine Hayles, 1999) .

This kind of labor also defines "people". It is not like liberal humanism, especially Hobbes, who believes that people are defined by some kind of ownership (C. B. Macpherson, 2018), but similar to the Soviet nationalism, which uses the law as a criterion to frame boundaries, that is, the law, especially the constitution, is used to stipulate the qualifications for exercising disembedding reflexivity (nationality, internal and external, NPC representatives, etc.), and the weight of input is evaluated in a democratic way. At the same time, this "input right" or "discourse right" will also become part of human rights, just as the survival of a person determines whether the identity of a "natural person" survives.

Therefore, workers cannot be replaced by machines. On the contrary, machines replacing people's labor in disembedding reflexivity is a very obvious "cheating", such as using AI to control public opinion for cognitive warfare (Dai Xu, 2017). And the results of this labor will not change with the level of labor productivity. Even from the perspective of "obligation", disembedding reflexivity does not have the traditional sense of labor productivity and investment-return rate.

c. Not for the purpose of profit or production of material resources.

Interestingly, the closest thing to disembedding reflexivity that this thesis can think of is ordering food in a restaurant.

Before the emergence of big data, ordering food was not usually considered a kind of labor that customers did to restaurants, even though restaurant operators could use the frequency of customers ordering a certain dish to obtain feedback. When big data and big data platforms appeared, this kind of customer input on the menu could be clearly quantified and summarized and analyzed using mathematical models.

Of course, customers can say that ordering food is exploited by operators through big data platforms, because customers cannot obtain the labor value they personally create, and if market researchers can form a labor-capital relationship with restaurants, then customers can too, because both are essentially obtaining market information for operators.

So, in disembedding reflexivity, is this a kind of labor? Is it an obligation? Is it a power?

First of all, this thesis believes that this is indeed a kind of labor, because inputting into disembedding reflexivity is the beginning of the operation of the disembedding reflexivity system, and disembedding reflexivity is an indispensable part of the cybernetic system, which has unique significance in terms of correction and epistemology.

However, for the statistical significance of input and output data, each input should be bound to an identity, even if anonymity is allowed. And because this cybernetics is designed for the organizational structure, economic calculation and process management of state-owned enterprises and state-owned assets, and is related to the normal operation of society, in order to maintain national security and social stability, disembedding reflexivity should be regarded as being bound to an identity, and naturally it will become an obligation to achieve the unity of power and obligation.

There is no doubt that the power of input can be considered as a kind of discourse power. And compared with the indirect form of public opinion influence and the ultra-long-term indirect form of electoral politics, disembedding reflexivity directly acts on the cybernetic system itself. If this cannot be regarded as a kind of power, then the supervisory board in the traditional corporate model is naturally meaningless.

d. Promote human progress while defending human subjectivity.

Similar to the reason for identity issues, disembedding reflexivity is always and can only be said to defend human subjectivity. Even from the perspective of "embeddedness" (Karl Polanyi, 2007), disembedding reflexivity is based on the simulation of "disembedding", and the main content of "embeddedness" politics, law, and social relations can be regarded as ideology and part of the state apparatus (Louis P. Althusser, 2019), so disembedding reflexivity always has a strong connection with society, which means that human subjectivity is considered to be a decisive premise in disembedding reflexivity.

Similarly, the question of "who can think" (N. Katherine Hayles, 1999) can essentially be deconstructed and extended to the above explanation of identity and labor.

And if the question comes to the representativeness of this identity construction for individuals, such as "cybernetic circuit that splices your will, desire, and perception into a distributed cognitive system in which represented bodies are joined with enacted bodies through mutating and flexible machine interfaces" (N. Katherine Hayles, 1999). An opposite

conclusion may be drawn: this representation is not a replacement of human identity by machine, because machines cannot be responsible for the state apparatus, but a replacement of language by machine, that is, a replacement of artificial voice. If people can tolerate mail-in ballots and electronic vote counting, then people may have enough reason to accept "flashing screens" (N. Katherine Hayles, 1999).

4. Methodology

Space-time frame is the synonym of the concept of "Chronotope" mentioned by Soviet literary researcher Михаил Михайлович Бахтин (Mikhail Mikhailovich Bakhtin) in the thesis "Forms of Time and of the Chronotope in the Novel", defined as a presupposed, tacit, often invisible, and generic narrative frame, function as a key "architecture" is the chronotope, or time-space frame of narratives (Michael M. Bakhtin, 1981). Space-time frame can be used to analyze the configuration of narrative temporality and the role of the timeline in literature, especially novels. It is an important research method and was later expanded to the research field of social sciences. In the field of social sciences, Michael M. Bakhtin believes in the close integration of time and space as the basis of narrative social intelligibility (Michael M. Bakhtin, 1981), so in space-time frame, space and time can be considered as interdependent social constructions (Michael M. Bakhtin, 1981).

The subjects mentioned in this thesis, including cybernetics, the political and socio-economic influences of cybernetics on local transformations in the reforms of New China, reflexivity and "Posthuman", involve cybernetics, control theory, demography, sociology, economics and political science. In demonstrating the existence of political and socio-economic influences of cybernetics at the local level in China, the family planning policy with population control theories and the game theory as an explanation model for local government debt risk in China were mainly used. For the disembedding reflexivity, this thesis selected territories: Kailu County, Tongliao City, Inner Mongolia Autonomous Region, China; Nanchang City, Jiangxi Province and Yushan County, Shangrao City, while in the proposal of cybernetic system for local state-owned enterprises is oriented multiple industrial cities in Shandong Province, Jiangsu Province, Shaanxi Province and Gansu Province in China.

On the one hand, according to Feng Guorui's suggestion in "System Theory, Information Theory, Cybernetics and Marxist Epistemology" that the practical and functional application of cybernetics will only be in the form of an interdisciplinary science & subject (Feng Guorui, P. 2-6, 1991) and the classification method presented by N. Katherine Hayles in "How we became posthuman", cybernetics has gone through first-order cybernetics, second-order cybernetics and posthuman (N. Katherine Hayles, 1999). The main focus of second-order cybernetics itself is social sciences, especially the field of cognition.

It is obvious that the family planning policy, which regulates the population through closed-loop control methods such as controlling the birth rate and women's fertility patterns through policies and legislation, can be definitely regard as an application of cybernetics in

demography. Therefore, it is persuasive to choose the family planning policy as an object to demonstrate the political and socio-economic influences of cybernetics in the local of China. In 1994, according to the "Decision of the State Council on Implementing the Tax-Sharing Fiscal Management System" (State Council of the People's Republic of China, 1994), China began to implement the tax-sharing reform. The tax-sharing reform will give Chinese local governments' expanded freedom in fiscal authorities and encourage local governments to adopt various models of self-financing. This model need to more deeply dependent on private and commercial financial institutions, in that case also will inevitably bring more risks than the centrally controlled fiscal system. Thus, the local governments in China had designed a variety of models to predict and control potential risks. For example, the "Game Theory Model Explanation of the Causes of Local Government Debt Risk" (Gao Xudong, Liu Yong, 2013) mentioned in the "Research on China's Local Government Financing Platform" starts with "The tragedy of the commons" (Garrett Hardin, 1968), and combines a series of related studies on the state-owned banking system (Chen Shiyuan, 2001) and state-owned enterprises (Li Hongkun) to construct a game theory model, designing a "white box" for policy banks and a "black box" for commercial banks to quantify the risks of local government debt. Although it is not directly named after cybernetics, the design of its risk model based on game theory also shows obvious cybernetics ideas. Naturally, it has the necessity and considerable representativeness to become an example of cybernetics in the economic field at the level of local development in China.

On the other hand, the spring ploughing incident in Kailu County, Inner Mongolia Autonomous Region, China in April 2024, the "Ti Deng Ding Sun" incident in Yushan County, Shangrao City, Jiangxi Province in March 2024, and the "6 • 1 Jiangxi Vocational College Food Safety Incident" ("Shu Tou Ya Bo") in Nanchang City, Jiangxi Province in June 2024 are all classic public opinion hotspots in which the whole society participated widely and forced the governance's correct through public opinion fermentation. Regarding "anti-expertism", the Chinese Internet hot word "suggest experts not to suggest" in May 2022 was firstly selected. It conforms to the requirements of disembedding reflexivity on the dialectical relationship between power and obligations, breaking the urban-rural duality and possible "anti-expertism".

In the last, "Posthuman" in "How We Became Posthuman Virtual Bodies in Cybernetics, Literature, and Informatics" is considered an important symbol of the third stage of the development of cybernetics. This thesis recognizes N. Katherine Hayles' classification method of cybernetics: cybernetics, second-order cybernetics, and Posthuman (N. Katherine Hayles,

1999). And N. Katherine Hayles is the first researcher to propose the concept of "Posthuman" in orient into summary. So, selecting "How We Became Posthuman Virtual Bodies in Cybernetics, Literature, and Informatics" as the object to discuss whether "Posthuman" will appear in China, in the premise based on China's national conditions, and if so, how it will appear is undoubtedly the most necessary and preferred choice. Proposing a "Chinese solution" in a targeted manner will also have the best directionality and pertinence.

This thesis adopts the research method of Qualitative analysis almost entirely, and can only follow the deductive approach. It is mainly subject to the following factors:

- a. Disembedding reflexivity and the cybernetic system designed for local state-owned enterprises in China, involving organizational structure, economic calculation and process management, and with disembedding reflexivity are all hypotheses, and there are no practical examples.
- b. The particularity of the research object and research boundary: The research and suggestion objects of the cybernetic model involving organizational structure, economic calculation and process management, and with disembedding reflexivity are state-owned enterprises, and the main boundary is state-owned enterprise reform. The direct driving force of China's state-owned enterprise reform is the policy based on the top-down model. The lack of data directly related to the driving force of state-owned enterprise reform and reliable analysis-prediction models makes it difficult to perform quantitative analysis.
- c. Unfortunately, except for the first fully automated unmanned terminal Yangshan Port built in 2017, China has no more relevant data and examples that fit cybernetics and state-owned enterprises. However, as a company founded in 2021 and promoting driverless technology, Luobokuaipao is exploring the construction of an AI business platform and improving the self-learning model of driverless driving. It has also triggered discussions related to "Posthuman" (N. Katherine Hayles, 1999) such as "Who is responsible for driverless traffic accidents?" However, because it is not a local state-owned enterprise and its business model has not been perfected and its prospects are not clear, it is not within the research scope of this thesis.

Although the research methods and approaches are greatly restricted, the advantage is that the deductive approach based on official documents, public historical events, and a large number of original works makes the reliability of Qualitative Analysis in this thesis not low, although there is totally no scarce of assumptions.

This thesis collected and referenced original documents such as “Cybernetics or Communication and Control in the Animal and the Machine”, “The Human Use of Human Beings The Human Use of Human Beings”, “Engineering Cybernetics”, “Population Control theories”, “Discussion of Probability Model of Women's Fertility Pattern”, “Autopoiesis and Cognition The Realisation of the Living”, “Systems Theory, Information Theory, Cybernetics and Marxist Epistemology”, “the Great Transformation”, “Mixed Fortunes: An Economic History of China, Russia, and the West”, “Research on Chinese Local Government Financing Platforms”, “How We Became Posthuman Virtual Bodies in Cybernetics”, Literature, and Informatics, and other data and materials from the Chinese government and related institutions. It took nearly four months in total. The main methods were borrowing from electronic libraries and searching on official websites. Unfortunately, only Chinese versions of "Research on Chinese Local Government Financing Platforms", "System Theory, Information Theory, Cybernetics and Marxist Epistemology", "Population Control Theories", "Discussion on Probabilistic Model of Women's Fertility Patterns" and "the Great Transformation" were found, and some of the content may not correspond perfectly to the English version.

It is worth noting that the data on officials' professions and resumes are collected based on the public data published on the government portals, official media and public institution websites of various provinces in China. Because the official information itself is confidential to a certain extent, it cannot be guaranteed to be representative of confidential units and other such information.

5. Delimitations, Limitations, Assumptions

Controllable factors/elements:

Through the deductive approach with existing theories such as cybernetics, second-order cybernetics, Autopoiesis system, Marxism-Leninism, etc.

Out of control factors/elements:

- a. The relationship between cybernetics and control theory, and the different standards in classification.
- b. The uncertainty of AI as a "new quality productive forces" to supplement cybernetics. It lies in: Transformation of scientific and technological achievements: Can it be effectively combined with material production? Potential risks and obstacles in ethics and law c. For example, Chatgpt and bionic people.

The threat of cybernetics to liberal humanism(N. Katherine Hayles, 1999).

- d. China's state-owned enterprise reform based on policy as a direct driving force.

Assumptions:

- a. Cybernetics is divided into "narrow cybernetics" and "general cybernetics" according to the application field.
- b. "Embedded" (Karl Polanyi, 2007) can be brought into reflexivity.

6. Presentation of the research content or of the case study

6.1 The practice of applying cybernetics at the local level in China

6.1.1 Cybernetics for population policy

In May 1978, the 7th World Congress of the International Federation of Automatic Control (IFAC) was held in Helsinki. Song Jian, Chen Hanfu, Yang Jiachi and other Chinese experts went there. The application of control theory in population policy by Dutch mathematician Huibert Kwakernaak attracted Song Jian's attention. After returning to China, Song Jian began to apply the concept of system engineering to study the "feedback mechanism of the population system" and established a mathematical model of the population system that integrates natural resources, social economy, living standards and ecological balance based on the national database. According to the calculation of the model, if the optimal overall birth rate of 1.7 can be achieved in 2000 (that is, an average of 1.7 children per family, which Song Jian believes is the only controllable parameter), then the total population of the country will likely reach the optimal number of 700 million in 2100 (Song Jian, 1989). This conclusion directly affected the implementation of the one-child policy in 1980.

"Population Control Theory", published in 1989, can be regarded as a preliminary summary of the application of control theory in the field of demography in China. In "Population Control Theory", Song Jian called this discipline that uses mathematical tools and quantitative description methods to study population problems "quantitative demography". This thesis adopts control theory as the main method to construct the population system.

According to the input-processing-output-feedback procedure of control theory, Song Jian used a classic Laplace transform process in "Population Control Theory" to interpret the basic operation of the population system:

Let $\varphi(t)$ be the infant birth rate whose change determines the population state $p(a, t)$. In population control with family planning as the main control quantity, $\varphi(t)$ can be used as the input of the system. Then, the total population can be expressed as:

$$N(t) = \int_0^{\infty} p(a, t) da$$

Input:

The data for the Song Jian-Yu Jingyuan population model comes from the national population census conducted approximately every 10 years, as well as the compilation of population archive data from various dynasties in China.

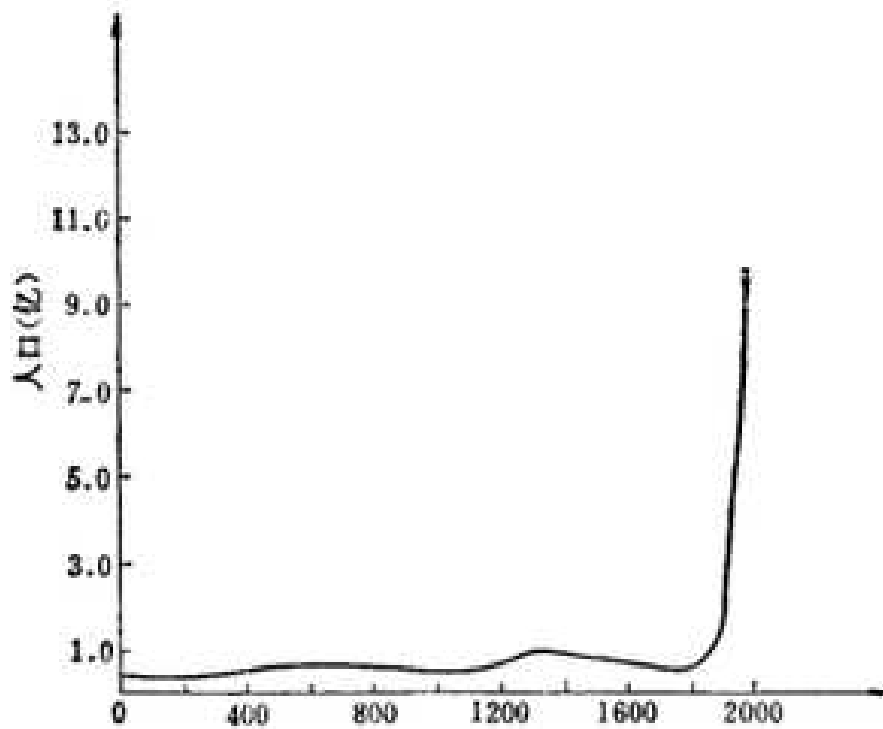
Figure 6: Changes in China's population in the past 2000 years.

表 1.3-1 二千年来中国人口数量变化情况

时代或年代	人口数量
西汉(纪元前 200 年)	最多达到 6000 万
东汉(纪元 156 年)	5000 万
三国(220—280 年)	1600 万
隋朝(606 年)	4600 万
唐朝(742 年)	4800 万
宋朝(1110 年)	4670 万
明朝(1303 年)	6050 万
清朝(1661 年)	2100 万
清朝(1757 年)	1.9 亿
清朝(1901 年)	4.26 亿
民国(1928 年)	4.74 亿
中华人民共和国 1949 年	5.48 亿
1953 年(普查)	6.02 亿
1955 年	6.15 亿
1960 年	6.62 亿
1965 年(普查)	7.25 亿
1970 年	8.25 亿
1975 年	9.20 亿
1980 年	9.83 亿
1982 年(普查)	10.32 亿

Source: Song, J., Yu, J. (1985), Population Control Theory, Beijing: Science Press, p.15.

Figure 7: Trends in China's population changes since the first year of the Christian era.



Source: Song, J., Yu, J. (1985), Population Control Theory, Beijing: Science Press, p.15.

Population growth is a complex system with a long span and large capacity. Therefore, preparing data before the founding of New China and even in ancient times is to meet the requirements of system dynamics, enrich and improve the initial data and initial state of the system, and thus make the model of population control more perfect.

Processing:

Quantitative demography uses mathematical models to predict and control population growth. Three models are mainly introduced in "Population Control Theory":

Continuous model

Use partial differential equations to describe the continuous changes in population status, including formulas such as average life expectancy, intergenerational interval between women, and reproduction rate, and then use optimal control theory to calculate the optimal fertility rate. Compared with discrete models and random models, this model is more suitable for theoretical research rather than practical population statistics because it relies heavily on quantitative mathematical tools.

The population function $N(a, t)$ can be set as the total number of people younger than a at a certain time t , where a represents age and t represents time, and both change continuously. From the practical significance of demography, $N(a, t)$ has $N(a, t) \geq 0$ and $N(0, t) = 0$ for any a and t . If a_m is set as the maximum age of the local population, then $N(a_m, t)$ is the total population at the local time t . Then the first-order partial derivative of $N(a, t)$ is:

$$N'_a(a, t) = \frac{\partial N(a, t)}{\partial a}$$

$$N'_t(a, t) = \frac{\partial N(a, t)}{\partial t}$$

It can be obtained that this function is the population age distribution function. Let this function be $P(a, t)$, then $p(a, t) \geq 0$, $p(a_m, t) = 0$.

$$N(a, t) = \int_0^a p(\xi, t) d\xi$$

$$N(a_m, t) = \int_0^{a_m} p(\xi, t) d\xi = \int_0^{\infty} p(\xi, t) d\xi$$

Suppose the ages are a_1, a_2 , and $a_1 > a_2$, then the total number of people aged between a_1 and a_2 at time t is:

$$N(a_2, t) - N(a_1, t) = \int_{a_1}^{a_2} p(\xi, t) d\xi$$

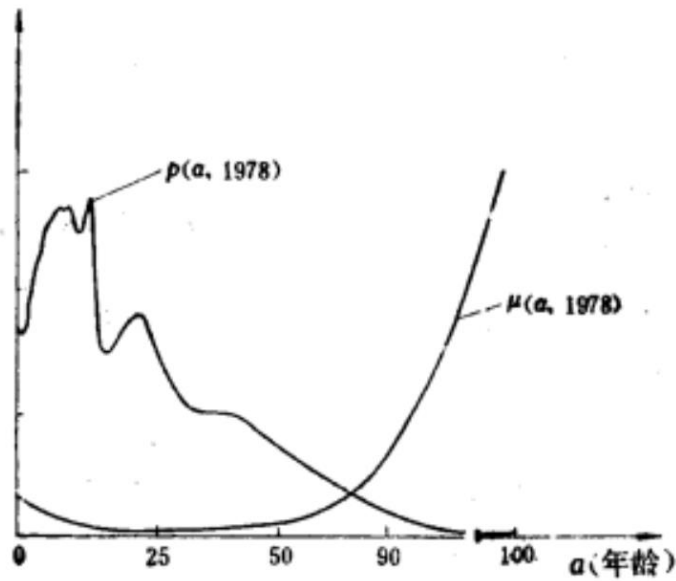
Similarly, if the age interval Δa , $\Delta a > 0$, then the number of deaths within time t is $M(a, \Delta a, t)$, the population is $p(a, t)\Delta a$, and the relative death function can be deduced as:

$$\mu(a, t) = \lim_{\Delta a \rightarrow 0} \frac{M(a, \Delta a, t)}{p(a, t)\Delta a}$$

Then the number of deaths $M(a, \Delta a, t)$ of people aged in the interval $[a, a + \Delta a]$ from t to $t + \Delta t$ is:

$$M(a, \Delta a, t) = \mu(a, t)p(a, t)\Delta a\Delta t$$

Figure 8: the population age distribution function $p(a, 1978)$ and mortality function $\mu(a, 1978)$ calculated based on the 1978 population data.



Source: Song, J., Yu, J. (1985), Population Control Theory, Beijing: Science Press, p.45.

Under this approach, there is also a population development equation:

$$\frac{\partial p(a, t)}{\partial a} + \frac{\partial p(a, t)}{\partial t} = -\mu(a, t)p(a, t)$$

Finally, we have the continuous model:

$$P(a, t) = \begin{cases} p_0(a - t)e^{-\int_{a-t}^a \mu(\xi)d\xi}, & a \leq t \\ \varphi(t - a)e^{-\int_0^a \mu(\xi)d\xi}, & a > t \end{cases}$$

But it is worth noting that this equation is established without considering population migration, based on the boundary condition of $p(0, t) = \varphi(t) = u(t)N(t)$, where $\varphi(t)$ is the net population growth, $u(t)$ is the net population growth rate, and $\mu(t)$ is the relative mortality rate. This equation is valid under the relatively strict household registration system and population mobility management system in China at that time, and has a strong factor of the times. In other words, this equation is based on complete control variables.

Of course, the "Population Control Theory" also mentions the immigration model and provides two ideas on the impact of immigration on population: if there is a relatively loose immigration policy, immigrants can be regarded as random variables, and local statistical data are used as input. If the immigration policy is relatively strict, the purpose of population

control can be achieved through planned or limited immigration or emigration, such as the population migration to the capital or border areas in ancient China-87 and the Soviet Union's special immigration policy from 1930 to 1950-86.

$$\frac{\partial p(a, t)}{\partial a} + \frac{\partial p(a, t)}{\partial t} = -\mu(a, t)p(a, t) + g(a, t)$$

For non-steady-state immigration, Lotka-Volterra equations were added to Population Control Theory, and the following conclusions were drawn:

$$\begin{aligned} \varphi(t) = & \int_0^t \varphi(t-a)m(a, t)e^{-\int_0^a \mu(\xi, \xi+t-a)d\xi} da \\ & + \int_t^\infty P_0(a-t)e^{-\int_{a-t}^a \mu(\xi, \xi+t-a)d\xi} da \end{aligned}$$

Among them, $g(a, t)$ is the immigration rate. It is regarded as a black box under a more relaxed immigration policy, and as a white box under a more stringent immigration policy.

Similarly, the fertility rate of women under closed-loop control under the family planning policy can also be regarded as a white box:

$$\varphi(t) = \beta(t) \int_{a_1}^{a_2} k(a, t)h(a, t)p(a, t)da$$

$\beta(t)$ is the average fertility rate of women, $k(a, t)$ is the female proportion function, $h(a, t)$ is the fertility pattern of women, and $[a_1, a_2]$ is the reproductive age range of women. Regarding the reproductive age of women, the World Health Organization (WHO) gives an interval of 15-49 years, while according to the Marriage Law of the People's Republic of China, the lower limit of the legally protected right to reproduce is 20 years old.

Annual discrete model

The annual discrete model uses the annual population status change as a sample, and uses differential equations and algebraic recursion equations to describe the change pattern, including discretization and renormalization of the data, but a considerable part of the basic formulas that substitute the discretized data are still continuous models. The most basic example of discretization mentioned in "Population Control Theory" is to use $x_i(t)$ to represent the total number of people who are i years old but less than $i+1$ years old in year i , and i must be an integer, and m represents the highest age of the population.

$$x_i(t) = \int_i^{i+1} p(a, t) da, i = 0, 1, 2 \dots m$$

If $x_i(t)$ is expressed in vector form, then $x_i(t) = \{x_i(t) = \{x_0(t), x_1(t), \dots, x_m(t)\}$, where each component represents the age structure of the population.

Compared with the continuous model, the discrete model is more suitable for calculating infant birth rate and mortality rate. Assume that the net infant birth rate is $\emptyset(t)$, $k_i(t)x_i$ is the total number of women aged i in year t , the average fertility rate of women is still $\beta(t)$, and $h(a, t)$ is still the fertility pattern of women, then in the t year:

$$\emptyset(t) = \beta(t) \sum_{i=a_1}^{a_2} k_i(t) h_i(t) x_i(t)$$

$h_i(t)$ must meet the normalization conditions:

$$\sum_{i=a_1}^{a_2} h_i(t) = 1$$

The infant mortality rate is $x_0(t)$, which is the number of infants who have not died before year t . Therefore, $\emptyset(t) - x_0(t)$ is the number of infants who died from year $t-1$ to year t . The infant mortality rate is $\omega(t)$:

$$\omega(t) = \frac{\emptyset(t) - x_0(t)}{\emptyset(t)}$$

$x_0(t)$ 为:

$$x_0(t) = (1 - \omega(t))\emptyset(t)$$

If we victories it, we can set $b_i(t) = (1 - \omega(t))(1 - \omega(t))k_i(t)h_i(t)$, $i = a_1, a_1 + 1, \dots, a_2$,

Reintroducing vector and matrix notation:

$$\mathbf{x}(t) = \begin{pmatrix} x_1(t) \\ \vdots \\ x_m(t) \end{pmatrix}, \quad \mathbf{g}(t) = \begin{pmatrix} g_0(t) \\ \vdots \\ g_{m-1}(t) \end{pmatrix},$$

$$H(t) = \begin{pmatrix} 0 & 0 & \cdots & 0 & \vdots \\ 1 - \mu_1(t) & 0 & & & \vdots \\ & 1 - \mu_2(t) & & & \vdots \\ & & \ddots & & \vdots \\ 0 & & & 1 - \mu_{m-1}(t) & 0 \end{pmatrix},$$

$$B(t) = \begin{pmatrix} 0 & \cdots & 0 & b_{a_1}(t) \cdots b_{a_1}(t) & 0 & \cdots & 0 \\ & & & 0 & & & \end{pmatrix},$$

Taken together, we can obtain a complete discrete population development equation set in vector form:

$$\mathbf{x}(t + 1) = H(t)\mathbf{x}(t) + \beta(t)B(t)\mathbf{x}(t) + \mathbf{g}(t)$$

In fact, this is a discrete bilinear system, known as the Song Jian-Yu Jingyuan Model. The average fertility rate of women $\beta(t)$ can be controlled by policies and legislation, which is an important factor in how the family planning policy affects the population. Among them, the matrix $H(t)$ is called the population state transition matrix from t to $t+1$, $B(t)$ is called the fertility matrix, and $\mathbf{g}(t)$ is called the population migration vector.

The final equation for the discrete model is then:

$$x_i(t + 1) = \beta(t) \sum_{i=a_1}^{a_2} b_i(t)(1 - \omega_1) \cdots (1 - \omega_{i-1})x_1(t - i + 1)$$

Probabilistic model

Leslie model. The birth and death of a person are regarded as random events that change over time, and the different age groups are linked by differential equations or difference equations.

After the model is built, the next step is to determine the boundaries of the variables.

According to the method in "Population Control Theory", quantitative demography divides the many variables that affect the population into two categories: control variables and controlled variables. Those that cannot be directly controlled, such as age changes and normal mortality rates, are called controlled variables, which are regarded as random events in probability models and are regarded as black boxes; those that can be directly controlled by

policies and legislation, such as the distribution of women's childbearing age, contraception, and abortion are called controlled variables and are regarded as white boxes.

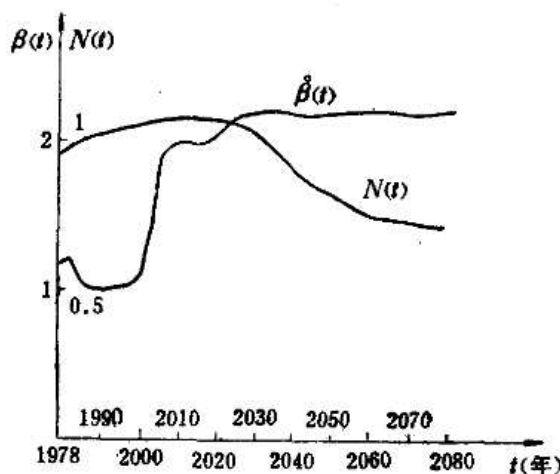
Then, short-term and long-term forecasts can be made according to needs. "Population Control Theory" believes that short-term forecasts can use the parameters of the current year as the standard to predict the next few years, mainly for comparing and correcting actual statistical data, so as to find out the shortcomings and potential risks of recent population control work. Long-term forecasts require the assumption of independent variables, such as mortality rates and women's fertility levels, and use the above-mentioned model for forecasting.

Output:

The output of the Song Jian-Yu Jingyuan population model presents the optimal solution of fertility rate, dependency index and aging index. It can be the control amount of women's fertility pattern (such as family planning policy) or the prediction of the year.

Figure 9: The optimal control of China's future population is not more than 1.2 billion, the dependency index is not more than 1.0, and the aging index is not more than 0.7.

年 代	1978	2000	2020	2040	2060	2080
最优妇女生育率 $\hat{\beta}(t)$	1.22	1.09	1.98	2.16	2.16	2.16
人口总数 $N(t)$ (亿)	9.850	10.56	10.46	9.139	7.644	7.388



Source: Song, J., Yu, J. (1985), Population Control Theory, Beijing: Science Press, p.304.

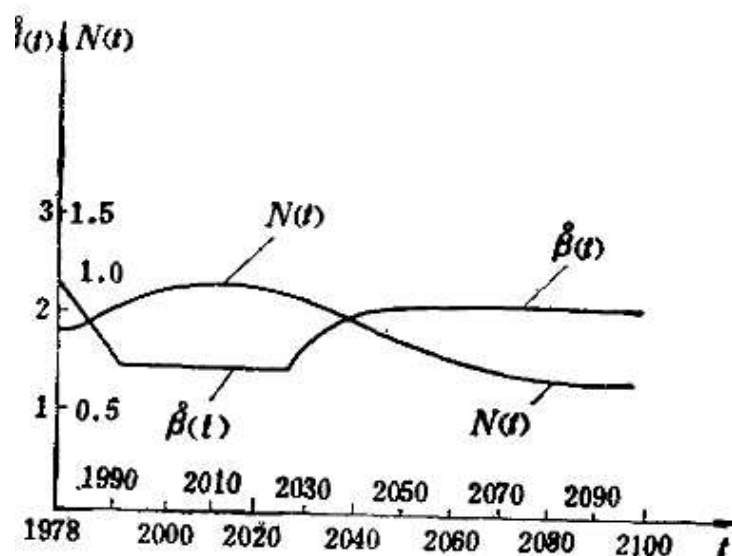
Song Jian pointed that, at the end of the 20th century and the beginning of the 21st century, China's most optimal total population is supposed to reach 1.2 billion, with a dependency

index of 1.0 (each working population has to support no more than one elderly and minor on average), and a life expectancy of 70 years. According to the model, the average fertility rate of women must not be less than 2.16, and the demographic turning point will occur around 2020-2030.

Feedback

Feedback is designed for making population forecasts, correcting the family planning policy, formulating future population control plans and conducting population structure research. In fact, the model has a significant effect. In 2000, China's total population was 1.267 billion (the State Council, 2000), and the aging index was 0.7, which is close to the prediction of Song Jian and Yu Jingyuan. And the net population growth rate fell below 0 in 2021-2022 (National Bureau of Statistics, 2021, 2022), reaching a negative growth stage. It is also basically consistent with the prediction of a population "turning point" that will emerge in 2010-2020.

Figure 10: The future trend of China's population under the optimal planning when the average fertility rate is mix 1.5.



Source: Song, J., Yu, J. (1985), Population Control Theory, Beijing: Science Press, p.306.

Figure 11: The future trend of China's population under the optimal planning when the average fertility rate is mix 1.7.

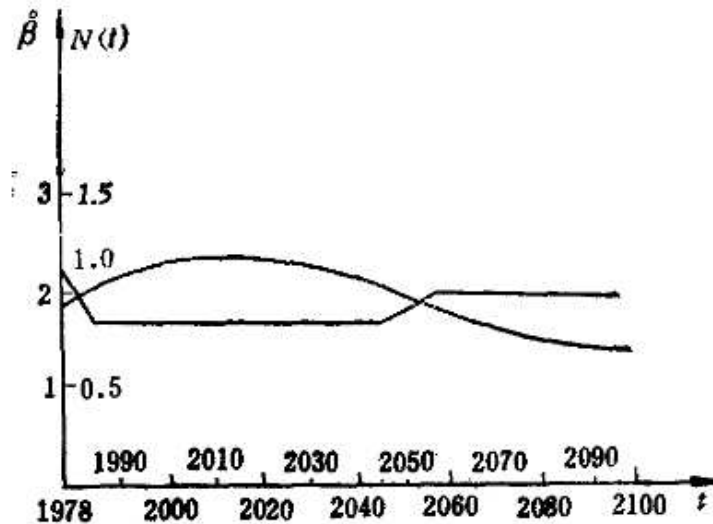


图 8.8-4 妇女平均生育率下限为 1.7 时中国未来人口变化

Source: Song, J., Yu, J. (1985), Population Control Theory, Beijing: Science Press, p.307.

6.1.2 Game theory model of the causes of local government debt risk

This model (Gao Xudong, Liu Yong, 2013) is essentially a sequential game model with multiple participants, also known as the "tragedy of the commons" (Hardin, 1968) model. The economic meaning of this model is that "commons" is considered to have the characteristics of non-exclusive and competitive quasi-public goods. This is a contradiction: every user can use this "commons", but every user's use will have an impact on the use of the next person, such as reducing the total amount or supply of "commons". "Research on China's Local Government Financing Platform" believes that the local government financing market is a "commons" and banks are users.

There are three basic assumptions about this model:

- a. Local governments generally have the impulse to incur debt.
- b. Banks pursue maximum economic benefits.
- c. The scale of loans is not controlled by the superior regulatory authorities.
- d. In the short term, banks can only increase loans rather than recover them.

The model consists of three functions: bank utility function, saturated market size function and optimal solution function for credit scale:

Bank utility function:

$$U = [\alpha\pi - \beta R(m, f, s, \mu) + \gamma W] \times m$$

Set π as the bank's loan interest rate, $R(m, f, s, \mu)$ is the loan risk, which is positively correlated with the loan volume m in the credit market, negatively correlated with fiscal revenue f , negatively correlated with system construction s , and correlated with socio-economics and political crisis μ . W is the social benefit return rate of the loan. And $\alpha + \beta + \gamma = 1$.

Saturated market size function:

$$m_B = \frac{(\alpha_B \pi + \gamma_B W)}{2\beta_B \mu_B} = mop_T$$

Optimal financing scale function:

$$m_A = \frac{(\alpha_A \pi + \gamma_A W)}{2\beta \mu} = mop_T$$

The model provides a strong mathematical support for predicting and verifying the impulse of local governments to over-indebtedness. It also predicted the collapse of Evergrande Real Estate on August 24, 2020 and the risk of overdue debts of urban investment companies to a certain extent.

And it also provides suggestions for risk prevention and control for the asset restructuring and reform of local urban investment companies in China. It can be reflected in the literature such as "Research on Risk Prevention and Control of Credit Bond Guarantee of Guarantee Institutions under the Background of Urban Investment Transformation" (Yang Bei, 2024), "Current Status, Problems and Countermeasures of Urban Investment Company Transformation and Asset Integration--Taking P Urban Investment Company as an Example" (Huang Duqin, 2024), "Supply-side Reform Promotes the Transformation and Development of Urban Investment Companies" (Zhou Xinhuan, 2016).

6.2 Case study: Internet public opinion that breaks the urban-rural dual structure, "anti-expertism" and reflexivity

First of all, it should be noted that this case study is based on an assumption:

The internal and external supervision of state-owned enterprises is analogous to the "urban-rural dual structure" (Jiang Zemin, 2002), and is regarded as a relatively closed system. In this

sense, the situation of local governments and state-owned enterprises is similar, and the influence of public opinion, especially the public opinion that breaks the urban-rural dual structure, is more typical for local governments, and there are more examples. Therefore, "Kailu County Spring Farming Time", "Yushan's 'Lantern Damage Assessment' Incident" and "Jiangxi's 'Rat Head Duck Neck' Incident" were selected as examples.

"Kailu County Spring Farming Incident" in April 2024 and "Jiangxi 'Shu Tou Ya Bo'" in June 2024 are cases where public opinion "question" (Because the question is a special political right, it is generally exercised by deputies to the National People's Congress) the administrative decisions of local governments, and the public opinion that affects the central government is forced to correct the governance of local governments, while "Yushan Ti Deng Ding Sun" in April 2024 is an example of inaction reported by public opinion.

The "Kailu County Spring Ploughing Incident" is a hot public opinion incident in which the Jianhua Town Government of Kailu County, Tongliao City, Inner Mongolia Autonomous Region, China, forcibly stopped the villagers from ploughing in the spring on the grounds that it failed to "increase the contract fee". In this incident, the villagers sought help from the official media "San Nong Fa Bu", other various news media, social platforms and online short video platforms through the public opinion platform, which attracted widespread public attention. In the end, the Kailu County Government issued a situation report, stopped the forced stop of spring ploughing, and gave the government official involved in the incident, Ji Yunhao, deputy secretary of the Jianhua Town Party Committee, dismissal and party warning.

The "Shu Tou Ya Bo" is a food safety incident that occurred at Jiangxi Vocational College of Technology. A student broke the news that a rat's head appeared in the canteen meals. After the report, the staff of the local market supervision bureau believed that the "rat's head" reported by the student was a "duck's neck", which can be cooked into a snack. However, this handling result caused widespread dissatisfaction with public opinion and quickly fermented on social platforms, leading to the State Council and the Jiangxi Provincial Government interviewing the Nanchang Municipal Government and the local market supervision bureau, and finally causing the local market supervision bureau to overturn the original conclusion and change it to "rat's head".

"Ti Deng Ding Sun" is a case of public opinion "questioning" the inaction of the local government. The incident occurred in Yushan County, Shangrao City, Jiangxi Province. A tenant was subjected to a harsh inspection by the landlord when checking out. The landlord even used ultraviolet light for flaw detection and proposed a huge compensation. After the

tenant protested, the landlord threatened the tenant. It is worth mentioning that this building was built without permission. The tenant first sought help from the police, but the police decided to use negotiation and mediation to resolve the issue and reduce part of the compensation, but the tenant still could not accept it. After seeking help from public opinion, the county government was forced to intervene. In the end, the compensation was cancelled, the landlord was detained and fined, and the building was decided to be demolished.

From these three examples, we can see that China's current means of public opinion supervision have been highly pragmatic and highly integrated with the "top-down" system (public opinion influences higher-level governments and even the central government, and then the central government issues administrative orders to local governments), with a clear purpose positioning on public authorities, especially the government. Then, this form of combining "top-down" and positioning public power has an unignorable similarity with disembedding reflexivity, which means that it is naturally convenient to transform into external supervision in disembedding reflexivity.

It is worth noting that in the eyes of generals and military scientists, public opinion is also a potential battlefield. Dai Xu's "Seventh Generation Warfare "Network Psychological Warfare" Targets People's Hearts" (Dai Xu, 2017) points out that public opinion may be manipulated and become a weapon of "cognitive warfare", thereby influencing and manipulating public opinion to achieve the purpose of endangering national security. Therefore, from the perspective of national security, the current solution is mainly focused on two aspects: identity and firewall.

Identity refers to the public display of the identity information of Internet users who express public opinion, such as IP location and the real-name system for high-traffic users that has been implemented. However, this will also bring about information ethics, especially the violation of privacy rights. On the other hand, "marking" users and their speeches with IP location may also lead to regional discrimination.

Firewall is a previous solution, represented by Fang Binxing and the "China Internet Firewall".

In addition, there is a problem of public opinion and experts and technocrats.

Cybernetic systems need to be maintained and programmed by experts and technocrats. Trust in cybernetic systems will also lead to a trust problem in experts and technocrats, such as who is responsible for the wrong decisions of cybernetic systems? Is the decision of the cybernetic system a complete optimal solution or an expert system or an extension of the expert's will?

The issue of responsibility is naturally traced back according to the whole process management. If it is a problem of model design, it is attributed to the experts, and the maintenance problem is attributed to the technocrats, and the end task allocation is still based on the principle of democracy.

As for the will of the system and experts, it involves "anti-expertism".

A clearly example of "anti-expertism" is "suggesting experts not suggest" (Gong, 2022), which mentions that there are four reasons why public opinion is disgusted with expert advice:

a. The gold content of some expert advice is low, and most of them are "correct nonsense".

For example, in the morning, an expert said "drinking coffee is good for health", and in the afternoon, an expert claimed that "drinking coffee may cause osteoporosis" (Gong, 2022)

b. Some expert suggestions are not considered from the perspective of the masses.

For example, "low-income people are advised to rent out idle houses" (Gong, 2022)

c. Some expert suggestions may be based on purely commercial interests rather than science.

For example, health products that lack efficacy.

d. Affected by fragmented news, experts' suggestions are misinterpreted out of context.

For example, "experts suggest that buying a house is more cost-effective than renting a house" is a rumor (Gong, 2022).

Combining the above four points, it is not the public but the experts who should be more worried about potential "anti-expertism". In particular, the evaluation of the professionalism of experts and the scientific nature of their suggestions, as well as the rectification of media news ethics.

So, will "anti-expertism" turn into anti-intellectualism?

Obviously, No. Because based on the previous analysis of "anti-expertism", China's public opinion can be seen as being based on pragmatism or even utilitarianism. It is even possible that those led by public opinion to an anti-intellectual impression are right experts.

6.3 Countermeasures Study: Cybernetics system design in organizational structure, economic calculation and process management local state-owned enterprises.

6.3.1 Model overview.

Military is one of the earliest fields where cybernetics was applied, and the earliest results of cybernetics for military purposes were anti-aircraft guns and ground-based anti-aircraft firepower networks. Interesting thing is, Norbert Wiener's understanding of anti-aircraft firepower is very unique: Wiener set the enemy's aircraft as a probabilistic model that could effectively be countered with a cybernetic system (Norbert Wiener, 1948). Therefore, for the reform of state-owned enterprises, can it follow this path and regard the inefficiency and long-term losses of state-owned enterprises as a probabilistic model, and then use a cybernetic system to deal with it?

Background: On December 4, 1982, the Constitution of the People's Republic of China adopted at the Fifth Session of the Fifth National People's Congress clearly stipulated that "the State Council shall implement the Premier responsibility system, and the ministries and committees shall implement the minister and director responsibility system." This marks that China's administrative system has officially changed from the committee responsibility system to the head responsibility system. In addition, the "Regulations on Accountability of the Communist Party of China" officially promulgated on September 1, 2019 also stipulates that the party committee should fulfill the main responsibility of comprehensively and strictly governing the party, strengthen the leadership of accountability work in the region, department and unit, and investigate the main responsibility, supervision responsibility and leadership responsibility of party organizations and party leading cadres who have failed to perform their duties in party building and the party's cause. This principle also applies to local state-owned enterprises. Therefore, in this case, the leadership can be considered to bear the main responsibility and the greatest risk for safety accidents and business errors.

Rough modeling:

Of course, like the "organ pipe" model (Norbert Wiener, p.109, 1948), we can assume that there are also two situations for the occurrence of safety accidents and business errors. The first is completely linear, and is only affected linearly by the number of production and operation activities and management and training. Then there are two "white boxes":

- a. The more production and operation activities, the more safety accidents and operational errors.
- b. The more investment in management and training, the fewer safety accidents and operational errors.

In the situation 2, the occurrence of safety accidents and operating errors is considered to be completely random, that is, there is no linear relationship between the investment in management and training and the occurrence of safety accidents and operating errors, which becomes a "black box". The number of production and operation activities still conforms to the linear relationship of "the more production and operation activities, the more safety accidents and operating errors", and is still a "white box".

If explained through game theory, in order to save the most cost and energy, the second case should be chosen, and the occurrence of safety accidents and operating errors is considered to be random. Because if the occurrence of safety accidents and operating errors is linear, it will inevitably constitute a bilinear function, which will only lead to a decrease in the number of production and operation activities and a higher investment in management and training, which can almost be equated with losses.

If the second case is chosen, then only the variable of the number of production and operation activities needs to be controlled, and management and training do not need too much investment. Recourse to randomness can at least save costs.

Situation 1:

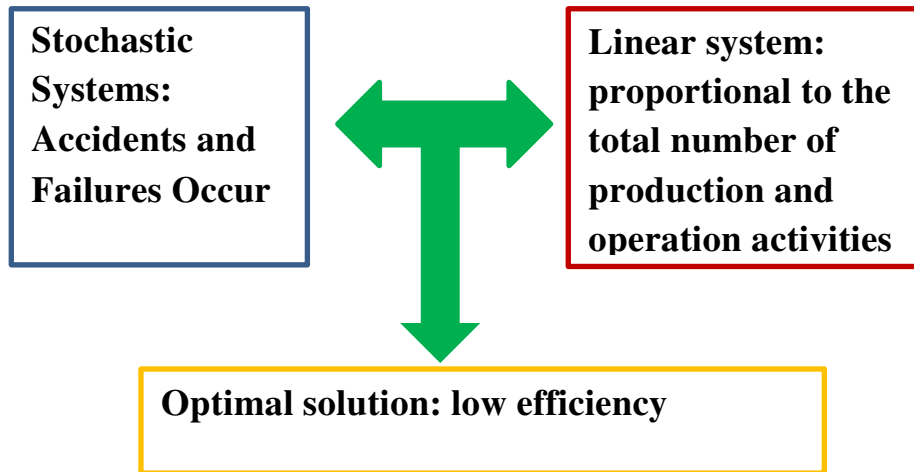
Set A be the number of safety accidents and operational errors, x be the function for controlling training and management, y be the function for controlling the number of production and operation activities, and n be the number of production and operation activities.

$$A = \{(x + y) \times n\}$$

Situation 2:

Under the control of the double random system, operators can only tend to the less random "safety accidents and business errors are proportional to production and operation activities" to obtain the optimal solution, that is, to forcibly treat it as a white box. It must be said that it has a certain color of game theory.

Figure 12: Low efficiency is the optimal solution.



Source: Self draw

In fact, both cases are very dangerous.

The first risk is over-investment and lazy governance. After all, even if management and training are considered to have a linear relationship with the occurrence of safety accidents and operational errors, after reaching a certain level (after all, continuous training cannot make all employees geniuses), the input-output ratio will inevitably decrease, and the linear relationship with reducing the number of production and operation activities will not be more obvious than that of reducing the number of production and operation activities. Then at least lazy governance will appear.

The second risk is "anti-system". Although the main control methods of the two are to start with adjusting the number of production and operation activities, attributing safety accidents and operational errors to random models will only be more inclined to risk transfer, which means that the form of transferring the subject of responsibility may be adopted, such as temporary workers under the subcontracting system.

Therefore, in order to deal with these risks and drawbacks, it is urgent to design a model with clear boundaries of rights and responsibilities, perfect process systems, and internal and external supervision to promote its internal vitality.

This thesis chooses a cybernetic system with disembedding reflexivity for the following reasons:

- a. The input-processing-output-feedback + reflexivity process of the cybernetic system is extremely consistent with the requirements of accounting and clear boundaries of rights and responsibilities.

- b. Cybernetics was first used in engineering and industry, starting from the functionalist narrative, which is suitable for the actual application of enterprise production and operation.
- c. Reflexivity, especially the disembedding reflexivity system, is more "institutionalized" than traditional administrative supervision and reporting, and it also helps to clarify the boundaries of rights and responsibilities.
- d. The cybernetic system not only does not require the addition of additional institutions and managers, but also can streamline institutions and save costs. If the country establishes a unified large system and big data system, it can also be more convenient to access and gain scale advantages.
- e. It helps to transform from "top-down" with "rule by man" to "top-down" with rationalism.

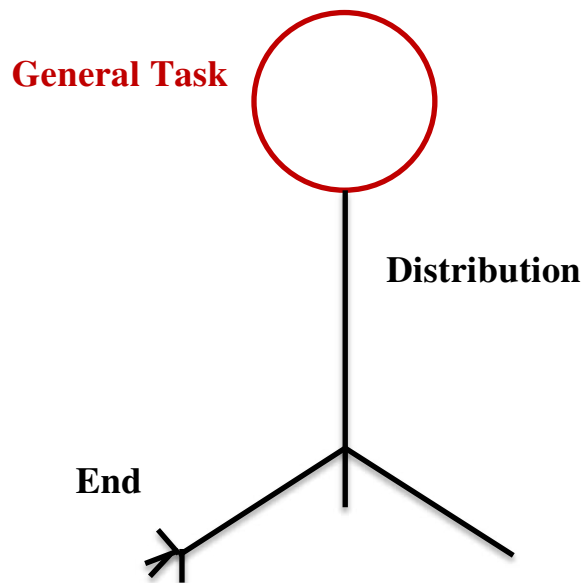
In actual operation, the output of the state-owned enterprises selected by the cybernetic system is fixed because of their nature: controlling specific industries or specific tasks (such as ensuring that state-owned assets do not suffer losses). Therefore, the top priority of the cybernetic system is input management and feedback management. Output management includes discourse management in the organizational structure and economic calculation, while feedback management is undertaken by disembedding reflexivity, which is responsible for the internal and external supervision of the whole process of people's democracy (Xi Jinping, 2021).

6.3.2 Organizational structure

The reform of the input end has two parts.

The first part is to better adapt to cybernetics. It is recommended to adopt a vertical management model with fewer levels, divided into a "flute-type" structure of distribution-end.

Figure 13: The "flute-type" of distribution-end



Source: Self draw

The general task is distributed (output) by the cybernetics system according to the actual situation (input), and the democratic principle is adopted at the end of the distribution, because the tasks assigned to each person are already sufficiently end-to-end and detailed.

The second part is the reform of discourse power.

It is recommended to use a fuzzy cybernetics system to encode the discourse power of each organization and transform leadership into discourse power. Then, input can be regarded as work and as the "voice" of discourse. At the same time, according to the organizations of coupling (Karl Weick, p.4, 1976), the discourse power is grouped into loose coupling and tight coupling; coupling of the technology core and coupling of the authority core. Loose coupling means that the more loosely the relationship between discourse power and input, the smaller the weight of the input, or it is directly included in the reflexive calculation. On the contrary, the closer the relationship, the greater the weight. The technology core evaluates discourse power based on technology, which affects the weight of input. For example, for technical issues, the discourse power and input weight of engineers are generally higher than those of administrative staff in the processing process, if administrative staff also have input weight. The authority core evaluates discourse power based on organizational structure, which affects the weight of input. For example, in the work of Group A, the discourse power and

input weight of the leader of Group A are higher than any other member, even if the member has technical advantages. This can also avoid the risk of syndicalism to a certain extent.

6.3.3 Economic calculation

As described in the preface, the state-owned economy is the state-owned enterprises, especially the centrally managed enterprises, which occupy a dominant position in the major industries and key areas related to national security and the lifeblood of the national economy, and are the important pillars of the national economy (Xi Jinping, 2015), and are based on the design of the socialist system of Chinese characteristics. Especially for traditional industrial cities, state-owned enterprises and whether/how to participate in the state-owned economic system are the most important factors.

Bookkeeping is a kind of power (Jacob Soll, 2014), and it is also the most basic and fundamental way of economic calculation.

Like the reform of discourse power, economic calculation is also a part of input management. By tracking the entire process of input and output, it ensures that the resources and the flow of each fund are transparent and traceable. Compared with management and economics, bookkeeping is indeed enough of "disembedding".

6.3.4 Process management

The positive content of process management, such as discourse reform, economic calculation, and people's democracy throughout the process, has been mentioned above. The issue of reflexivity discussed here.

There are two main issues:

Political organization.

Some state-owned enterprises will have the organization of the Communist Party of China, and the question of whether the dual system of control theory and the party-government system will be formed. The answer is undoubtedly based on the existing institutional design. This is determined by the most fundamental feature of the socialist system with Chinese characteristics: the leadership of the Communist Party of China (Xi Jinping, 2017). Although the control of economic calculation is objective enough, the central government's control over state-owned enterprises cannot bypass the issue of the Communist Party organization. On the other hand, this political force may also be a necessary condition for the formation of "disembedding" (Karl Polanyi, P. 15, 2007).

The connection problem of reflexivity of internal and external supervision.

First, according to the principle of information entropy (Claude E. Shannon, 1948): the more random the information, the more information it conveys. Professional opinions are always not so random, so the input will not be so convergent, so it is possible that professionals will have the same opinions on a certain matter, while non-professionals, especially external supervision, will have random opinions on a certain matter. Then in order to control the danger of close integration, such as "Many a missionary has fixed his own misunderstandings of a primitive language as law eternal in the process of reducing it to writing" (Norbert Wiener, p.63, 1989), the application of disembedding reflexivity in the system should have the following prerequisites:

a. The process must be transparent, especially the input and output.

Otherwise, the internal and external supervision based on reflexivity will fail. And this is the openness and transparency at the institutional level. The input of the cybernetic system, especially the input after fuzzy cybernetic compilation, can technically achieve this goal. The probability-based model that requires public opinion or insiders to expose the "Kailu County Spring Farming Incident" and "Rat Head Duck Neck Incident" has been essentially improved.

b. Leadership is completely transformed into discourse power.

For local state-owned enterprises that play a controlling role in specific industries or have specific tasks, their production and operation tasks are determined. Thus, compared with the management role, the necessity of the management role of state-owned enterprise leaders is slightly less. Then, the weight of discourse power will be changed from administrative level and position decision under the leadership responsibility system to a mechanism of joint action of multiple factors such as technology, experience, resume, election, etc., to avoid the final convergence to close integration.

c. The distribution of work at the end must be based on the principle of democracy.

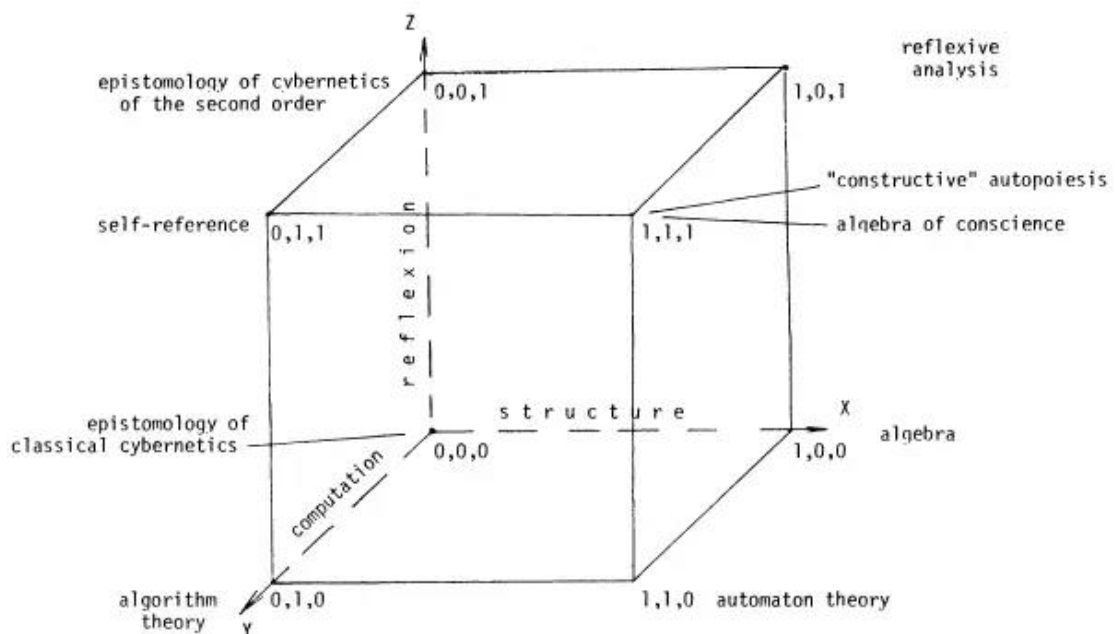
Most local state-owned enterprises are involved in industrial production and finance. The processes in these work areas are highly process-oriented and institutionalized, and the cybernetics system can be taken over and transformed smoothly. Therefore, the democratization of the distribution of work tasks at the end is an important feature of this cybernetics that distinguishes it from the traditional cybernetics model.

The democratic distribution of work tasks at the end can first guarantee the democratic participation of all employees internally, and continue to promote the transformation of leadership into discourse power. Furthermore, democratic discussions can help correct the decisions of superior departments or maintenance departments at the same level in the processing or feedback of cybernetics systems.

The Cybernetic Cube by Vladimir A. Lefebvre in “Second Order Cybernetics in the Soviet Union and the West” (Vladimir A. Lefebvre, 1967) is an important reference on how reflexivity works in the computation of cybernetic systems.

Figure 14: Cybernetic Cube by Vladimir A. Lefebvre in “Second Order Cybernetics in the Soviet Union and the West”

Structure (X), calculation (Y), reflexivity (Z)



Source: Lefebvre, V. (1967), ‘Second Order Cybernetics in the Soviet Union and the West’, Power, Autonomy, Utopia, p.123-131.

7. Results & Findings

7.1 About cybernetics.

Cybernetics is inevitable to become a practical interdisciplinary subject.

However, the "excessive optimism" (Norbert Wiener, p.162, 1948), which Norbert Wiener held a pessimistic attitude, has always accompanied the development of cybernetics. In 1946, the first mysterious "Messey Conference" proposed to form a "General theory" and discussed that this "General theory" would be a vague humanistic mixture of computers, neurophysiology, psychiatry, anthropology and sociology (Frank Fremont-Smith, 1946), and 10 similar conferences were held from 1946 to 1953. Starting from the seventh meeting in 1949, the focus of the discussion of the Messi Conference was on cybernetics, and the classic "Cybernetics: Circular causal and feedback mechanisms in biological and social systems" (Heinz von Foerster, p.325, 1949) was proposed. In 1950, two years after Norbert Wiener published *Cybernetics or Control and Communication in the Animal and the Machine*, *The Human use of Human Beings: Cybernetics and Society*, which focuses on the humanities, was completed. In Chapter 10, "Some communication machines and their future," Wiener used the possible future chess-playing robots (which already exist), public opinion, and the market as examples to make the following statement about the future of cybernetics: "whether for good or evil, the present obvious inadequacy of the brain when the latter is concerned with the customary machinery of politics." (Norbert Wiener, p.179, 1950), objectively acknowledging the possibility of applying cybernetics to social sciences and the inevitability of its future application beyond military and engineering. However, due to the technical conditions at the time, especially computing power and ideology, Wiener was still very conservative about the prospect of applying cybernetics to social sciences, just as he insisted in *Cybernetics or Control and Communication in the Animal and the Machine*: "Moreover, in the absence of reasonably safe routine numerical techniques, the element of the judgment of the expert in determining the estimates to be made of sociological, anthropological, and economic quantities is so great that it is no field for a newcomer who has not yet had the bulk of experience which goes to make up the expert." (Norbert Wiener, p.25, 1948). Human demand for new theories of cybernetics, control theory, and automation grew with the economic recovery of post-war reconstruction. In 1957, the International Federation of Automatic Control (IFAC) was established in Paris, and in 1969 The World Organization for Systems and Cybernetics (WOSC) was established. Ştefan Odobleja It was not until the Sixth World Congress of the International Federation of Automatic Control (IFAC) in 1975 that Jay W.

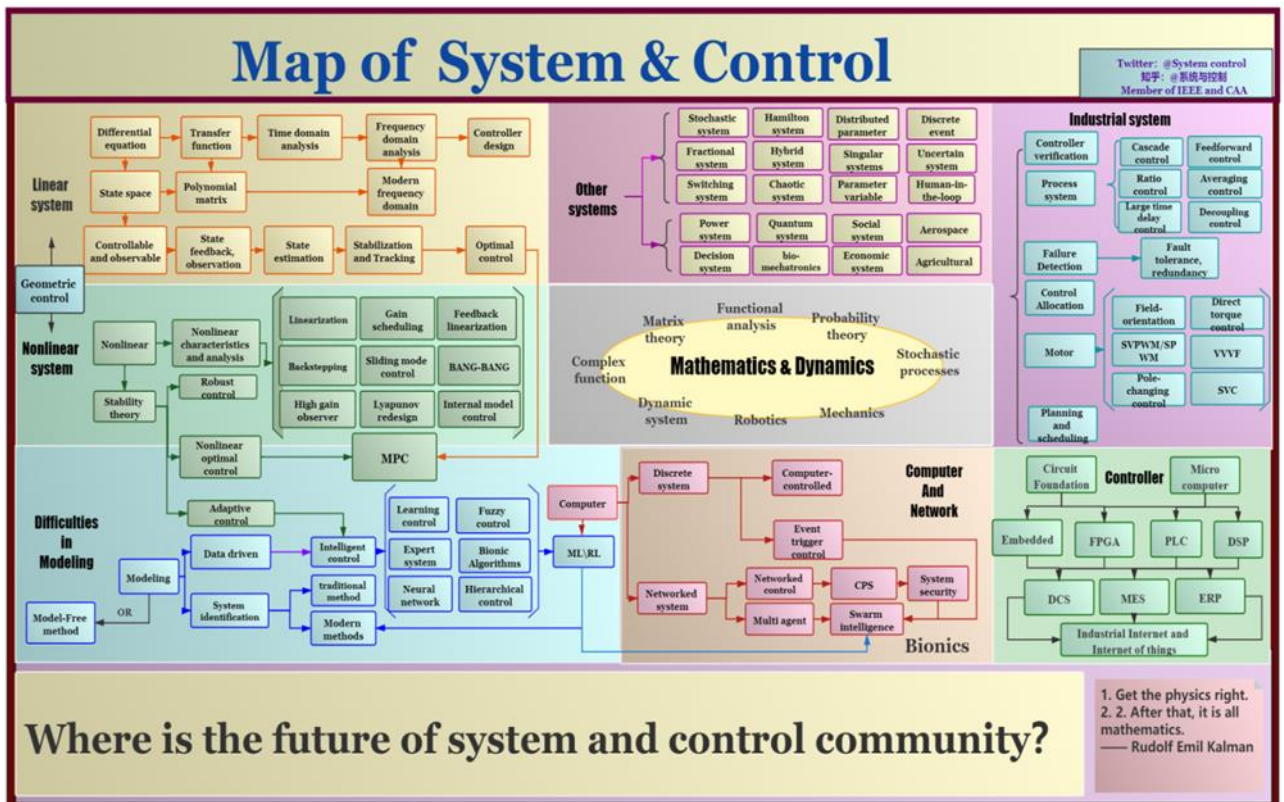
Forrester said in his report "Dynamics of Socio-Economic Systems" that "It is no exaggeration to say that the hope of solving the problems of inflation, population explosion, famine, unemployment, and the limits on growth lie with those trained in the inherent control process and dynamics of feedback loops" (Jay W. Forrester, 1975).

The Soviet Union's achievements were also impressive. Soviet scientist Виктор Михайлович Глушков (Victor Mikhailovich Glushkov) proposed the works "Introduction to Automatic Control Systems" (Victor M. Glushkov, 1970), "Macroeconomic Model and Principles of OGAS Construction" (Victor M. Glushkov, 1975) and "Management of Scientific and Technological Progress" (Victor M. Glushkov, 1980), aiming to design an automated system to solve the problems of long-term and short-term planning and coordination between departments. The speech by Soviet Prime Minister Алексѣй Николаевич Косыгин (Alexei Nikolayevich Kosygin) at the 24th Congress of the Communist Party of the Soviet Union in 1971 presented that the Soviet planned economy would enable to create a nationwide automated system to collect and process information for accounting, planning and management of the national economy. Although the OGAS system eventually went functional bankrupt, this did not impede the unique status of the Soviet Union and Victor Mikhailovich Glushkov in the history of cybernetics and control theory.

Thus, this thesis proposed that the unique value of cybernetics, which is different from control theory, is not limited to individuals, organizations, and specific information or signals, just connected to "between man and machines, between machine and man, and between machine and machine" (Norbert Wiener, p.9, 1950) and the potential to systematize problems through input-process-output and black & white box. During the war, this interaction between signal systems and automation served the complex system of war and belonged to the original category of narrow cybernetics. In the fields of society, economy, politics and even biological sciences, this interactive and systematic overall solution pointed out "Above all, the lasting legacy of cybernetics is precisely this phantasmatic excess of faith in gaining control over the future by yielding, in a targeted." (Timon Beyes; Claus Pias, p.93, 2019).

Figure15: Map of system & control

For modern control theory, cybernetics has become a small branch on the map, but the relevant ideas of cybernetics still affect the continued development of control theory.



Source: System control, IEEE and CAA.

7.2 About China's local level

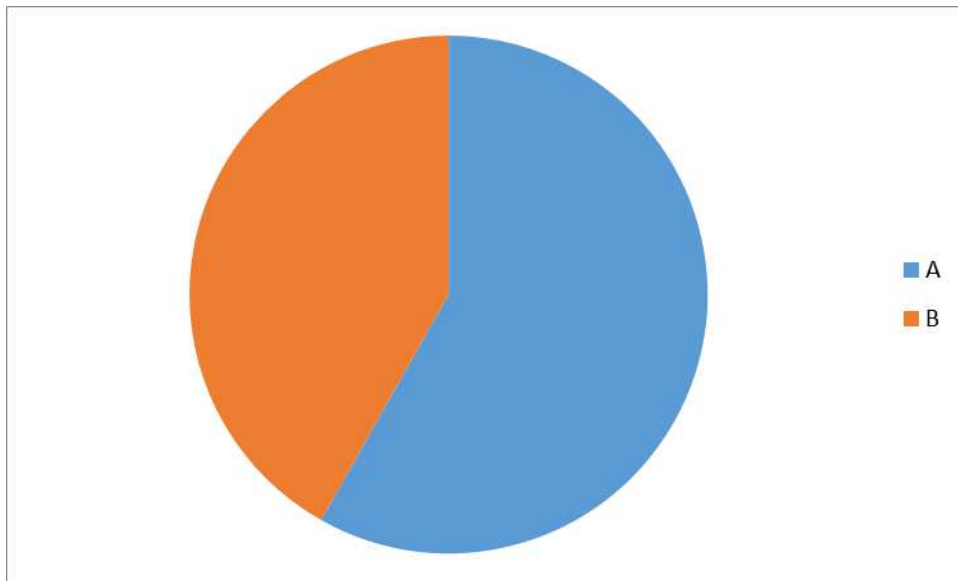
Cybernetics does not conflict with the operating logic of China's local state-owned enterprises.

China's current big data and information reforms already have a cybernetic color. For example, the government big data bureaus that are generally set up at the local level, the national integrated government service platform "One Network for All" that will be launched in 2024 to serve 1.4 billion people, and the fully automated unmanned port Yangshan Port that was put into operation as early as 2017. Moreover, the public ownership nature of socialism with Chinese characteristics has already resolved from the outset the concerns that cybernetics would "eliminate" liberal humanism (N. Katherine Hayles, 1999).

In "Science in Russia and the Soviet Union: A Short History", British science and technology historian Loren R. Graham proposed that expert governance is a product of the contradiction between science and regime (Loren R. Graham, 2000). This thesis uses the undergraduate degree in the public resumes of local state-owned enterprise leaders in several provinces such as Jiangsu Province and Gansu Province to obtain the following incomplete statistics:

Chart 1: Distribution of bachelor's degree levels among leaders of local state-owned enterprises.

Humanities and social sciences are cataloged as A, engineering and natural sciences are cataloged as B.



Source: Self draw.

It is striking that the members of directors and supervisory boards in the state-owned enterprises selected as the sample are mostly from social sciences, especially accounting, economics and finance fields. But for accounting and bookkeeping, cybernetic systems have a designed advantage. From this means, a cybernetic system has abilities to become not only experts, but also directors.

About technocrats serving cybernetics systems.

Unlike Autopoiesis systems (Humberto R. Maturana and Francisco J. Varela, 1972), cybernetics systems require technocrats to maintain them. The reasons for choosing technocrats are very direct:

First, clarify the responsible parties. Cybernetics systems are not systems that push responsibilities to computers. Technocrats are part of the government and they are directly responsible to the authorities.

Second, compared with ordinary civil servants, technocrats understand technology better. Compared with experts, technocrats will be more supervised as civil servants.

However, such technocrats are very different from typical Soviet technocrats. The Soviet technocrats were relatively weak in the cultivation of humanities and social sciences, which also affected the development vision of experts. If we consider that the senior leaders of the

Soviet Union all had a technical professional education background, this narrow technical education had a more profound impact on their knowledge structure, management style and policy orientation (Loren R. Graham, p.186, 2000). The technocrats serving the cybernetic system will have their expert attributes diluted and become more inclined to be "high-ranked maintenance personnel."

8. Discussion

N. Katherine Hayles put forward four characteristics of "posthuman" in "How We Became Posthuman Virtual Bodies in Cybernetics, Literature, and Informatics":

1. First, the posthuman view privileges informational pattern over material instantiation, so that embodiment in a biological substrate is seen as an accident of history rather than an inevitability of life (N. Katherine Hayles, 1999).

2. Second, the posthuman view considers consciousness, regarded as the seat of human identity in the Western tradition long before Descartes thought he was a mind thinking, as an epiphenomenon, as an evolutionary upstart trying to claim that it is the whole show when in actuality it is only a minor sideshow (N. Katherine Hayles, 1999).

3. Third, the posthuman view thinks of the body as the original prosthesis we all learn to manipulate, so that extending or replacing the body with other prostheses becomes a continuation of a process that began before we were born (N. Katherine Hayles, 1999).

4. Fourth, and most important, by these and other means, the posthuman view configures human being so that it can be seamlessly articulated with intelligent machines (N. Katherine Hayles, 1999).

The main content of the discussion was about the four characteristics of "Posthuman" mentioned by N. Katherine Hayles in "How We Became Posthuman Virtual Bodies in Cybernetics, Literature, and Informatics", and different opinions and countermeasures were given based on reflexivity and the feasibility of cybernetics.

a. Informationization and dataization: Posthumans value informationized data and despise material examples, believing that the body formed by biological matrices is a historical accident rather than a necessity of life.

The production and acquisition of material materials have an original purpose for the cybernetic system. The cybernetic system uses the economic development theory of socialist principles, and in accordance with the distribution method of the future society proposed by Marx in "Critique of the Gotha Program", that is, productivity determinism, takes the great abundance of materials as the premise for realizing communism (Karl Marx, 1875). As a socialist country that declares "the guiding role of Marxism" in its constitution, China has adopted the path of socialism with Chinese characteristics in order to realize the main line of social development of historical materialism, and specifically puts forward the propositions of

"science and technology is the first productive force", "four modernizations", "three representatives", and "adhering to the party's line for a hundred years". In 2017, the report of the 19th National Congress of the Communist Party of China pointed out again: "As socialism with Chinese characteristics enters a new era, the main contradiction in our society has transformed into the contradiction between the people's growing needs for a better life and the unbalanced and inadequate development." It once again emphasized that the demand and production of material materials are implemented throughout China's socialist construction, which means that the new quality productivity represented by cybernetics will first guarantee and serve the production of material materials for a long time, and make it extremely rich. Therefore, the cybernetic system will never despise materiality, at least for a considerable period of time. Instead, it will take material resources, and even to a certain extent, "extremely abundant material resources" that can be distributed in accordance with the principles of socialism and communism, as its primary goal.

b. The opposition between body and machine disappears: The opposition between body and machine is not reliable. The human body is a tool that humans must learn to control, while the machine is an extension of the human hand.

This cybernetics is based on human subjectivity. It regards humans as the basic unit that cybernetics actually affects the operation of social production and life at the whole social level, rather than a kind of "dual dimension that exists in the three-dimensional atomic world and in the digital space as a bit byte information state", with a strong humanistic feature. Because when people accept the solutions derived from cybernetics, they must also work for reflexivity. In this way, people must assume the identity of machine maintainers and developers in a certain sense because of reflexivity, and they cannot become part of the machine, or let the machine become part of humans, otherwise the cybernetics system will lose its basic conditions and basic units for terminal execution.

c. The separation of identity and body: In the posthuman era, identity and body are separated, the body can be replaced by machinery, and the mind can be displayed by computer programs.

A reasonable assumption is that Posthuman does not necessarily completely retain the current human legal, ethical and political systems. However, the existence of reflexivity marks the power and obligation that is identical to identity: labor. That is, when using cybernetics, it must serve reflexivity, just as for experienced restaurant operators, the data of customer orders will obviously create labor value. Therefore, the mind will not be displayed by computer programs, because people as individuals must participate in reflexivity, otherwise the

cybernetic system will not be able to maintain, which means that to a certain extent, the possibility of becoming a "Posthuman" will be lost first of it.

d. Evaluation to the Differences between Autopoiesis system (Humberto R. Maturana and Francisco J. Varela, 1972).

Could it be ranged human intelligence alongside an intelligent machine puts the two into a relay system that constitutes the human as a special kind of information machine and the information machine as a special kind of human?

But Unlike real life forms, AI's behavioral logic is not based on genes, but on the developer's settings. Therefore, it is impossible to truly substitute into the Autopoiesis system. Unlike N. Katherine Hayles's conjecture in "How We Became Posthuman Virtual Bodies in Cybernetics, Literature, and Informatics": It is no accident that evolution is a sore spot for autopoietic theory, for the theory was designed to correct what Maturana and Varela saw as an overemphasis on evolution and reproduction as the defining characteristics of life. Over and over, they argue that evolution and reproduction are logically and practically subordinate to autopoiesis, even the boundaries of computer viruses that spread at an astonishing speed do not have as wide a recognition boundary as DNA, even though the recognition boundary of DNA is not as wide as the single-stranded structure of RNA.

So the real transcendentalism may be absolutely examined in the view of functionalist. The real "cyborg" may not be to give humans cool mechanical prostheses, but to do the opposite, to cultivate human organs outside the body and directly function as a real machine, rather than treating humans as machines. Just like the "cyborg" artificial womb, this is always ignored but indeed the most easily accepted. In fact, humans are doing this so, if contact lenses are regarded as "skeuomorphs" of glasses.

Indeed, this is a rebellion against capitalism, and what is being rebellious is still "information society is the purest form of capitalism" (Fredric Jameson, 1998), especially as described by N. Katherine Hayles in "How We Became Posthuman Virtual Bodies in Cybernetics, Literature, and Informatics": It signals instead the end of a certain conception of the human, a conception that may have applied, at best, to that fraction of humanity who had the wealth, power, and leisure to conceptualize themselves as autonomous beings exercising their will through individual agency and choice.¹³ What is lethal is not the posthuman as such but the grafting of the posthuman onto a liberal humanist view of the self. (N. Katherine Hayles, 1999)

And in the face of Norbert Wiener's anxiety about cybernetics, especially the concern that cybernetics will serve authoritarianism and even dig the grave of humanistic liberalism. But just like the communism that also attempts to reverse the alienation of human beings by capitalism, especially bourgeois legal rights (Karl Marx, 1875), N. Katherine Hayles believes that the posthuman need not be recuperated back into liberal humanism, nor need it be construed as antihuman (N. Katherine Hayles, 1999). This means that "posthuman" does not threaten human subjectivity. What really threatens human subjectivity is the arbitrary deconstruction of human beings through irresponsible "labeling": "Breakdown occurs when the hyphen is no longer sufficient to keep body, gender, and political categories separate from one another." (N. Katherine Hayles, 1999).

But for countries that practice public ownership, Norbert Wiener's urgency to defend liberal humanism is meaningless. Just like the difficult attempt to defend private ownership and private rights in political change and collectivism, Norbert Wiener's anxiety about cybernetics can also be transferred to Foucault's struggle against another monopoly capitalism, Nazism (State Racism) (Michel Foucault, 1976), because this is almost contradictory.

In addition, the destruction of "labeling" and the protection of human rights in a certain sense are also important gains of the cybernetic system. The cybernetic system uses a new set of standards to recode identity, and disembedding reflexivity deconstructs labels such as leadership, positions and other traditional identities through discourse power and weight, and even challenges private ownership. And from the influence of cybernetics and reflexivity on epistemology (Heinz Von Foerster, p.230, 1949), physiological factors may not be impossible to be isomorphic based on functionalism through cybernetics, such as artificial wombs. The emergence of artificial wombs can free women from the complex emotions and connections with the womb, making gender an expression that can be "defunctionalized", just like "a fantasy about technological extensions of the male body that endow it with supernatural power" (N. Katherine Hayles, 1999). For countries that implement strict population control policies, the means of controlling women's fertility patterns through legislation and policies can also be replaced by artificial wombs, which can not only better promote eugenics, but also avoid any form of infringement on the basic human rights to fertility.

This thesis is not supposed to oppose most of N. Katherine Hayles's views. Focused on the "cyberpunk" in the concept of "posthuman", this thesis proposed that it could exist a solution that has ability to achieve human subjectivity in the field of artificial intelligence through productivity rather than "cyborg" (N. Katherine Hayles, 1999). After all, even if electronic

systems can really be regarded as biological organisms, the existence form, similar to the Autopoiesis system (Humberto R. Maturana and Francisco J. Varela, 1972), cannot transcend input by human.

9. Conclusions

First, through the most important work promoting the family planning policy, "Population Control Theory"(Song Jian, Yu Jingyuan, 1985), and the game theory model explanation of the causes of local government debt risks mentioned in "Research on China's Local Government Financing Platform"(Gao Xudong, Liu Yong, 2013), control theory has indeed exerted political and socio-economic influences on China's local governance. It is mainly manifested in:

- a. Closed-loop control in family planning: changing women's fertility patterns through legislation and other means. From "One child policy" to "Two child policy" and the current "Three child policy".
- b. In order to cope with local fiscal transformation: tax-sharing reform.

The game theory model of the causes of local precious debt risks successfully used mathematical means to strongly support the prediction that "local governments have the impulse to over-indebtedness" (Gao Xudong, Liu Yong, 2013).

Regarding these two most important examples, the following effects were produced:

- a. Adjusted the local population structure.

The subsequent "Two child policy" and "Three child policy" attempted to reverse the population fault crisis brought about by the intersection of the cliff-like decline in fertility and rapid aging (Chen Wei, 2022).

- b. Promoted eugenics and improved the quality of the population (Shi Zhilei, Teng Chongbo, 2023).
- c. Promoted equality of inheritance rights between men and women in the actual implementation process (Weng Di, 2011).

- d. With "the tragedy of the commons", it was suggested that local governments should carry out mixed ownership reform of the government financing market and clearly define the rights of various creditors entering the financing market. It was also similarly applied in the "Opinions of the CPC Central Committee and the State Council on Deepening the Reform of the Investment and Financing System" issued in 2016, as well as in a series of urban investment transformations starting with the "Opinions of the State Council on Strengthening the Management of Local Government Debt" issued by the State Council of China in 2014

and the "Measures for the Clearance and Identification of Local Government Existing Debts Included in Budget Management" issued by the Ministry of Finance of China. By stipulating that platform credit is institutionally decoupled from local governments, the boundaries of the local government financing market and the rights of various creditors have been clarified to a certain extent, and the impulse of local governments and urban investment companies to over-indebtedness has been restrained.

About disembedding reflexivity:

In this thesis defines disembedding reflexivity as the reflexivity that, maintains the cybernetic system under the public ownership economic system for being fully autonomous in the linear process (white box), and usually be simulated.

Disembedding reflexivity has the following characteristics:

a. Exclusiveness.

The primary goal is to ensure the "disembedding" of cybernetics, that is, to maintain the existence and normal operation of the linear white box network and exclude unnecessary political and social "embeddedness".

It is worth noting that exclusiveness and simulation are mutually sufficient and necessary conditions.

b. Simulation

Disembedding reflexivity is not really "disembedding" with politics and society. On the contrary, disembedding reflexivity relies on the strength of the socialist system with Chinese characteristics to ensure its maximum "disembedding" within the cybernetic system and get rid of unnecessary political and social interference. Its essence is simulated, and it may also be considered as a deeper "embeddedness" (Karl Polanyi, 2007).

c. Public ownership

Disembedding reflexivity and the cybernetic system that uses it are defined and designed as part of China's local state-owned enterprise reform. They are only applicable to state-owned enterprises that play a controlling role in a certain industry or have a specific task (such as ensuring that state-owned assets are not lost), not to the whole society. To the greatest extent possible, avoid the anxiety similar to Wiener that cybernetics will undermine or even destroy liberal humanism.

d. Identity.

It is both the identity of internal and external supervision and the identity of labor and power. The identity of internal and external supervision means that disembedding reflexivity is part of internal and external supervision and the whole process of people's democracy. There are both internal designs for the reform of organizational structure and process management, and external attempts at public opinion supervision. The identity of labor and power means that disembedding reflexivity is both a compulsory labor for its undertakers that is not for the purpose of making a living and a power to input into the cybernetic system. There are no full-time "disembedding reflexivists", but everyone can participate in "disembedding reflexivity".

Although Cybernetics system design in organizational structure, economic calculation and process management of local state-owned enterprises is currently only a simple model with only a schematic diagram, its Economic calculation, democracy promotion and social experiment functions can be further explored and even applied to the reform of local state-owned enterprises in China, especially those that control specific industries or have specific tasks.

At the Economic calculation level, Cybernetics system and the large system theory currently under development can provide detailed plans and the most conservative solutions for task subdivision for specific business goals, such as keeping state-owned assets at least from loss. This can also be regarded as a kind of "disembedding". Cybernetics is naturally suitable for accounting and bookkeeping. It can start from clarifying the input end, help the country better streamline the organizational structure, reduce the political cost brought by "embeddedness", save resources, fight corruption, and use power more scientifically within the "top-down" institutional framework (Jacob Soll, 2014) to ensure the operation and simulation of disembedding reflexivity.

At the same time, cybernetics with disembedding reflexivity can eliminate the uncertainty of "laymen commanding experts" in the leadership, dilute the leadership, and leave more voice to employee representatives and professional and technical personnel, because in the cybernetics system, it is technically feasible to hand over the task allocation at the end of the system to democracy, so that the production process and decision-making process respect individuals more and listen to individual opinions, otherwise specific work will not be able to start, making reflexivity an indispensable part of the system operation. Therefore, the system has the function of promoting democracy. And build internal and external supervision, and

strive to achieve "whole-process people's democracy", which is also an important proposition and future direction of China's political reform.

At the input end of disembedding reflexivity, providing feedback to the system will also become labor, and it has the identity of labor and power. However, due to differences in profession, resume and identity, the data input by each person in reflexivity should also have different weights, so a quantitative evaluation system based on the principles of fuzzy cybernetics should be established, and risk prevention designs such as AI detection should be added. As for internal and external supervision, due to the potential distrust of experts and "high-power positions", "professional opinions" endorsed by experts may not be adopted or even be discredited. The suggestion given in this thesis is to adhere to the principle of "coming from the masses and going to the masses"; on the other hand, it is to improve the education level of the people, which also leads to how to propose different solutions for "posthuman" (N. Katherine Hayles, 1999). Of course, this system still has legal gaps, such as the distribution of powers and responsibilities under the cybernetic system, and the accountability issues arising from disembedding reflexivity (such as providing false input or interfering input).

The solution to "posthuman" (N. Katherine Hayles, 1999) and disembedding reflexivity are two sides of the same coin.

- a. The Marxist-Leninist solution to the problem of ownership at its origin bypasses the anxiety of liberal humanism about the "posthuman" era, and turns the problem to the alienation and replacement of people by ideology rather than technology. Just like the Cold War, the two sides of the Cold War could have different politics, literature, history and even biology (Lysenko affair), but the same mathematics.
- b. Disembedding reflexivity The identity of labor and power maintains human subjectivity and strictly limits human identity. Therefore, politically and legally, "machine life" will not obtain personality rights.
- c. The connection between AI and industry is expected to continue to maintain the opposition between humans and machines. This is not a "skeuomorph"(N. Katherine Hayles, 1999), but the development of machines, especially intelligence, which does not need to force humans to transform their bodies, that is, "cyborg".
- d. The self-mockery of "She Chu"s is currently the closest concept to "cyborg". It can be argued that this concept comes from the legacy of China's transition from a labor-intensive

economy, and is a true "skeuomorph", where employers still treat and assess employees the same way they did 20 years ago, where physical labor is the most important factor of production for workers and working hours have the most direct and optimal linear relationship with profits. But it can also be another situation for "She Chu", the most frightening thing is not that their jobs are replaced by machines, but that machines cannot replace their jobs, but become a factor that creates anxiety and loses bargaining power, resulting in the strange situation where workers maintain "involution".

10. Recommendations for future research

Unfortunately, due to the lack of data, especially the lack of internal operation and management information of state-owned enterprises, the model lacks effective verification methods and specific mathematical modeling. Therefore, it is hoped that more data and information can be obtained in the future to enrich and finally propose mathematical modeling.

In the 1950s, Hong Xintao, a Chinese children's literature writer, created a children's literature work called "The Magic Paintbrush". In this story, a poor but painting-loving child named Ma Liang got a magic brush from a mysterious old man in a cave. This magic brush has the power to turn the things he draws into real objects. Of course, we have no way of knowing whether this brush can automatically recognize functions like today's AI or whether Ma Liang is actually a genius in hyperrealism like Leng Jun. This is a very classic cybernetic processing model:

Ma Liang's painting technique is a typical "black box", because people's creativity and brushstrokes are often non-linear, and are not even based on reality, even Ma Liang, who is talented in painting in the story.

The magic brush has the ability to turn pictures into real objects, so its output must be linear. After all, the story does not mention what Ma Liang created for ancient China, which is the background of the story of "The Magic Paintbrush", such as computers, satellites, tanks... So, it constitutes a typical "white box".

This is "magic power" for Ma Liang, but not for AI. Actually, in the other hand, in "Critique of the Gotha Program" also in a kind of mentioned the story "The Magic Paintbrush": Labor is no longer just a means of making a living, but has become the first need of people's lives (Karl Marx, 1875)

At the production level, under a highly developed socialistic condition, the relationship between AI-intelligent manufacturing technology and people will be people and pens rather than "people" and "virtual people", and naturally there will be no replacement relationship that has been exaggerated. As assumed, if AI and 3D printing become the mainstream of production, the opposition between people and tools will not only not weaken, but will become more solid. Because in this case, creativity, creativity, and even wild fantasies as "black boxes" will bypass the criticism of technical feasibility, and AI based on machine learning and self-learning systems will be responsible for the technical rationality of daily life. Just as telling jokes is meaningless to non-social animals, AI will not replace people who ask

questions to ask and answer questions by themselves, interfering with the operation of the "black box". By then, the work of most people will be to contribute their creativity and serve the reflexivity of providing feedback and evaluation. The production of material materials will be fully automated by AI coordinating machines to implement it. This is not the unemployment of screwdrivers, because there is no need for people to screw screws, just as there is no reason to set up "train coal shovelers" for the operation of steam trains in modern society. But this is the unemployment of "low-level workers", because in this case, people's main job is to use their knowledge and aesthetics to create, and those with weak creative ability have the obligation to constantly maintain this system by making demands and giving feedback. This is not simple, and there is no way to be lazy, because this is a society that requires everyone to express their own thoughts as a job, and it is also a society with great material abundance that can significantly promote human transformation rather than focusing most of their energy on passively adapting to the social atmosphere.

Glossary

IFAC

International Federation of Automatic Control

NPC deputy

Deputy to the people's congress of China

Bibliography

- Althusser, L. (2019), *Sur la reproduction (On the reproduction)*, Xian: Northwest University Press Co. Ltd., p.150.
- Ampère, A. (1843), *Essai sur la philosophie des sciences, ou exposition analytique d'une classification naturelle de toutes les connaissances humaines. Tome 2.* (Essay on the philosophy of science, or a natural exposure analytical classification of all human knowledge, Part II) , Paris: Bacheleier.
- Bakhtin, M. (1981), 'Forms of Time and of the Chronotope in the Novel', *the Dialogic Imagination*, 1981a, p.84-258.
- Beyes T., Pias C. (2019), 'The Media Arcane', *Grey Room*, 75, P.84-107.
- Chen H., Liu X.(2003), 'A study on the probability model of women's fertility pattern', *Chinese Journal of Health Statistics*, 8-20-4.
- Clausewitz, K. (1832), *On war*, Beijing: Democracy & Construction Press.
- Dai, X. (2017), 'The seventh generation of warfare: "cyber war" targets people's hearts', *liberation army daily*, 1-24
- Feng, G. (1999), *Systems Theory, Information Theory, Cybernetics and Marxist Epistemology*, Beijing: Peking University Press.
- Foerster, H. (1949), *Understanding Understanding Essays on Cybernetics and Cognition*, New York: Springer.
- Forrester, J. W.(1975), *Dynamics of Socio-Economic Systems*.
- Fremont-Smith, F. (1946), 'Letter from Frank Fremont-Smith to Warren McCulloch', Washington: APS, 8 February 1946.
- Gao, X., Liu, Y. (2013), *Research on Chinese Local Government Financing Platforms*, Beijing: Science Press.
- Gong (2022), 'suggest experts not to suggest', *Workers' Daily*, 05-26.
- Graham, L. R. (2000), *Science in Russia and the Soviet Union: A Short History*, Shang Hai: Fudan University Press.

- Hayles, N. K. (1999), *How We Became Posthuman Virtual Bodies in Cybernetics, Literature, and Informatics*, Chicago: the University of Chicago Press.
- Hu, X.(2013), *War Engineering Theory*, Beijing: PLA National Defense University Press.
- Lefebvre, A. V. (1967) , ‘Second Order Cybernetics in the Soviet Union and the West’, *Power, Autonomy, Utopia*, p.123-131.
- Li, S. (1998), *Fuzzy Control, Neural Control and Intelligent Control Theory*, Beijing: Tsinghua University Press.
- Polanyi, K. (2007), *the Great Transformation*, Hangzhou: Zhejiang People's Publishing House.
- Popov, V. (2014) *Mixed Fortunes: An Economic History of China, Russia, and the West*, Oxford: OUP Oxford.
- Macpherson, C. B. (2018), *The Political Theory of Possessive Individualism: Hobbes to Locke*, Hangzhou: Zhejiang People's Publishing House.
- Marx, K.(1875), *Critique of the Gotha Program*, Beijing: People's Publishing House.
- Maturana, H. R., Varela, F. J.(1972), *Autopoiesis and Cognition The Realization of the Living*, London: D. Reidel Publishing Company.
- Maxwell, J. C.(1868), *On governors*, London: Proc. Roy. Soc., 16, p. 270-283.
- Pickering, A. (2010), *The Cybernetic Brain*, Chicago: the University of Chicago Press.
- Qian X., Song, J.(1983), *Engineering Cybernetics*, Beijing: Science Press.
- Song, J., Yu, J. (1985), *Population Control Theory*, Beijing: Science Press.
- Soll, J.(2014), *The Reckoning: Financial Accountability and the Rise and Fall of Nations*, New York: Basic Books.
- Tirole, J.(1997), *From the theory of industrial organization*, Beijing: China Renmin University Press.
- Tu, X., Wang, C., Guo Y.(2005), *Large-Scale System Cybernetics*, Beijing: Beijing University of Posts and Telecommunications Press.
- Weick, K. E.(1976), ‘Educational Organizations as Loosely Coupled Systems’, *Administrative Science Quarterly*, Vol. 21, p. 1-19.

Wiener, N. (1948), *Cybernetics or Communication and Control in the Animal and the Machine*, Cambridge: the M.I.T Press.

Wiener, N. (1950), *The Human Use of Human Beings*, London: Free Association Books.

Xi, J. (2022), 20th National Congress Report.

Annexes

