Why do civilizations collapse? Is our civilization in danger?

Introduction

The mysterious Maya civilization vanished amid unknown disasters; the great Greek and Roman civilization, emblematic of classical antiquity, fell under the trampling iron hooves of nomadic tribes; the once-flourishing medieval Byzantine civilization succumbed to the banners of the Crusades. Winston Churchill once remarked, "The longer you can look back, the farther you can look forward." The rise and fall of civilizations inevitably lead us to ponder: why do civilizations collapse? Is our civilization at risk?

View Civilization as a System

In the 1940s, Isaac Asimov proposed in his "Foundation" series that by using vast amounts of statistical data on large populations as input factors in a psychohistory model, the future of human collectives' actions could be predicted[1]. One notable feature of civilizations is precisely their large populations, so it can be inferred that the idea of psychohistory, or the idea of viewing civilization as a system, can also be applied to predict the future of civilizations.

This essay attempts to model civilizations and qualitatively analyze the importance of influencing factors. Through principal component analysis of the causes of civilization collapse, we find that the primary variables determining a civilization's survival are food security, warfare, plague, natural disasters(including climate change and meteorite impact), and technology. Among these, we consider war to have the greatest weight. Ideological conflicts and resource disputes are the two main triggers of war. Technology, as a tool of war, plays a significant role in the initiation and intensity of conflicts. Considering the current situation, technology seems likely to exhibit its immense and nearly terrifying power.

What is "Civilization"?

Here, we must discuss the definition of civilization. Quoting L.S. Stavrianos from "A Global History," features such as "urban centers, institutionalized political authority in the form of states, tribute or taxation, writing, social stratification, monumental

architecture, and specialized arts and sciences" can generally serve as guidelines for identifying civilizations[2]. This resonates with the definition on Cambridge dictionary that "human society with its well developed social organizations, or the culture and way of life of a society or country at a particular period in time"[3]. According to these definitions, all empires should be recognized as civilizations. The distinction between civilizations is a contentious issue. Undoubtedly, all nations are typical representations of civilization, and nations with similar ideologies and religious beliefs could be classified together as one civilization. Nowadays, in the increasingly interconnected world, interactions and integration between civilizations occur on a global scale. This relationships closely links the rise and fall of multiple civilizations, making it impossible for any civilization to disappear without affecting others.

Collapse of Ancient Civilizations

It is crucial to analyze the factors contributing to the collapsing of ancient civilizations. The primary factors summarized are basically food security, warfare, plague, technology, and natural disasters (including climate change and meteorite impact). Stable food production and supply have been the foundation of human survival and civilization existence regardless of ancient or modern times. Climate directly determines the growth of crops, or the food production. Around 2200 BC, the people of the Akkadian civilization suffered from prolonged droughts which finally led to food shortages. Chemical analysis of marine sediments in the Gulf of Oman indicates that the climate became extremely dry during the Akkadian civilization's final period[4], severely damaging agricultural production and resulting in insufficient food to support the large population. The earliest Akkadian empire disintegrated, its central cities gradually abandoned, and a large population migrated to other regions. Past civilizations have shown poor resilience and tolerance in the face of climate change.

Ancient medical technologies were often inadequate dealing with plagues, leading to large-scale population deaths, which could greatly weaken the economic and military strength of states, threatening internal stability and the resistance toward external invasions. The Antonine Plague[5] that occurred in the Roman Empire between 165-180 AD and the Justinian Plague[6] between 541-542 AD caused millions of deaths, severely weakening the empire's capacity to face invasions from the Sassanid Persians and Muslim Arabs. Although plagues did not directly deliver fatal blows to civilizations, they greatly diminished governmental control and exacerbated internal political struggles, making formerly powerful empires "more vulnerable to external pressures and internal fragmentation"[2] as Leften Stavros Stavrianos described.

According to data from the Food and Agriculture Organization (FAO) of the United Nations, global food production has increased nearly 300% since the 1960s[7]. This

growth is primarily attributed to advancements in agricultural technology, for example the modern farming methods. "Potential for increased efficiency, reduced costs, and improved yields through the adoption of smart technologies" indicates that technological applications have the potential of keeping sustainable development of agriculture[8]. Considering plagues, in 2016, an estimated 90 000 people died from measles - an 84% drop from more than 550 000 deaths in 2000[9]. Although currently the COVID-19 pandemic has caused severe damage, it has ultimately been well-controlled through human collaborative efforts.

As mentioned above, the weight of influential factors, food security and plague, on the progress of civilization are gradually decreasing, and the most likely factor leading to the collapse of modern civilization falls to warfare which is triggered by ideological conflicts or resource disputes.

The Role of Technology and the "Stairs Theory"

Technological development has a dual nature: it can significantly boost productivity while also having the potential to become a powerful weapon destructing civilizations. Following paragraph will discuss the role of technology in the development of civilization. According to "A Global History of Technology," the impact of technology is evident both spatially and temporally[10]. Spatially, before the Industrial Revolution, the per capita GDP of the East and the West did not change significantly. However, after the Industrial Revolution, Europe's per capita GDP increased 50-fold in 200 years. China's per capita GDP increased more than 10-fold in just 40 years; Temporally, technology is almost the only power in the world capable of cumulative progress, allowing subsequent generations to "stand on the shoulders of giants" to achieve further goals.

Technology has changed the course of history, from the primitive stone tools of slash-and-burn agriculture, iron plows, the invention of the steam engine,all the way to the invention of computers. These technological revolutions are discrete on the timeline, meaning history's development is stair-step-like. Civilization is like a person aiming to climb upstairs, with technology driving him to progress on the historical staircase. After several steps, a platform appears, which we call an "era." However, the higher one climbs, the harder the fall. This is reflected in the scale of wars: in the Ancient Roman time, the Ottoman Turks destroyed the Byzantine civilization, affecting only Central Asia and Europe[11]; after the Industrial Revolution, the British Empire, Spain Empire established colonies worldwide during the age of discovery, with conflicts and wars spanning Europe, Asia, Africa, and the Americas[12].

Anthropologists M.D. Sahlins and E.R. Service's "cultural dominance law" states that "cultural mechanisms that can effectively exploit energy in a given environment will

generally eliminate less efficient mechanisms to secure their own development in that environment."[13] This explains the phenomena of colonization and expansion. Taking China in the late Ming and early Qing dynasties as an example, ancient Chinese science and technology had long been at the forefront of the world. However, by the 19th century, China's technological level lagged further behind the West. The imperial examination system was responsible for recruiting intellectuals, but its disdain for science and technology and the ideological suppression of intellectuals led to a decline. During the reign of Emperor Kangxi, the introduction of more Western scientific and technological knowledge showed signs of revival. Cannons manufactured with the help of missionaries played a significant role in quelling the Revolt of the Three Feudatories and resisting Russian invasions[14]. However, by the mid-Kangxi period, military needs had been met.Therefore scientific and technological development was no longer prioritized. By the mid-Qing Dynasty, the retrogressive thoughts of the Qianjia School led most Chinese people to remain conservative. The consequences of technological backwardness were starkly displayed through the Opium Wars, the ceding of territory to eight foreign powers, and the threat to China's sovereignty.

The Threat of Technology-Catalyzed War to Modern Civilization

As with the "stairs theory", the rapid development of technology accelerates civilization's ascent but also brings greater risks. Applying the systematic analysis method to modern civilization, we believe technology reduces the likelihood of plagues and food crises destroying modern civilization but increases the probability of war-induced collapse. Today, food security issues have been greatly improved with the support of scientists and advanced technology, and plagues have effective countermeasures and technical support. Therefore, these two factors pose a relatively low risk to the current civilization. In comparison, the rapid technological advancements over the past one to two centuries, such as integrated circuits, automated production lines, high-precision instruments, and artificial intelligence, have all led us to the brink of a third great revolution—the information technology revolution[15]. However, subsequent issues are also apparent. The level of technological development and the height of human cognition has become significantly increasingly mismatched. The rise of artificial intelligence has triggered scholars' thoughts. Technology is considered the primary driving force of human development, also an inexhaustible source of innovation. Its immense power is inevitably displayed in military applications. The invasion by barbarian tribes has always been a significant external cause of civilization collapse. Technology has empowered wars with unprecedented energy and destructive power. The advent of nuclear weapons has taken us from wars fought with swords and guns to a new realm, intensifying global interactions. Current reports show that nine countries declare possessing nuclear weapons[16], and International Atomic Energy Agency

Director-General Mohamed M. El Baradei claims that "30 countries have the capability to rapidly produce nuclear weapons." The global nuclear arsenal can potentially erase all human achievements on this planet to ashes. Humanity now fully possesses the capability to destroy its civilization. The uncontrollable power of the information age and the increasingly tense global situation are evident in ongoing wars. The localized war between Russia and Ukraine, which began in 2022, has resulted in about 500,000 casualties so far[17]. The Israeli-Palestinian conflict has been ongoing since Israel's establishment in 1948. Deep-seated conflicts and long-standing ethnic hatred make it unlikely that these disputes will be resolved soon, and the disparity in military strength exacerbates the painful consequences of war.

All nations take pride in their robust military power, which protects their citizens and temporary safety in a small scale. But looking to the future, isn't this like a chain reaction bomb spreading across the globe? In the modern civilization system, warfare and technology complement each other, and their instability directly affects future development directions. Humans tend to create things they cannot yet comprehend, as exemplified by the black boxes in artificial neural networks. However, our ideologies are still immature; religious disparities, racial differences, and social inequalities all challenge the boundaries between civilizations, fostering further conflict, with technology serving as an excellent outlet. Our civilization has been in danger since the first divergence appeared, but now "danger" the devil has found a fitting weapon, revealing its long-hidden face.

Conclusion

As elaborated above, many civilizations tight together to form a dynamic global system, and the factors involved cannot be discussed in isolation. From the moment the first divergence appeared in the civilization, danger has quietly emerged, putting civilization at risk. Ideological conflicts and resource disputes are the two main swords triggering countless wars which is the biggest potential executioner of current civilizations. In the words of Churchill: “Study history, study history. In history lies all the secrets of statecraft.” Technology has transformed the way people express their anger: from throwing stones at each other to deploying nuclear weapons capable of destroying the Earth, making the collapse of modern civilization more likely to happen.

Reference

[1] Asimov, I. (1991). Foundation series. Bantam Books.

[2] Stavrianos, L. S. (1970). A Global History. Prentice Hall.

[3] https://dictionary.cambridge.org/dictionary/english/civilization

[4] Gao, L. (2000). Deep-sea evidence for climate change and the collapse of the Akkadian Empire. Marine Geology Frontiers, (07), 26.

[5] Duncan-Jones R P. The impact of the Antonine plague[J]. Journal of Roman Archaeology, 1996, 9: 108-136.

[6] Raoult D, Mouffok N, Bitam I, et al. Plague: history and contemporary analysis[J]. Journal of Infection, 2013, 66(1): 18-26.

[7] https://www.fao.org/4/Y4683E/y4683e06.htm

[8] Zulfikhar, Rosa, et al. "Utilization of Smart Agricultural Technology to Improve Resource Efficiency in Agro-industry." West Science Agro 2.01 (2024): 28-34.

[9] https://www.who.int/news/item/26-10-2017-substantial-decline-in-global-measles-deaths-but-disease-still-kills-90-000-per-year

[10] Wu, J. (2019). A Global History of Technology. CITIC Press Corporation.

[11] Treadgold W. A history of the Byzantine state and society[M]. Stanford University Press, 1997.

[12] Arnold D. The age of discovery, 1400-1600[M]. Routledge, 2013.

[13] Naroll R. Evolution and Culture[J]. 1961.

[14] https://www.sohu.com/a/198188193_100002224

[15] Disessa A A. The third revolution in computers and education[J]. Journal of Research in Science Teaching, 1987, 24(4): 343-367.

[16] Herre B, Rosado P, Roser M, et al. Nuclear weapons[J]. Our World in Data, 2024.

[17] https://www.thepaper.cn/newsDetail_forward_26379408