

# Chapter 1

## Waves of Civilization Development and the Digital Revolution

### ABSTRACT

*This chapter analyzes the evolution of civilization via the concept of civilizational waves. Seven waves are identified: (1) the agricultural wave, (2) the industrialization wave, (3) the information wave, (4) the globalization wave, (5) the virtualization wave, (6) the bio-material wave, and (7) the artificial intelligence wave. After discussing the key characteristics of each wave as well as their impacts upon civilization, the chapter then analyzes and discusses the two most important revolutions in the last 220 years: the Industrial Revolution and the IT Revolution. The chapter also develops a model showing the relationship between the civilizational waves and revolutions.*

### THE EVOLUTION OF WAVES OF CIVILIZATION DEVELOPMENT

By analyzing the history of civilization's development, one can distinguish essential characteristics that dominated in each period. Such periods can be referred to as "waves" since the importance of each epoch waxes and wanes over time, with the force of each generally subsiding as another comes to dominate. Seven such waves can be distinguished, and the role of ICT in the formation of some can be identified.

#### The Agriculture Wave

Civilization began about 6,000 years ago when people settled and began to develop agriculture using tools and with the help of irrigation systems, which resulted in an increase in agricultural productivity and an increase in the wealth of the best farmers and owners of irrigation systems. This consequently led to the creation of organized cities, bureaucratic administrations, and the military as well as the governing bodies. Over time, city-states began to merge, and the strongest states began to forge empires. Competitive empires waged wars, resulting in a demand for armaments and tool development. This, in

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turn, resulted in improved techniques for the manual (artisan) production of goods, including everyday items. This period, lasting several millennia, is a period of civilization development based on the Agriculture Wave, which continues to this day because people need food to live.

## **The Industrialization Wave**

The invention of printing in Europe by Johann Gutenberg in 1454 led to the rapid development and dissemination of knowledge, which soon gave rise to modern science in the 17<sup>th</sup> century (Isaac Newton 1642-1726). One effect of this development of knowledge and science was the invention of the steam engine by James Watt in 1776. This gave rise to the Industrialization Wave, where machines in mechanized factories replaced manual labor. As a result, artisan manufacturing was replaced by high efficiency industrialized production. These products were distributed by railways, which have become the driving force behind human mobility. What is essential is that the Industrialization Wave continues to this day because people still need these products. This wave is also called the Industrial Revolution. Its beginnings are marked by the changes in English society due the development of the factory system around the year 1840, which was supported by the development of railways.

## **The Information Wave**

After World War II, computers (starting with ENIAC in 1946), telecommunications networks, and the Internet began to be used, automating the production of services and decision-making and revolutionizing communication between people and organizations on a global scale. This gave rise to the Information Wave, which could not have come into existence without the previous civilizational waves. This wave has radically improved the functioning of both the Agricultural Wave and the Industrialization Wave. Its beginnings are marked by the silent and creeping revolution of personal computers in the year 1980.

## **The Globalization Wave**

The development of hypertext, the World-Wide-Web, and search engines like Netscape, Explorer, Firefox, Safari, and Chrome have resulted in ubiquitous Internet use in every country of the world. This has contributed to the removal of manufacturing from Western civilization to third world countries, where there is cheap labor. Because of high-speed Internet and accessible email communication, the world has seemed to have shrunk. Distance has ceased to be a restriction on communication for companies, which has led to the development of the global labor market and consumers. This process is accompanied by strong support for the free movement of capital without border control. As a result, the global transportation of people and goods in the form of airline industries and transoceanic shipping has developed. This created the Globalization Wave around 2000. An important feature of this wave is the unification of solutions (a la McDonald's) as well as the gradual integration of different civilizations.

## **The Virtualization Wave**

The global use of the Internet has resulted in the emergence of virtual social networks such as Facebook, Instagram, Twitter and others, which has led to the development of virtual communities that operate parallel to real communities and have a strong influence on the them. Gradually, this “virtuality” is

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