Chapter 1
Definition and History of Smart Cities:
The Development of Cities and Application of Artificial Intelligence Technology in Smart Cities

Kangjuan Lyu
SILC Business School, Shanghai University, China

Miao Hao
SILC Business School, Shanghai University, China

ABSTRACT

This chapter summarizes the development of cities, in terms of structural tendencies and the essence and problem of traditional cities. Then the definition of smart cities and their characteristics are discussed. Therefore, the development of AI (artificial intelligence) is the origin and technical basis of smart cities. Through big data and cloud computing, AI will reinvent traditional cities. Finally, varied applications of artificial intelligence technology in smart cities are explored including basic infrastructures such as monitoring systems, urban transportation, urban planning, and public services, such as medical and health, security, and varied fields in life.

1. CITY

In ancient times, people gathered based on their surnames and races which formed the earliest clan tribes (Stavrianos, 1999). Subsequently, in order to achieve higher efficiency and build a more complete system, many large-scale divisions of labor came into existence. This kind of division has not only caused changes in industries but also gradually formed a collaborative geographical situation in space, which could be called city. Today, city can be defined as a permanent and densely settled place with administratively defined boundaries whose members work primarily on non-agricultural tasks (Caves, 2004).

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1.1 The Development of City

The prototype of the city was the market. Market refers to the mechanism and space media that buyers and sellers gather together and transfer resources on a large scale and efficiently to the people who can really play their role by virtue of the independent decision-making of information gathering, exchange, and transaction. As the original self-sufficient society had gradually disappeared, it is trade that encouraged people to gather in a certain area. People then gradually settled down to live in the area, which became the original city.

As technology advances, Division of labor is getting more specific, and collaboration becomes indispensable for production. The increase of in productivity levels leads to the reduction of economic self-sufficiency and growth of markets. The economic ties between urban and non-urban areas become closer. With the increased concentration of population, in cities, megacities, large and medium-sized cities have developed formed, and which then subsequently, develop into megacities, urban circles and metropolitan areas have also developed (Caves, 2004). According to the World Bank database, the world's urban population has reached 4.196 billion in 2018.

1.2 The Structure of City

The structure of the city is about the arrangement of land use (British Broadcasting Corporation, 2013). The urban planners, economists, and geographers in earlier times have developed several models to explain the way different types of people and businesses exist in urban environments. Urban structure can also refer to urban spatial structure, which involves the layout, connectivity, and accessibility of urban public and private spaces.

In 1924, sociologist Ernest Burgess founded the concentric ring model, the first model that explains the distribution of social groups in urban areas. According to this model, a city develops outward from the central point of a series of concentric rings. The innermost ring represents the central business district. It is surrounded by a second ring, which is the transition zone, containing industry and lower-quality housing. The third ring is the area providing housing for the working class, known as the independent worker's quarters. The fourth ring road has newer and larger houses, usually middle-class. The outermost ring is called the commuter zone. This area represents those who choose to live in the suburbs and commute to the CBD every day (Burgess, 1924).

In 1939, economist Homer Hoyt proposed the Sector model. He thinks a city grows in a fan rather than a ring. Certain areas of the city are more attractive for activities. As the city grew, these activities flourished and expanded outward, forming a wedge that became part of the city. To some extent, this theory is just an improvement of the concentric model (Hoyt, 1939).

Geographers Chauncy Harris and Edward Ullman proposed the Multiple nuclei model in 1945. A city contains more than one activity center. Some activities are attracted to specific nodes, while others try to avoid them. Incompatible activities avoid gathering in the same area (Harris, & Ullman, 1945).

With the development of cities, megalopolis became the main form of urban patterns. The concept of a central city has gradually taken shape. It refers to large cities and megacities playing an important role in a certain area and national socio-economic activities that have comprehensive functions or multiple leading functions and serve as hubs. Later, environmental consciousness gradually awakened, and the demands for the construction of eco-city gradually appeared. It modeled on the self-sustaining resilient structure and function of natural ecosystems. When the city developed into the post-industrial stage,