

# **Christaller's Central Place Theory**

## **Introduction**

Central Place Theory (CPT) is an attempt to explain the spatial arrangement, size, and number of settlements. The theory was originally published in 1933 by a German geographer Walter Christaller who studied the settlement patterns in southern Germany. In the flat landscape of southern Germany Christaller noticed that towns of a certain size were roughly equidistant. By examining and defining the functions of the settlement structure and the size of the hinterland he found it possible to model the pattern of settlement locations using geometric shapes.

## **Assumptions:**

Christaller made a number of assumptions such as:

All areas have

- an isotropic (all flat) surface
- an evenly distributed population
- evenly distributed resources
- similar purchasing power of all consumers and consumers will patronize nearest market
- transportation costs equal in all directions and proportional to distance
- no excess profits (Perfect competition)

## **Explanation of some terms: Central Place, low order, high order, sphere of influence**

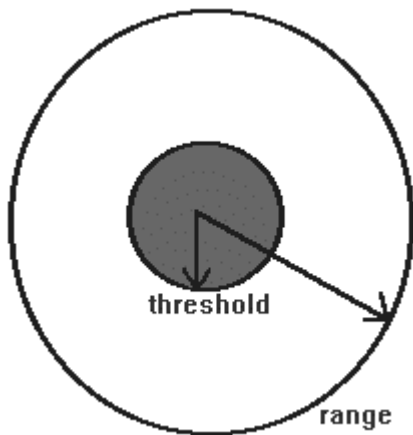
- A Central Place is a settlement which provides one or more services for the population living around it.
- Simple basic services (e.g. grocery stores) are said to be of low order while specialized services (e.g. universities) are said to be of high order.
- Having a high order service implies there are low order services around it, but not vice versa.
- Settlements which provide low order services are said to be low order settlements. Settlements that provide high order services are said to be high order settlements.
- The sphere of influence is the area under influence of the Central Place.

## **Details of the theory**

The theory consists of **two basic concepts**:

- threshold  
-- the minimum population that is required to bring about the provision of certain good or services

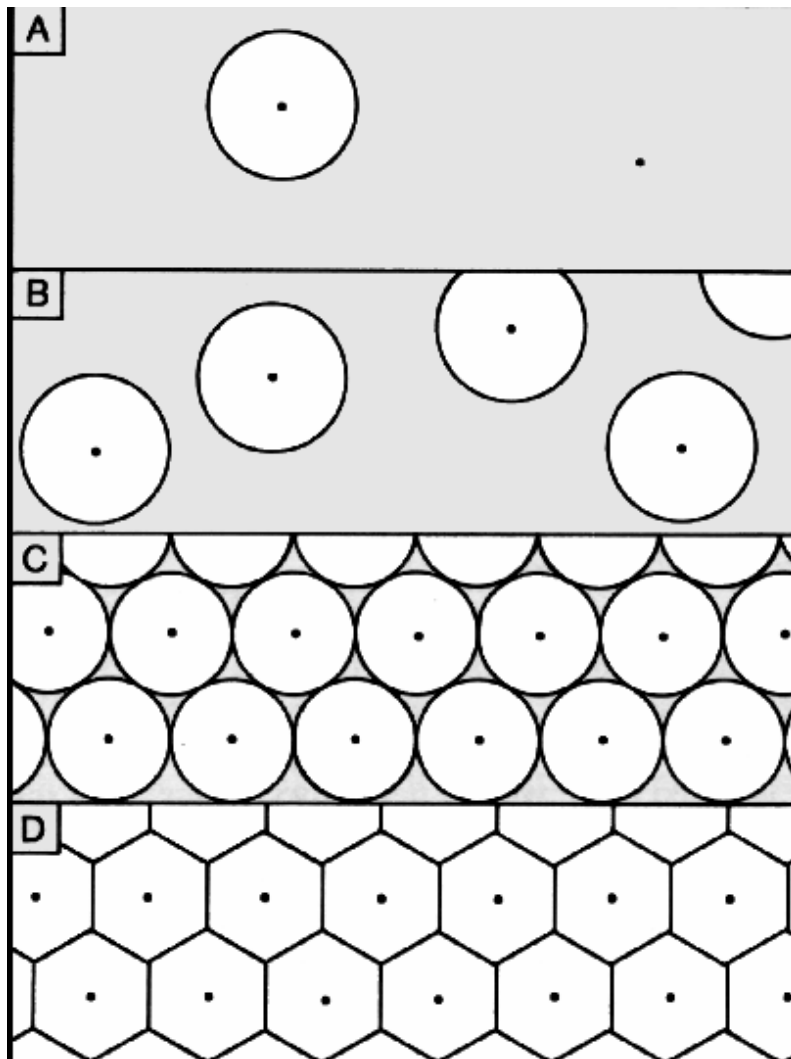
- range of good or services
  - the average **maximum distance** people will travel to purchase goods and services



From these two concepts the lower and upper limits of goods or services can be found. With the upper and the lower limits, it is possible to see how the central places are arranged in an imaginary area.

**Arrangement of the Central places/ settlements::**

As transport is equally easy in all direction, each central place will have a circular market area as shown in C in the following diagram:



However, circular shape of the market areas results in either un-served areas or over-served areas. To solve this problem, Christaller suggested the hexagonal shape of the markets as shown in D in the above diagram. Within a given area there will be fewer high order cities and towns in relation to the lower order villages and hamlets. For any given order, theoretically the settlements will be equidistance from each other. The higher order settlements will be further apart than the lower order ones.

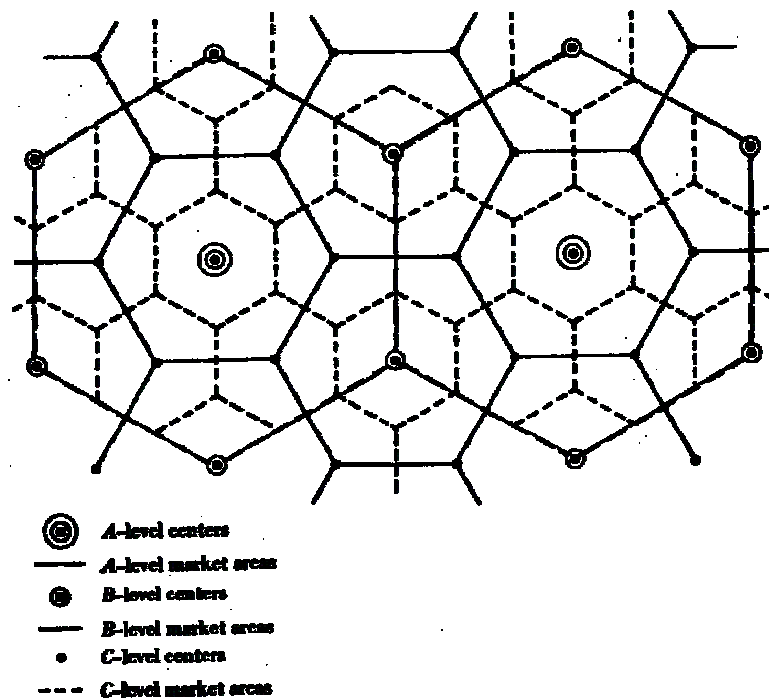
**The three principles in the arrangement of the central places:**

Christaller noted three different arrangements of central places according to the following principles:

1. The marketing principle (K=3 system);
2. The transportation principle (K=4 system);
3. The administrative principle (K=7 system).

1. The marketing principle

The following diagram shows the arrangement of the central places according to the marketing principle. There are \_\_\_\_\_ orders of central places. (note: There can be many orders of settlement.) (a) First order service center providing first order services (b) Second order service center providing second order services. (c) Third order service center providing third order services



The different orders of settlements arrange themselves in a **hierarchy**. Generally speaking lower is the order, larger is the number of settlements and higher the order, greater is the area served.

If the arrangement of the settlements is according to the principle  $k=3$ , the theoretical **number of settlements** will progressively divide the previous order by 3 as shown in the following table:

	<u>Cumulative total</u>	<u>Actual number</u>
7 <sup>th</sup> order	1	1
6 <sup>th</sup> order	3	
5 <sup>th</sup> order	9	
4 <sup>th</sup> order		
3 <sup>rd</sup> order		
2 <sup>nd</sup> order		
1 <sup>st</sup> order		

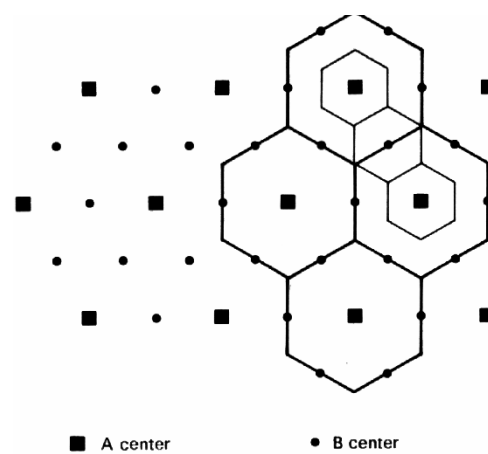
One high order **central place** is serving three (including itself) of the next lower order central places. The relationship of the **market area** between a lower order center and the centers of the higher level can also be indicated by the value 3.

## 2. The transportation principle

Christaller pointed out that the marketing principle is an awkward arrangement in terms of connecting different levels of the hierarchy. As an alternate arrangement, Christaller suggested that central places could be organized according to what he called the transport principle

The traffic principles states that the distribution of central places is most favourable when as many important places as possible lie on one traffic route between two important towns, the route being established as straightly and as cheap as possible. The more unimportant places may be left aside. According to the transport principle, the central places would thus be lined up on straight traffic routes which fan out from the central point.

When Central places are arranged according to the traffic principle, the lower order centers are located at the midpoint of each side of the hexagon rather than at the corner. Thus the transport principle produces a hierarchy organized in a  $k=4$  arrangement in which central places are nested according to the rule of four.



The following table shows how the  $k=4$  principle can be interpreted:

Level of hierarchy	Equivalent number of central places dominated by higher order center	Equivalent number of market areas dominated by higher order center
1. Metropolis	1	1
2. City	3	4
3. Town	12	16
4. Village	48	64
5. Hamlet	192	256

### 3. The administrative principle

Christaller's other suggested organizing principle was based upon the realization that from a political or administrative viewpoint centers it was unrealistic for centers to be 'shared'. Any pattern of control which cuts through functional units is potentially problematical. Christaller suggested that an arrangement whereby lower order centers were entirely within the hexagon of the higher order center would obviate such problems. Such a pattern is shown in the following diagram. All the six lower order centers are fully subordinate to the higher order center which, therefore, dominates the equivalent of seven market areas at the next lowest level.



## Evaluation of Central-Place Theory

The following passages are some of the evaluation of Christaller's central place theory. Can you summarize the ideas?

The pattern of cities predicted by central place theory may not hold because of the failure to meet initial assumptions.

1. Production costs may vary not only because of economies of scale but also by natural resource endowments (i.e. not a homogeneous plain)
2. Transportation costs are not equal in all directions
3. Rural markets (initially households) are not evenly distributed
4. Non economic factors (culture, politics, leadership) **may be** important but not evenly distributed
5. Competitive practices may lead to freight absorption and phantom freight (other forms of imperfect competition)

### **What are the advantages of central place theory?**

The theory does a reasonably good job of describing the spatial pattern of urbanization. No other economic theory explains why there is a hierarchy of urban centers.

Heilbrun wrote: "A hierarchy is by definition a systematic arrangement of the classes of an object." In this case the object is economic centers, large and small. The central place hierarchy provides a description of the relationship between a central place--higher order place--and its tributary areas--lower order places. Once this hierarchy is pointed out, anyone can see it.

(An aside: There is a hierarchy of towns in North Dakota--and make no mistake about it, the four cities top that hierarchy. Hierarchy has become a dirty word in some academic circles, but with central place theory, hierarchy is as natural as the ecological spread of vegetation. The question is--will there be a stable long lasting relationship, or a 'dysfunctional' one? In biology, if one species dominates too much, it ends up killing itself off. The cities need the 'export dollars' provided by people in small towns, and the small towns need the specialized services provided by the cities. A strategy which helps both of them develop--in which state level development resources are shared--seems to be reasonable and wise.)

Central place theory does a good job of describing the location of trade and service activity. (It also does a good job of describing consumer market oriented manufacturing.) Trade and service activity has an increasing relevance as the U.S. economy shifts from manufacturing to services over time. Small-town community economic developers can secure quite specific, relevant information about what kind of trade or service enterprise will likely work, and what kind of enterprise will not likely work in a given small community

#### **Christaller's model will never be found in the real world because:**

- Large areas of flat land are rare, with the presence of relief barriers channelling transport in certain directions
- Government intervention can dictate the location of industry
- Perfect competition is unreal with some firms making more money than others.
- People vary their shopping trends, not always going to the nearest centre
- q People or resources are never perfectly distributed
- q Christaller envisaged each centre with a particular function whereas they have many which change over time

- **Application to Economic Development**

Applying the central place theory, many studies have been done regarding to establishments and retail viability.

For instance, in his article, Shonkwiler (1996) summarized important knowledge already established by other researches.

- 1) Average transportation costs per purchase are lowered by multipurpose shopping trips.
- 2) The consumer might find it desirable to shop at multiple locations on a single trip.
- 3) Not only population but demographic characteristics, socioeconomic structure, potential expenditures, and shopping behavior are the most important factors to explain spatial clustering.
- 4) Although a major tenet of central place theory was that producers tend to locate as far as possible from competitors, firms may recognize the advantages of agglomeration and the benefit of centrality that result from adjacent location.
- 5) The development of central places depends on factors such as transport costs, expenditure shares for relevant goods and the cost characteristics of stores.
- 6) Planning commissions continue their efforts on industrial recruitment while the pursuit of other development strategies such as retail-sector expansion may be overlooked.

Moreover, in his statistical analysis of rural retail business, Shonkwiler (1996) concludes, “retail business interdependencies exist and minimum demand threshold values for various retail sectors are sensitive to the presence or absence of other type of retail firms.”

Additionally, in his regression analysis to rural communities, Mushinski (2002) concludes “incorporating explicit geographic interdependence between establishments in a place and sources of supply and demand in neighboring areas” exists, and is “particularly significant on the supply side.” Moreover, “outlying establishments tend to reduce the number of establishments in a place, which underlines the importance of spatial competition in retail development.”

## Central Place Theory in Australia

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Walter Christaller Central Place Theory" states that the central place (Melbourne) provides the hinterland with goods and services that are of high cost where as low cost necessities would be

supplied by local markets in the hinterland. High cost goods would be sold in larger cities because the thresholds for these goods would be high enough to sustain a store. Low cost necessity goods like bread and milk would be sold at small markets in the small towns surrounding the central place. In light of this theory we can see that population distribution would decrease as you made your way out of the central place and then begin the rise again as one became closer to the next central city. At the midway point between the two central cities you would find the least expensive land. This land was often used for purposes such as farming and grazing.

Christaller's theory, however, does not hold in Victoria for several reasons. To begin, there were only few supporting cities located around Melbourne like Bendigo, Ballarat and Geelong (all to the west). There were no other central cities either, the nearest would be Sydney which is over 900 kilometers from Melbourne. There were however, a multitude of small cities caused by the gold rushes of the mid and late 1800s. This caused Melbourne's hinterland population to fall dramatically as it reached the outback. This would lead us to believe that Melbourne could be sketched as a central city with several concentric circles, each one holding less and less population. This concentric circle concept is altered by the fact that Melbourne is sitting on the rather large Port Phillip Bay.

The largest factor contributing to the non-conformation with the Central Place Theory is the actions of government officials in Melbourne. After the initial railroad entrepreneurs fell into bankruptcy the government was forced to buy them out and make a go of it themselves. However, these government officials found they could use the railroad to line their own pockets. The scheme went as follows; First, the officials would trek out into the bushland and purchase cheap grazing land. Then, they would build a railroad line out to their once inexpensive land. This caused land prices to soar. The more wealthy middle and upper-class citizens would purchase the now subdivided land and build their own houses. Public transportation made it possible for these citizens to reach the outer suburbs. Reasons for this were threefold: transport time in and out of the city was now very small. Train transport was much faster than omnibuses and trams; they provided exact schedules which made it possible for passengers to rely on them for everyday transport; the price of a ticket was within the budget of its upper and middle-class passengers.

This caused a ring of unused land between the central station (Flinders Station) in Melbourne and the final termini of the railroads. The unused land stayed unused because the lower-class workers still had to be within walking distance of their work and the mid and upper-class preferred to either be in close, upper-class, suburbs like St. Kilda, Windsor, Brighton and Kew or in the far out suburbs of Frankston, Pakenham and Whittlesea.

This situation, however, fixed itself over time. Lower-class workers became more wealthy due to government intervention in the case of workers rights and to the rise of unions. This new found wealth allowed them move out of walking distance and into the previously uninhabited band of land between the outer and inner suburbs. Another factor leading to the settlement of the inner area was that the railroad made an allowance for special worker trains that cost less and were directed right to the factory areas.