

Analysis vs synthesis

Synthesis is a sister method to analysis that involves using a systems approach to study complex situations. It does not replace analysis. Both approaches are complementary.

Synthesis comes from the ancient Greek σύνθεσις, meaning "with" (σύν) and "placing" (θέσις). It refers to "a combination of two or more entities that together form something new" (Wikipedia). According to the preeminent systems scientist Russell Ackoff, it is a three step process that involves

1. seeing the system as part of a larger system,
2. trying to understand the working of the system as a whole, and how the parts work together rather than individually,
3. and only then disaggregating our understanding of the whole into an understanding of individual parts by identifying its role or function in the system of which it is a part.

Analysis also involves three steps:

1. taking the object or problem apart,
2. trying to understand each part taken separately
3. and then aggregating the understanding of the parts into an understanding of the whole

According to Ackoff analytical thinking explains what the parts do and how they work whereas synthetic (or systems) thinking explains why the parts do what they do. Analysis helps obtain knowledge. Synthesis helps obtain understanding.

In his major work "General System Theory", Ludvig Von Bertalanffy uses the following simple demonstration to describe situations appropriate for synthesis rather than analysis.

1. **a** ○○○○ **b** ○○○○○ Any group of objects can be described by their *number*, their *species* or the *relations* between them. The groups *a* and *b* in case 1 differ only by their number. The groups in case 2 differ by their species, or color. In these two cases each group may be understood as the sum of each of the elements in isolation. We can describe the difference between groups *a* and *b* by their
2. **a** ○○○○ **b** ○○○●
3. **a** ○—○—○—○ **b** 

number in case 1 and by their color in case 2. The characteristics of cases 1 and 2 are **summative** as they can be obtained by summing together the behavior and the characteristics of each individual element in isolation. As there are no relations between the elements, their characteristics are the same both within and outside the group. Analysis is an appropriate approach in cases 1 and 2.

In case 3, not only the properties of the elements must be known but so must the relations between them. The characteristics of case 3 are **constitutive** as they depend on the specific relations between the elements within the group. To understand these characteristics we must know something about both the parts and the relations between them. In this third case, a systems approach (systems/synthetic thinking) is necessary to preserve the links between the elements.

References

Bertalanffy, L. (1969). *General system theory: Foundations, development, applications*. New York: George Braziller.

Ackoff, R. L. (1999). *Ackoff's best: his classic writings on management*. John Wiley & Sons.