Time Complexity Analysis

The basic ideology of the algorithm is that the last element is always the pivot. So iteratively this algorithm will choose the last element of the sorted sub-sections as the pivot.

Worst-Case Scenario:
Consider the example [1, 2, 3, 4, 5, 6, 7, 8] or [8, 7, 6, 5, 4, 3, 2, 1] where the vector is sorted either in an ascending or descending order. The pivot is the extreme element in both the cases, either the smallest or the biggest element of the group. If the vector is ascending, all the elements will be on the left side of the pivot. The new pivot is going to be the (n-1)th element for the next iteration. This goes on until all the elements are exhausted, that is, the first element. So the number of comparisons in the first iteration is n, second iteration is n-1, third is n-2, so on until the last iteration which is 1. Hence, it is going to be n + (n - 1) + (n - 2) + … + 3 + 2 + 1 = n^2. This holds good even for vectors in descending order where the pivot element is the smallest and all the elements will shift to the right of the pivot after every iteration and the pivot will be the next smallest number.
Therefore, Worst-Case Time Complexity is O(n^2).

Best and Average-Case Scenario:
For best-case scenario, consider the example [1, 6, 2, 7, 3, 8, 4, 5] and for average-case scenario, consider any vector such as [4, 3, 5, 2, 1, 3, 2, 3]. In best-case, the pivot divides the vector into 2 equal halves and in average case, the pivot divides the vector into (i) and (n - i) parts. Iteratively, the number of elements and comparisons keeps reducing by half in best-case and in average-case it reduces a factor which is more or less equal to half. Hence, the time complexity is T(n) = 2*T(n/2) + constant*n for best case and for average-case, it will be T(n) = T(i) + T(n - i) + constant*n.
Iteratively, these 2 scenarios will converge to n*log(n) as the vector keeps reducing by half further and further in the best-case scenario and by a variable factor in the average-case scenario.
Therefore, Best and Average-Case Time Complexity is O(n*log(n)).