Conversion of mechanical energy into electricity using triboelectric nanogenerators (TENGs) is a rapidly expanding research area. Although the theoretical origin of TENGs has been proven using the Maxwell's displacement current ($I_D$), a profound quantitative understanding of its generation is not available. Moreover, a comprehensive analysis of the fundamental charging behavior of TENGs and building a standard to evaluate each TENG's unique charging characteristic are critical to ensure efficient use of them in practice. We present a thorough analysis of TENG's charging behavior through which a more complete evaluation of TENG charging is proposed by introducing the structural figure of merit (FOMCs) in a charging system (powering capacitors). The analysis is based on Maxwell's displacement current and results are verified experimentally. To achieve this, according to the distance-dependent electric field model, we provide a systematic discussion on the generation of $I_D$ in TENGs, along with the derived analytical formula and numerical calculations. This work suggests a new way to deeply understand the nature of the $I_D$ generated within the TENGs; and the modified FOMC can be used to predict the charging characteristics of TENGs in an energy storage system, allowing us to utilize the TENGs more efficiently towards different applications.