Numerical soil classification: A missed, but not a lost, opportunity

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Abstract
The history of numerical soil classification from its advent in the 1960s is reviewed. The current and future possibilities for a numerical approach are explored in the light of available large soil databases and prior soil classificatory knowledge.

Key Words
World Reference Base for Soil Resources (WRB), numerical taxonomy, Soil Taxonomy, pedometrics, numerical soil classification.

Introduction
The idea of numerical classification comes from the 1770s – the so-called Adansonian approach (Michel Adanson, French botanist, 1727-1806). This notion came into reality in the 1950's and 1960's with the advent of digital computers and numerical analysis. This movement was largely led by biologists.

History
Soil scientists were involved in the early stages of numerical taxonomy and many experiments with numerical soil classification were completed. However these were generally local studies of limited scope. The jump to national and international studies was not made, largely, we believe, because of the lack of good national and global soil databases in the 1970's and '80's.

Discussion
Today, we have good national and international databases, much faster computers, and better pedometric methods such as continuous classification (with fuzzy k-means with extragrades), so the possibility of global numerical classification is good. But, is it too late? Many would argue that the era of soil classification is past. We believe that there is still a great need for improved and new ways of ordering soil information. There are some choices to be made however. Do we create classes of soil horizons and/or profiles? Do we use all soil properties to define and allocate soil classes? Do we create such classes *ab initio* or do we start with centroids of pre-defined classes (e.g., WRB diagnostic horizons or Soil Taxonomy suborders) with the aim of improving them? Do we use new technologies such as NIR and MIR reflectance spectra to generate data for classification?
It is clear however that at least the concept of taxonomic distance is essential for the improvement of all conventional national and international soil classification systems.

Conclusion
The time for numerical soil classification based on large global datasets has arrived.