The sound systems of the world languages exhibit properties that fit the framework of complex adaptive systems well. Their multi-layered structure - sound systems are composed of segments (vowels, consonants or diphthongs), which can themselves be decomposed into smaller units (features) – leads to an huge space of possible types, yet observed systems, while being highly variable, display significant regularities in the distributions and interactions of segments and features. Explanations for this organization have to be found in the individual histories of languages as well as in general constraints, whether articulatory, perceptive or cognitive. In the last decades, various theoretical frameworks have been put forward to describe the latter mechanisms, focusing on concepts such as ‘feature economy’, ‘ease of articulation’, ‘ease of perception’, ‘sufficient’ or ‘maximal’ dispersion etc. Previous approaches are often tested against a variety of languages, yet sometimes remain more qualitative than quantitative. Additionally, if many studies have focused on vocalic systems, consonantal systems remain more elusive. We therefore try to offer a range of quantitative approaches that depart from more traditional linguistic approaches. To this end, we have been ‘data-mining’ the UPSID database, which contains a carefully balanced sample of 451 languages from all linguistic families. We will review a range of attempts at deciphering the complexity of sound systems, taking into account the limits of our dataset: i) revisiting the notion of feature economy with respect to the description length of the linguistic descriptions, ii) analyzing the boundedness of the dataset and its statistical consequences, iii) trying to derive evolutionary models from synchronic data.