



## The impact of the evolution of structural analysis methods on built forms

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### Summary

Over the last decades, the new technical means and methods, and in particular computing technology, have become more and more popular and efficient and their capabilities evolved exponentially in due time. This development has led to the present situation, where structural analysis has stopped being a hindrance to the development of projects with geometrical and construction complexity.

This paper explores the impact of the available design tools, especially in the field of structural analysis, on the built forms in each historical period. This process is studied through a detailed time-line, relating the evolution of built forms with the historical developments in the fields of construction materials, structural analysis methods, etc.

**Keywords:** Structural analysis, architecture, digital revolution, computer technology, CAD, FEM, NURBS, parametric.

### 1. Introduction

Throughout history, in the field of architecture, as in many other areas, the imagination of creators has gone well beyond of the technical and construction possibilities of their time. Thus, many of these new ideas have required a long period to materialize until the scientific, technological and industrial development had enough time to catch up.

From the old building masters, who used simple rules of proportion based on experience for the design and construction of their structures, to the present day, when the use of computers and specialized software is generalized, structural analysis methods have undergone a constant development process.

The major technological and industrial development emerged especially during the second half of the last century has configured a fertile breeding ground for the transformation of architectural forms in a radical and disruptive way. This process has been supported not only in technological advances but scientific also.

In the architecture field, these technical limitations have therefore gradually tightened leading to the current situation in which any formal approach can be represented and analysed from a structural point of view, thus concluding that the structural analysis and the graphical representation's barrier in the development of architectural projects has disappeared [1].

Throughout the following pages it is examined how the development of the Finite Element Method in the 50's and the Bezier curves in the 60's of the last century and the subsequent spread of personal computers and specialized software in the architectural and engineering offices from the 80's and 90's, enabled the development of any architectural proposal independently of its complexity. This has caused a revolution at a formal level in architecture, especially in the field of iconic building [2].