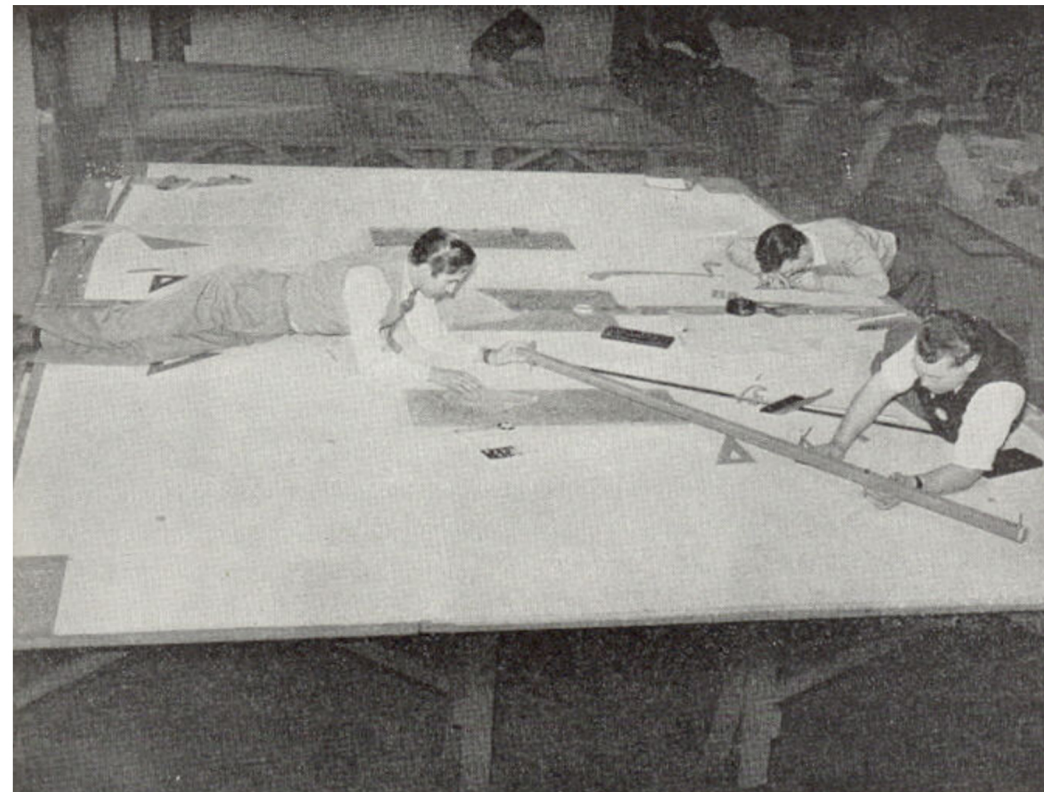Naim Korqa

GENERATIVE DESIGN FOR BIM
Its Influence in the Design Process
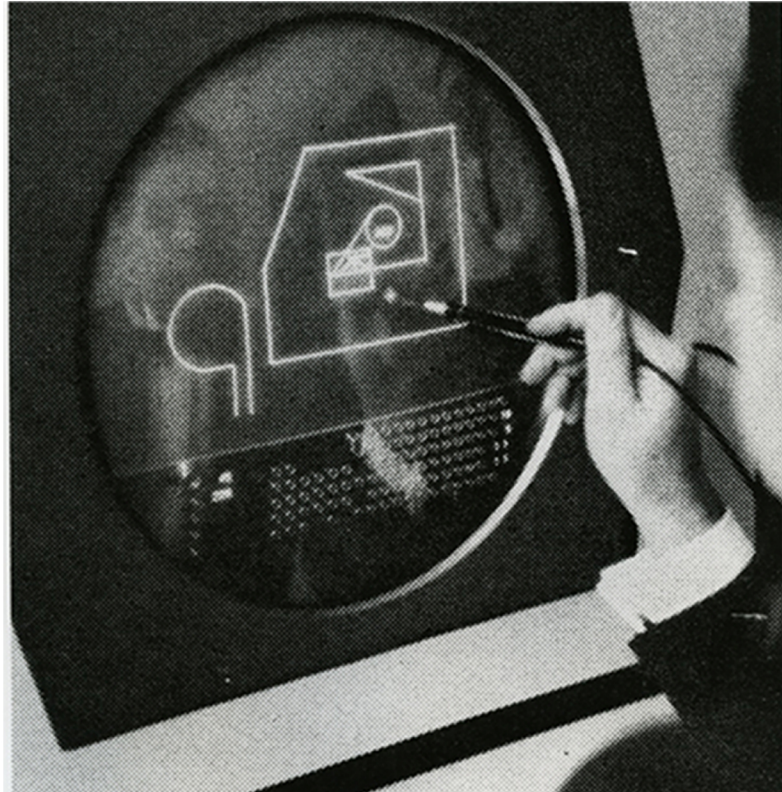
TÉCNICO LISBOA

November 2015

Introduction

Computer Aided Design (CAD)

Computer Aided Design

MIT Sketchpad program, ca.1965
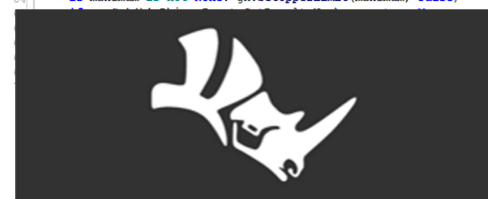

Keith Bentley begins selling MicroStation

CAD + Scripting

AUTOLISP - AUTOCAD

RHINOSCRIPT-RHINOCEROS
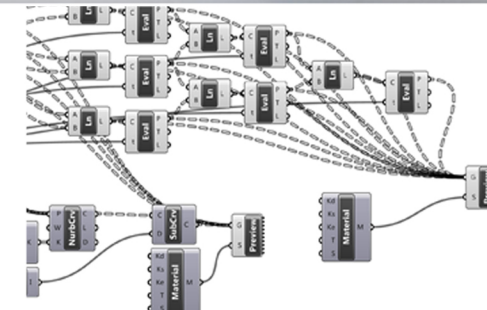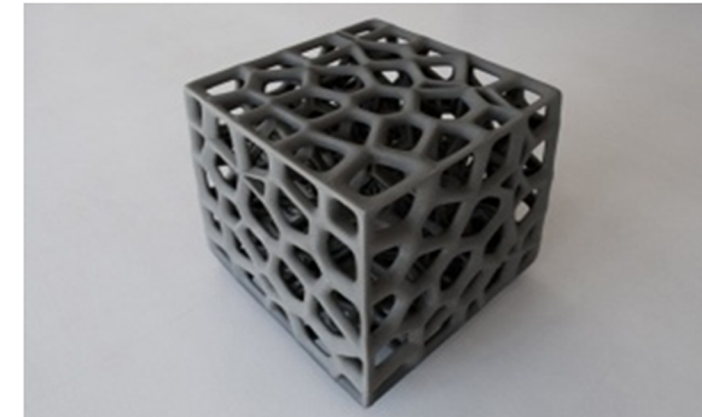
GRASSHOPPER-RHINOCEROS

Building Information Modeling (BIM)

FOUNDATION LOUIS VUITTON
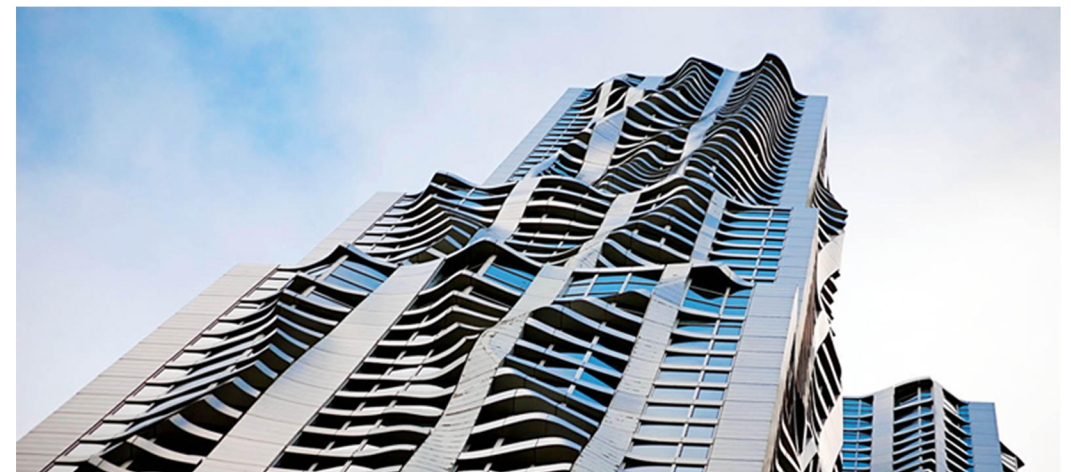
BEEKMAN TOWER

Building Information Modeling

BIM advantages:

- 2D drawing & 3D model

- project information

- energy analyses

- collaborative design

- scheduling

- clash detection

- cost estimation

Generative Design
(GD)
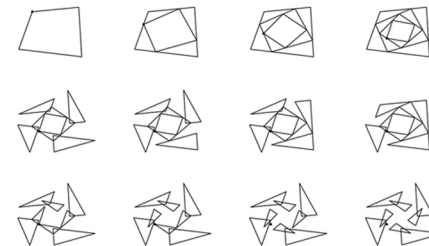
Shape Grammar
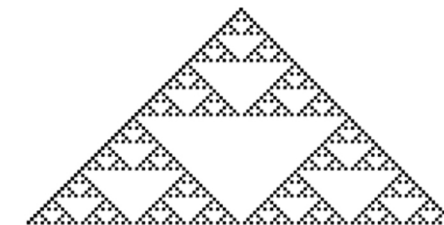
Cellular Automata
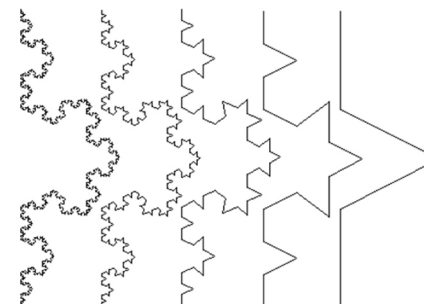
Fractals
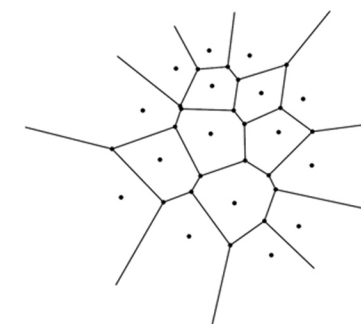
Voronoi Diagramas
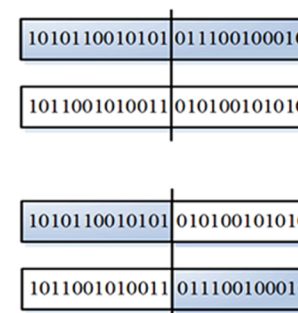
Genetic Algorithms
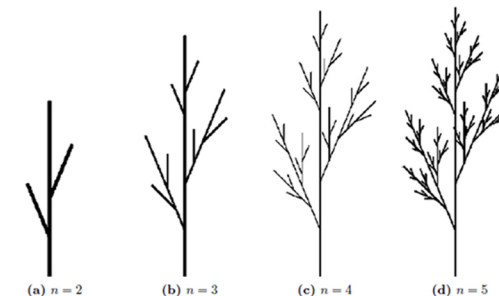
L-systems

Generative Design + BIM
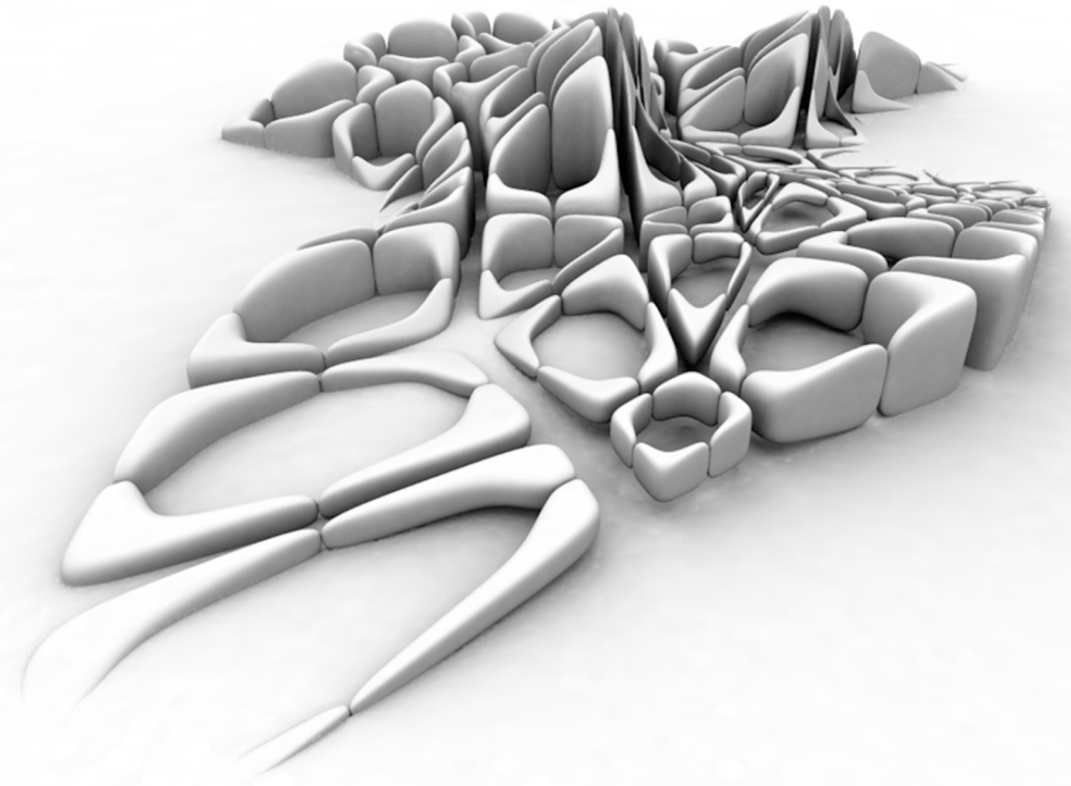
Generative Design + BIM
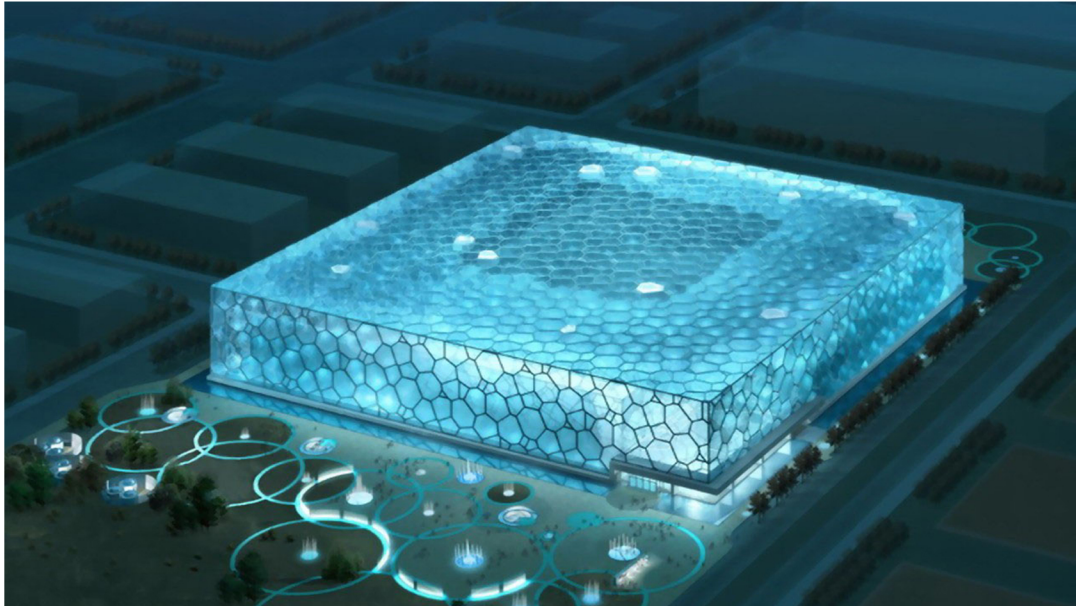
BEIJING NATIONAL AQUATIC CENTER
Architect: PTW architects & OVE Arup

AVIVA STADIUM
Architect: Populous & Scott Tallon Walker

NEW WORKFLOW
IN THE DESIGN PROCESS

Generative
Design

NEW WORKFLOW
IN THE DESIGN PROCESS

TÉCNICO
LISBOA

TRADITIONAL DESIGN WORKFLOW

CLIENT → DESIGNER → PROBLEM STRUCTURING → DECIDE THE WORKFLOW

DESIGNER → CONCEPT TESTING → DESIGNER → SCHEMATIC DESIGN → DESIGNER → DESIGN DEVELOPMENT → DESIGNER → CONSTRUCTION DOCUMENTS

CLIENT CONTRACTORS → CONSTRUCTION

DESIGNER PROGRAMMER

DESIGNER → CONCEPT TESTING → PROGRAMMER → SCHEMATIC DESIGN → DESIGNER → PROGRAMMER → DESIGN DEVELOPMENT → DESIGNER → PROGRAMMER → CONSTRUCTION DOCUMENTS

GENERATIVE DESIGN WORKFLOW
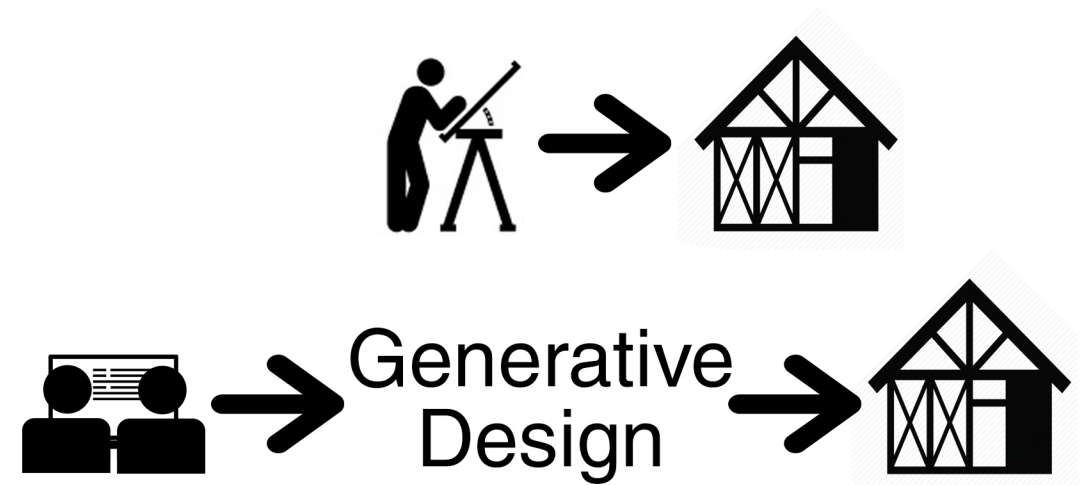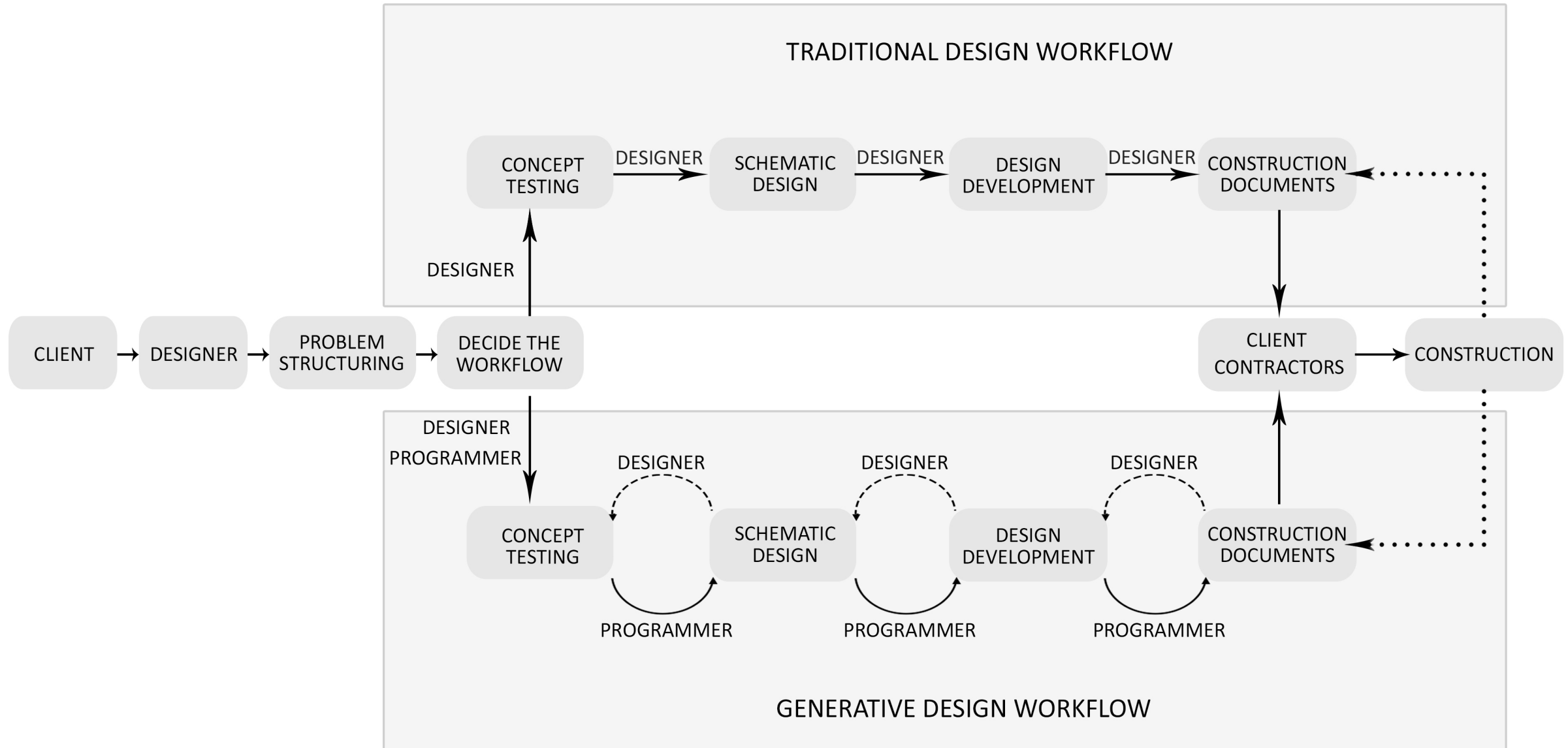
Complexity depends on the:

- amount of description

- amount of elements needed

- time and effort involved

- number of elements in a system

- number of types of elements

- interrelationship between elements

- hierarchical relationships

- variety of modes of operation

Scale factors:

- type of program
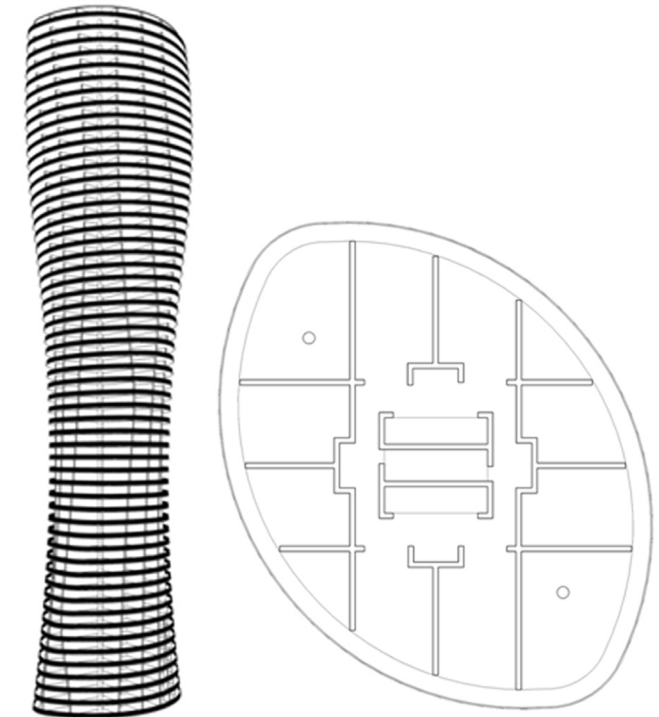
- project duration

- client and

- project cost

	SMALL SCALE	BIG SCALE
NON-COMPLEX	**BIM**	**BIM+Macro**
COMPLEX	**GD+BIM**	**GD+BIM**

EVALUATION

Absolute Towers exterior image/ plan

Production of the model

BIM	GD
2h 14 min	14 h

EVALUATION
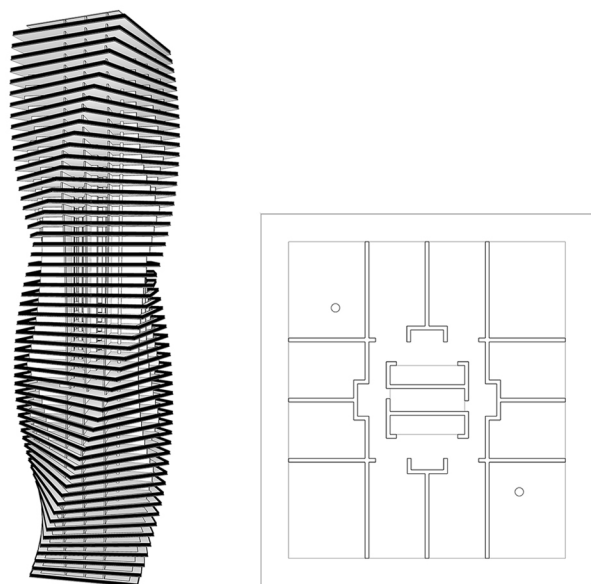
rectangle slab shape

BIM	GD
1h 25 min	10 min
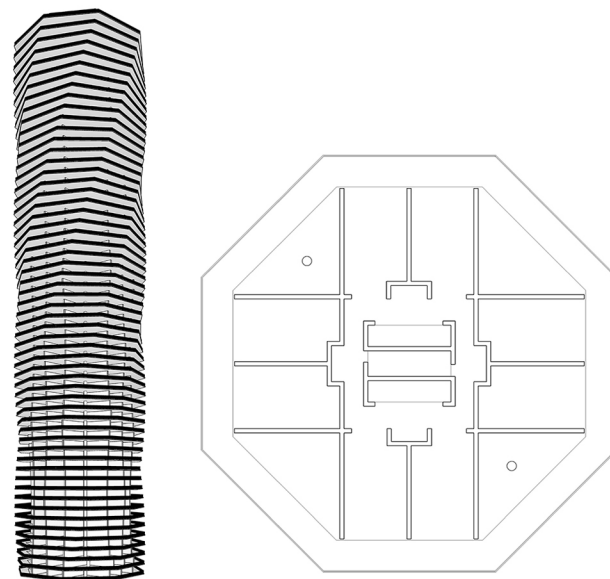
octagonal slab shape

BIM	GD
1h 35 min	11 min
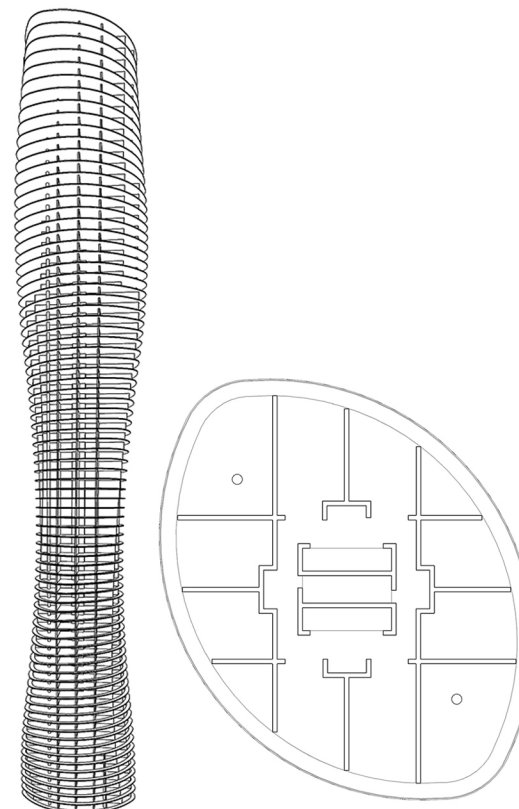
80 levels

BIM	GD
48 min	7 min
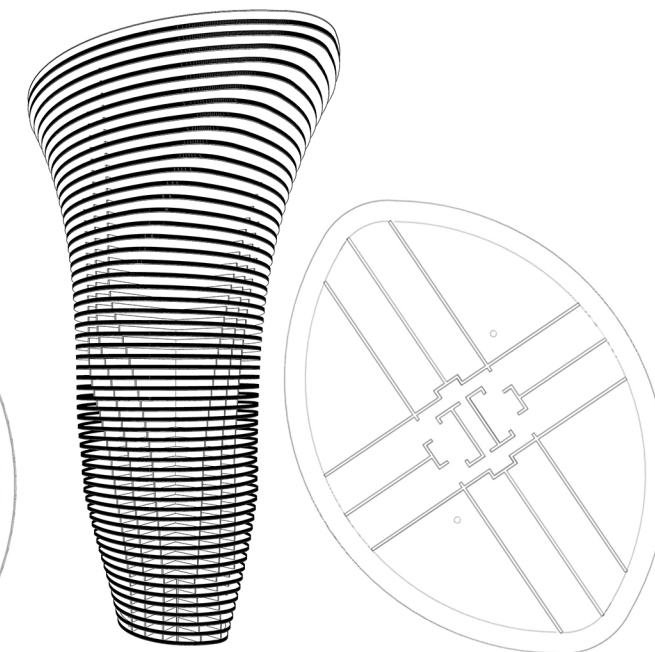
increasingly slab area

BIM	GD
1h 52 min	4 min

CONCLUSION

- conceptual freedom to make changes

- more solutions and alternatives

- high performance design