

# Topic

- **14:00~14:20**
  - > 설계자동화 및 인공지능 형태의 Generative Design기술  
(임민수전무, 엠듀)
- **14:20~14:35**
  - > ATC/AAP계약서 변경과 서명 방법 설명  
(Selina Shen, Partner Program Support Manager, Autodesk/  
임민수전무, 엠듀)
- **14:35~14:40**
  - > 3D모델링 디자인 공모전 설명 (채훈차장, 엠듀)
- **14:40~15:00**
  - > Q &A

SEN  
경제 라이브



# 현대차, 걷는 무인 모빌리티 '타이거' 공개



발행일 2021-02-10 10:34:57

오토데스크와는 AI 기반의 '제너레이티브 디자인(Generative Design)' 기술로 타이거의 다리, 휠, 샴시, 타이어까지 가볍고 견고한 3D 프린팅 제조가 가능하도록 설계 부문에서 협업했으며, 선드버그-페라는 외부 스타일링, 차체, 샴시, 다리 부품 설계 및 소프트웨어 개발 부문에 참여했다.

※ 제너레이티브 디자인(Generative Design): 설계자가 설정한 조건과 정의에 따라 수백, 수천 개의 최적화된 디자인을 신속하게 제시할 수 있는 방법

## 오토데스크 제너레이티브 디자인 - 슈퍼카 휠 설계에 적용

이상준 기자 © 2020년 4월 1일 설계, 엔지니어링S/W, 제조 뉴스 Leave a comment  
1,793 Views

- 슈퍼카 BAC Mono 휠 설계에 적용, 무게 35% 절감 및 설계 시간 대폭 감소



# The Future of Making

제조  
건축/토목/플랜트/건설

임민수

전무, 엠듀 | [mslim@eatc.co.kr](mailto:mslim@eatc.co.kr)

AUTODESK.









수요는 날로 증  
가하는데



자원은  
한정적입니다



2050년까지

62%

전기 에너지 수요 증가

\$13.3조

투자 필요





# 40%

제조 기업, 전문 인력 부족





# 1.3억 + 개

자동화 관련 일자리 창출



A worker with a beard and safety glasses is seen from the side, working at a wooden desk in a factory. He is using a laptop that displays a 3D simulation of a robotic arm. In the background, a large industrial robotic arm is visible through a glass partition. The scene is brightly lit with natural light from large windows.

# 54%

새로운 기술 및 숙련도 향상 요구





372,000

신규 제품 수/년





**13,000**

신규 빌딩/년



**\$3.7T**

인프라투자/년







MORE  
IS INEVITABLE  
LESS






# THE OPPORTUNITY

A close-up photograph of a black robotic gripper, likely from a LEGO Mindstorms set, holding a small green LEGO brick. The gripper's fingers are positioned on either side of the brick, which is placed on a reflective surface. The background is a blurred orange-brown wall. The word "BETTER" is overlaid in large white letters.

# BETTER





# 자동화

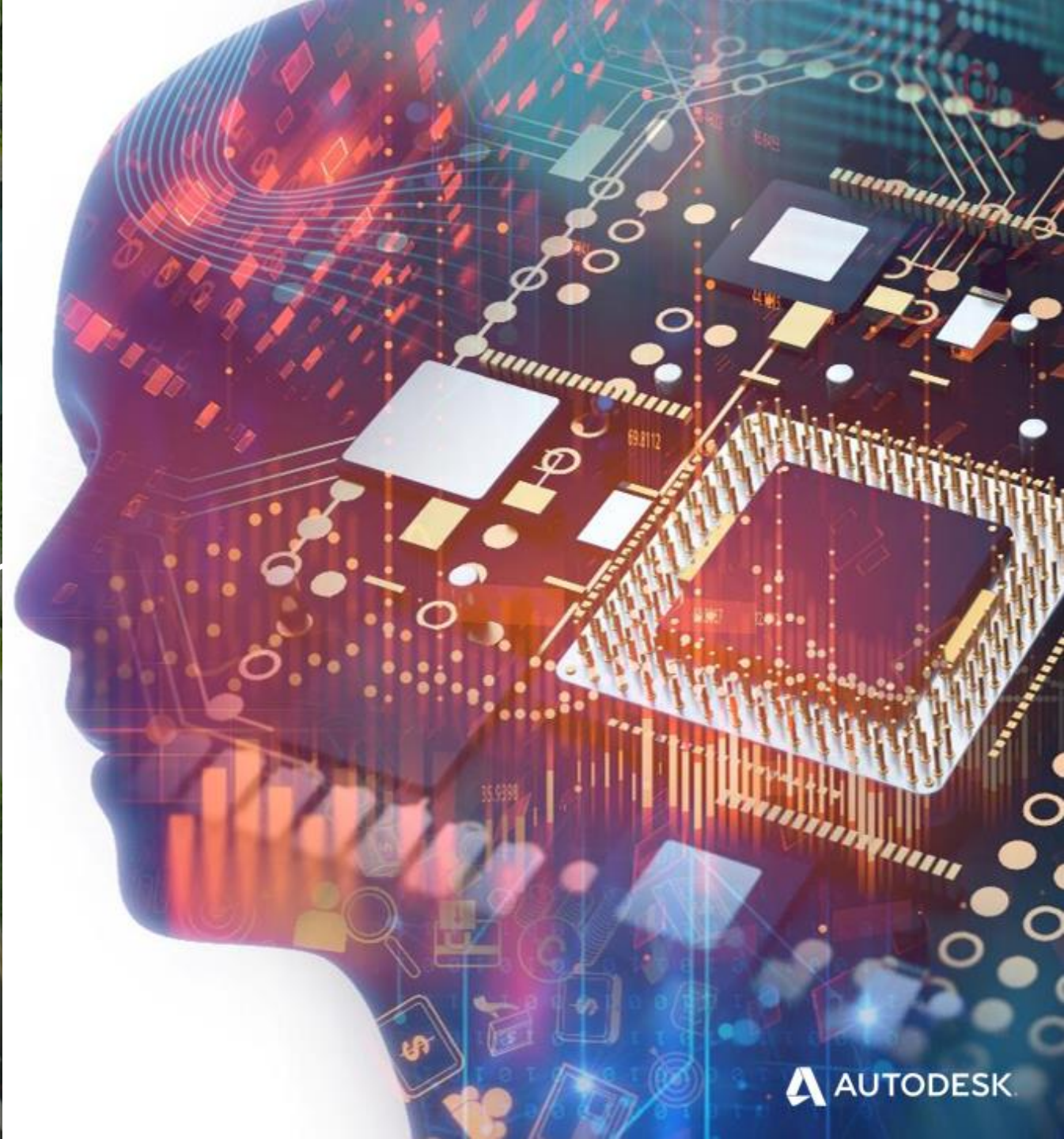
## Automation



# 인공지능 기반 적용 사례 GENERATIVE DESIGN:

A form of artificial intelligence, dedicated to the creation of better outcomes for products, buildings, infrastructure and systems.

The Future of work  
Powered by Generative Design











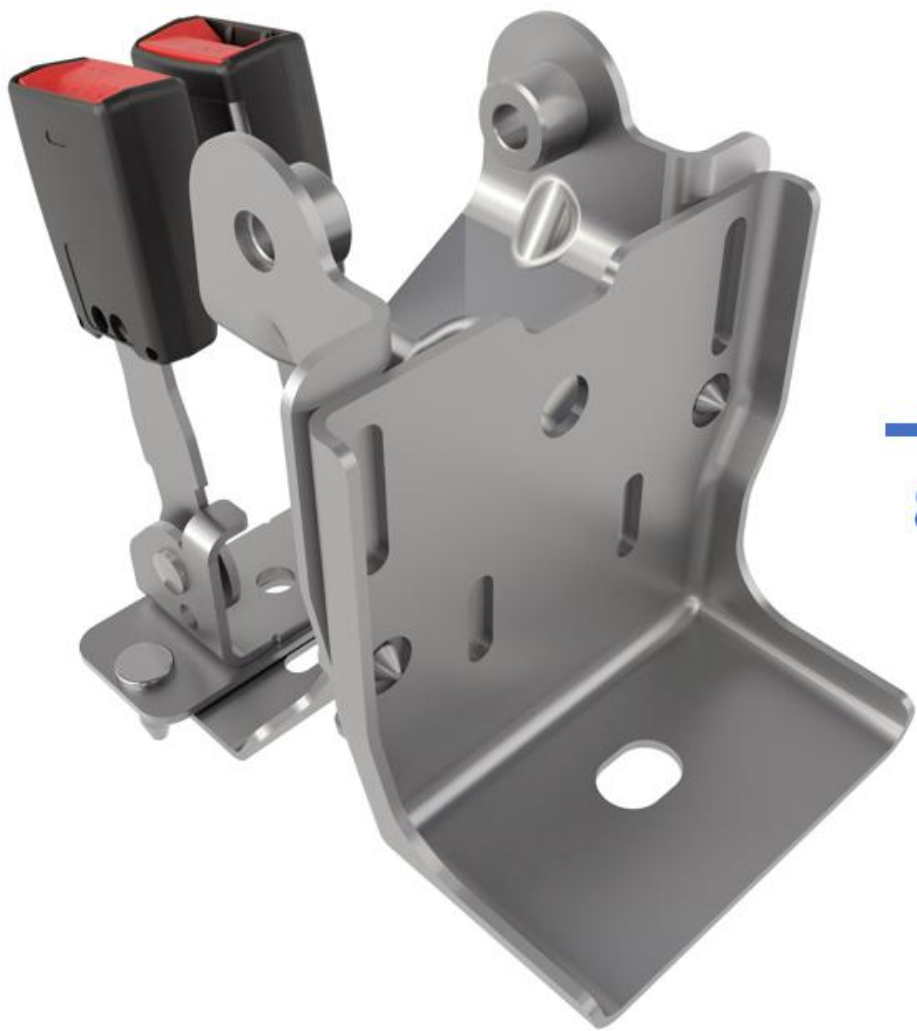












## Generative Design & Additive Manufacturing

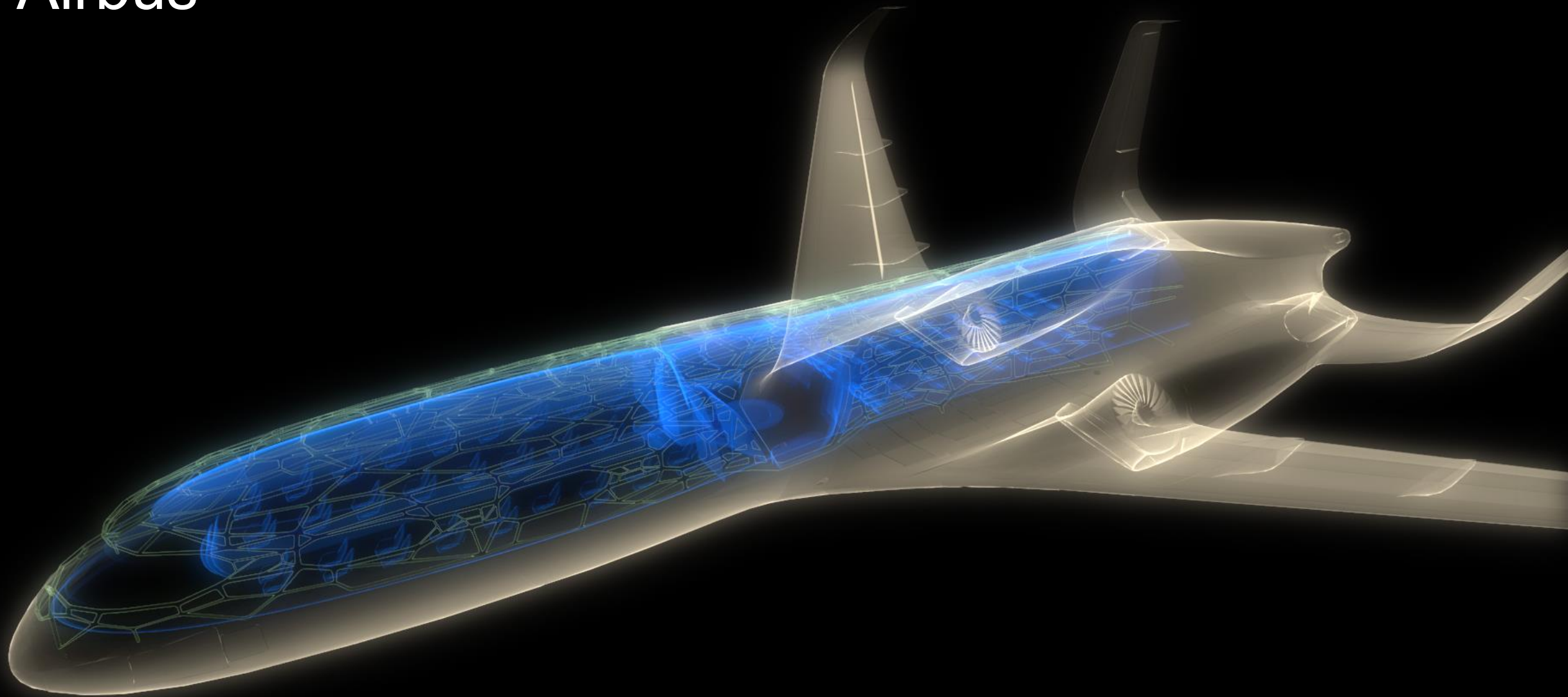


8 components into 1 part  
40% lighter  
20% stronger





# Airbus

















Regenerate

Input/Output

Time/Cluster

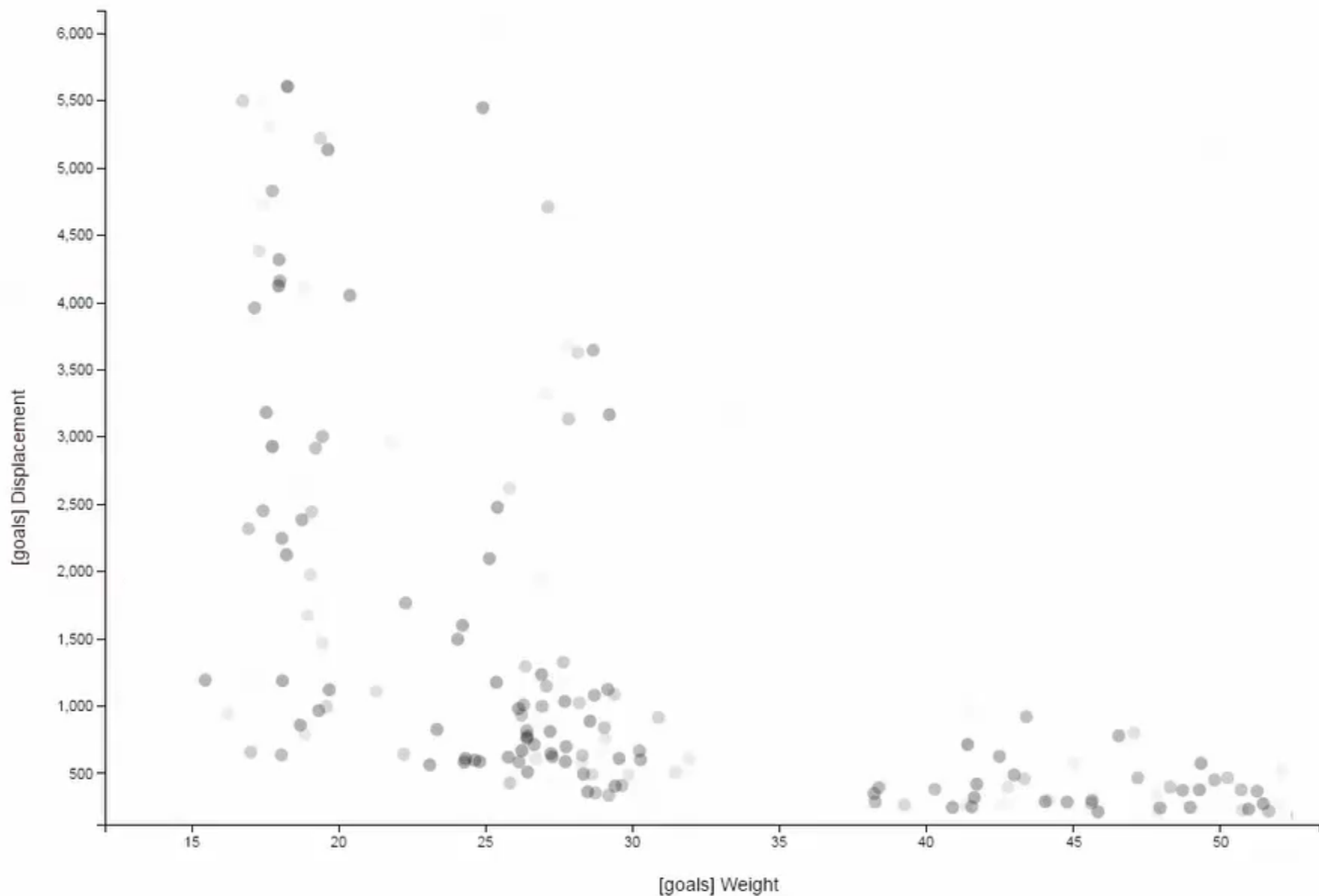
Pareto Designs:

Show/Hide

Isolate

X-axis: Weight ▼

Y-axis: Displacement ▼







FUSION 360





# 건설산업의 디지털 혁신 전략

임민수전무  
마케팅  
(주)엠듀  
2021.6.29.





# 국토부, BIM 인공지능 활용 건설자동화 기술

 국토교통부		<b>보 도 자 료</b>		<div>2018 평창 동계올림픽대회 및 동계패럴림픽대회</div> <div>하나 된 열정 하나 된 대한민국</div> 
		배포일시	2018. 1. 2.(화) 총 5매(본문4)	
담당 부서	기술정책과	담 당 자	· 과장 정채교, 서기관 정양기, 주무관 김종현 · ☎ (044) 201 - 3557, 3553	
보 도 일 시		2018년 1월 3일(수) 조간부터 보도하여 주시기 바랍니다. ※ 통신·방송·인터넷은 1. 2.(화) 11:00 이후 보도 가능		

## BIM·인공지능 활용 건설자동화 기술 2025년까지 개발 건설기술진흥 기본계획...가상시공·부재 모듈화 제작·로봇 통한 현장 조립

참 고	제6차 건설기술진흥기본계획 추진방향
비전	<b>“Smart Construction 2025”</b> <b>- 2025년까지 3D 프린터, AI 적용한 건설자동화 기술 개발 -</b>
주요 목표	<ul style="list-style-type: none"> <li>■ 건설 노동생산성 40% 향상*, 사망자 수 30% 감소**                      건설 Eng. 근로시간 단축 20%***                 </li> <li>* 시간당 생산성(한국생산성본부) : ('15) 13.6\$ → ('20) 19\$</li> <li>** 건설업 사망자 수(안전보건공단) : ('16) 554명 → ('21) 388명</li> <li>*** 연간 근로시간(Eng. 노동계) : ('13) 2,560시간 → ('21) 2,100시간</li> <li>■ 건설Eng 해외수주 100% 확대*</li> <li>* 해외수주 통계(해외건설협회) : ('16) 17억\$ → ('22) 34억\$</li> </ul>

## 【 4차 산업혁명에 대응하는 스마트 건설기술 개발 】

○ 현장에서 작업이 이루어져 정밀 시공이 어렵고 안전사고 발생 가능성이 높은 단점을 극복하기 위해,

- 3차원 설계기술인 BIM을 활용하여 가상으로 시공(VR)후에, 3D 프린터를 활용하여 공장에서 건설 부재를 모듈화하여 제작하고, 인공지능(AI)을 탑재한 건설 로봇에 의해 조립·시공하는 건설 자동화 기술을 2025년까지 개발 할 계획이다.



- 이와 더불어 드론, 사물인터넷(IoT) 센서, 초소형(마이크로) 로봇 등을 활용하여 시설물의 이상을 신속하게 검지·대응하는 시스템 개발도 적극 추진할 계획이다.

○ 또한 현재 개발 중에 있는 BIM 기술 활용을 유도하기 위해 설계 기준 및 매뉴얼을 마련하고, 2020년까지 500억 원 이상의 도로 사업에 BIM 설계를 의무화한다.





# DESIGN AUTOMATION

설계 자동화를 통한 생산성 증대





70%

반복적이고 시간 낭비적인 설계 업무





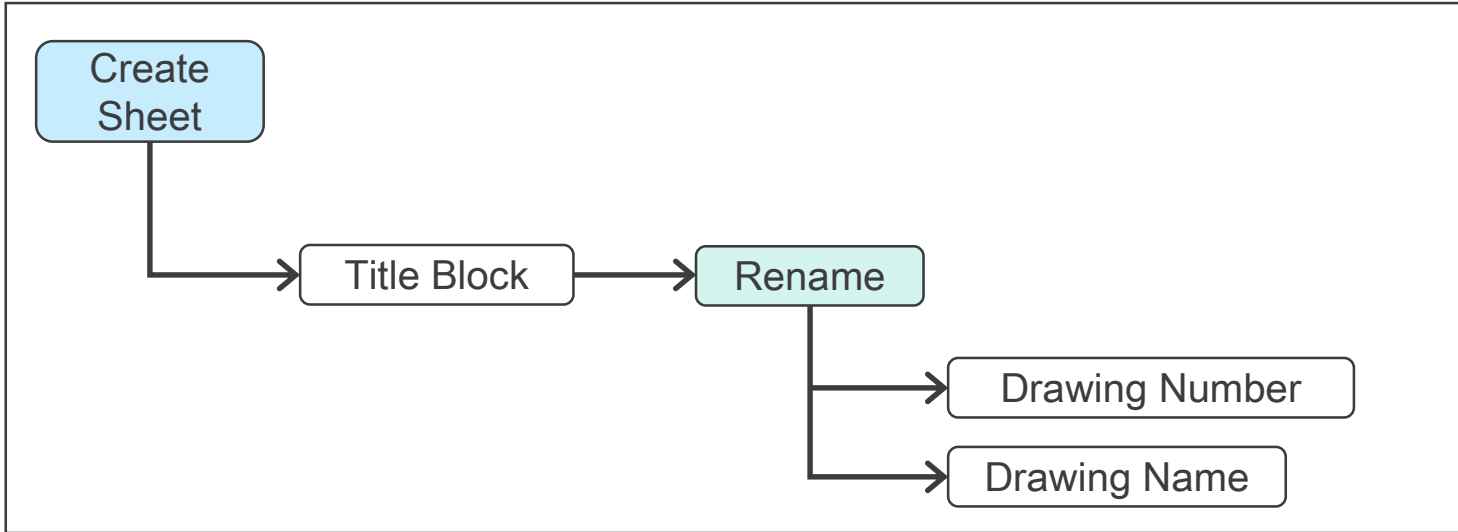
AUTODESK<sup>®</sup> DYNAMO

시각적 자동화 툴



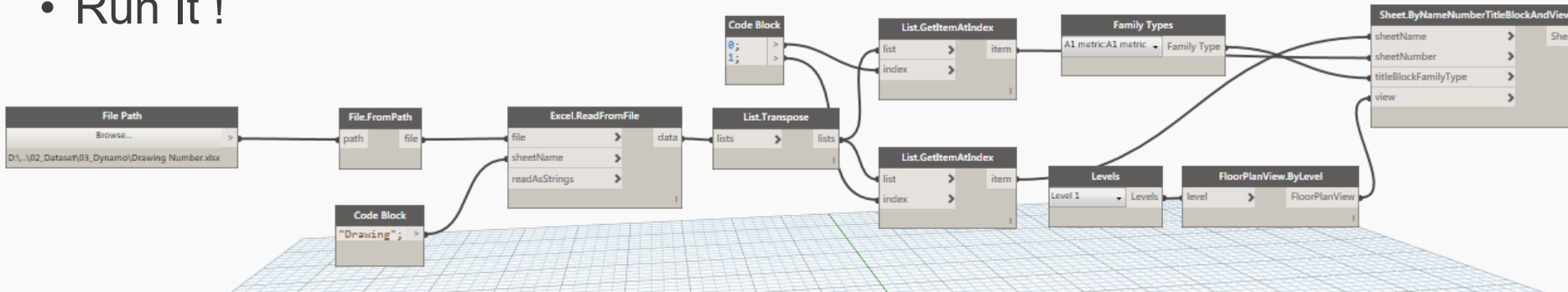
# 도면 생성

Common way to create sheet and change drawing number and name



500 Times

- Create Dynamo 12 Nodes
- Run It !



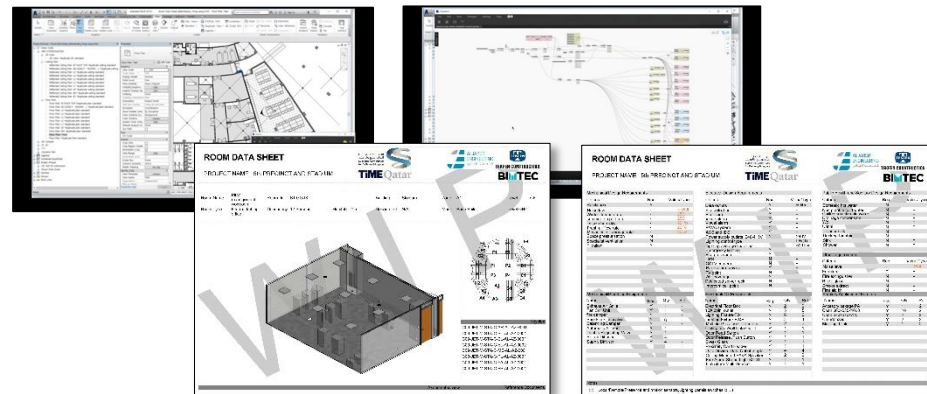


# 자동화 적용 사례

## □ ooooo Stadium

- 약 4260개 실 x 5장 = **약 21,300 장의 도면 필요**  
(3D, 평면도, 천장도, 입면도, 장비 일람표)
- 기존방식 예상 작업량 = **10명 x 12주 작업**
- 다이나모 방식 예상 작업량 = **1명 x 3주 작업**

**120 wk → 3 wk로 단축**



## □ oo 기술연구소

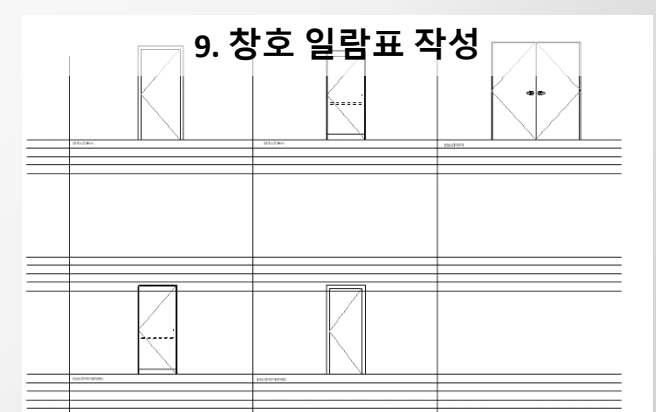
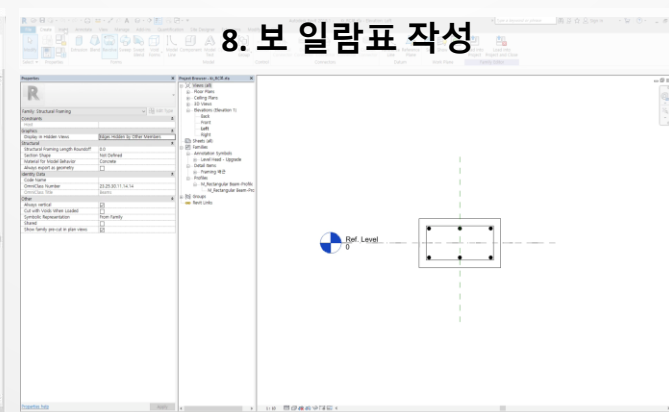
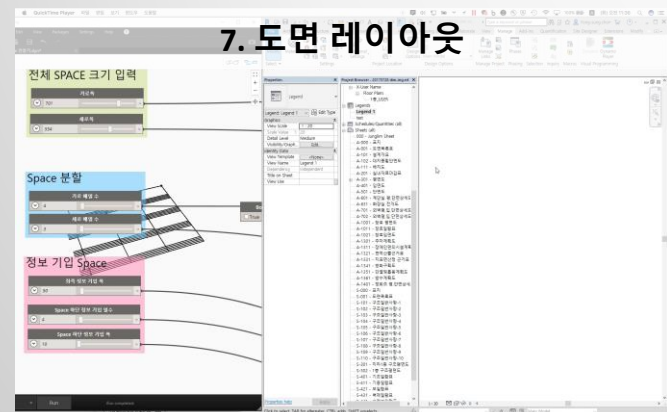
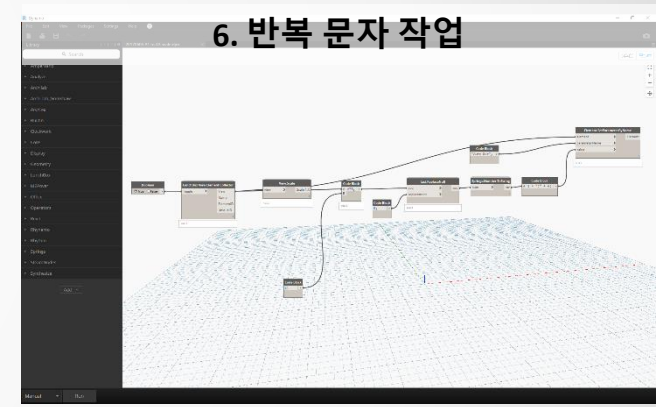
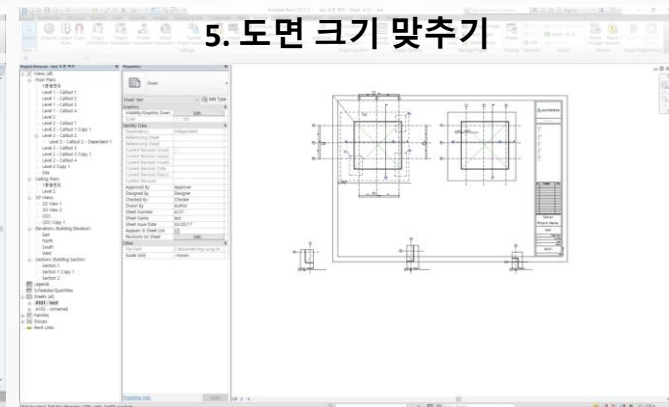
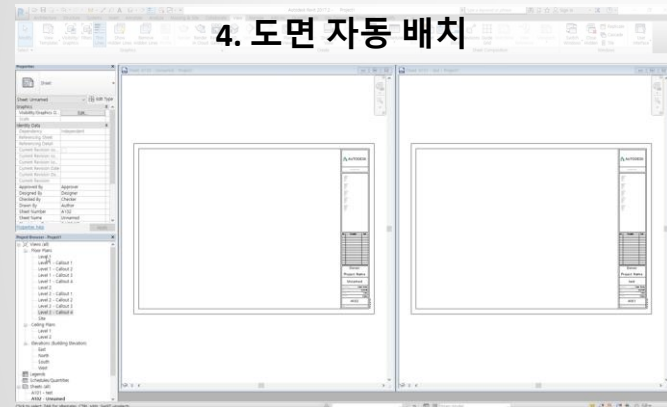
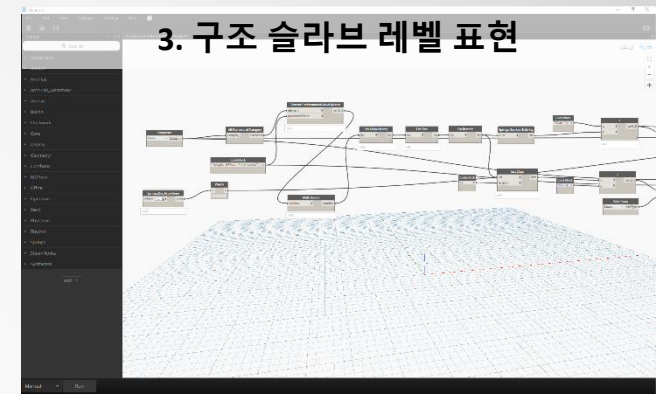
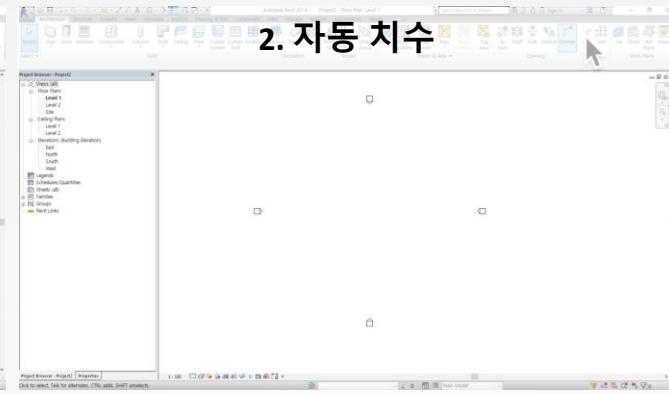
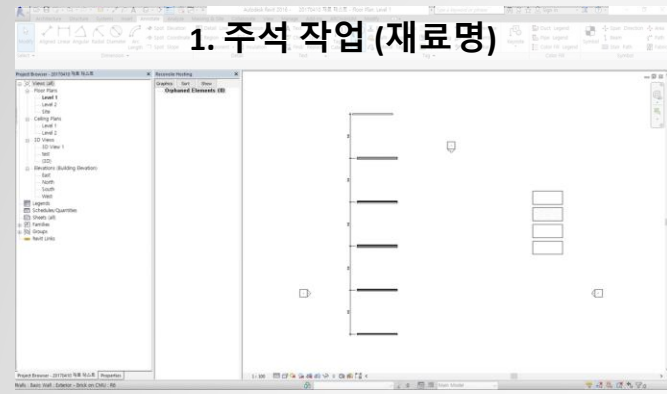
- 약 86개 실 x 3장 = **약 258 장의 도면 필요**
- 기존방식 예상 작업량 = **1명 x 1주 작업**
- 다이나모 방식 예상 작업량 = **1명 x 1일 작업**

**5 day → 1 day**



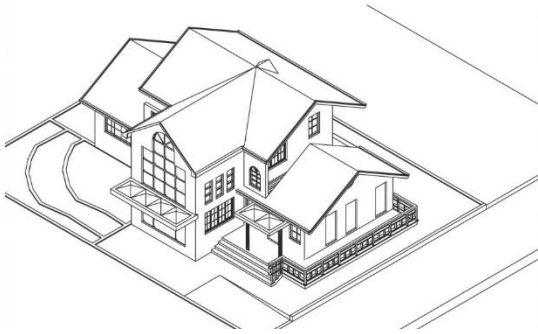


# Usage Computer

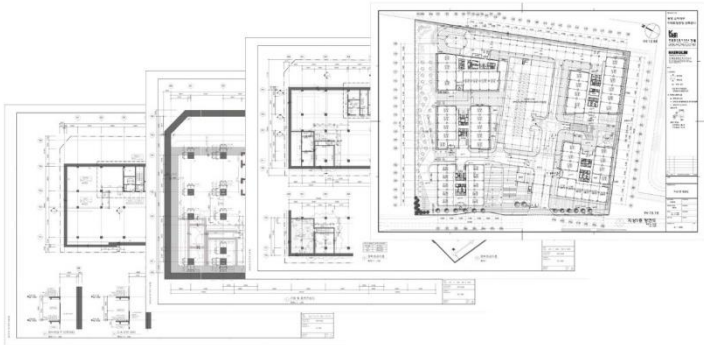




## Usage Computer



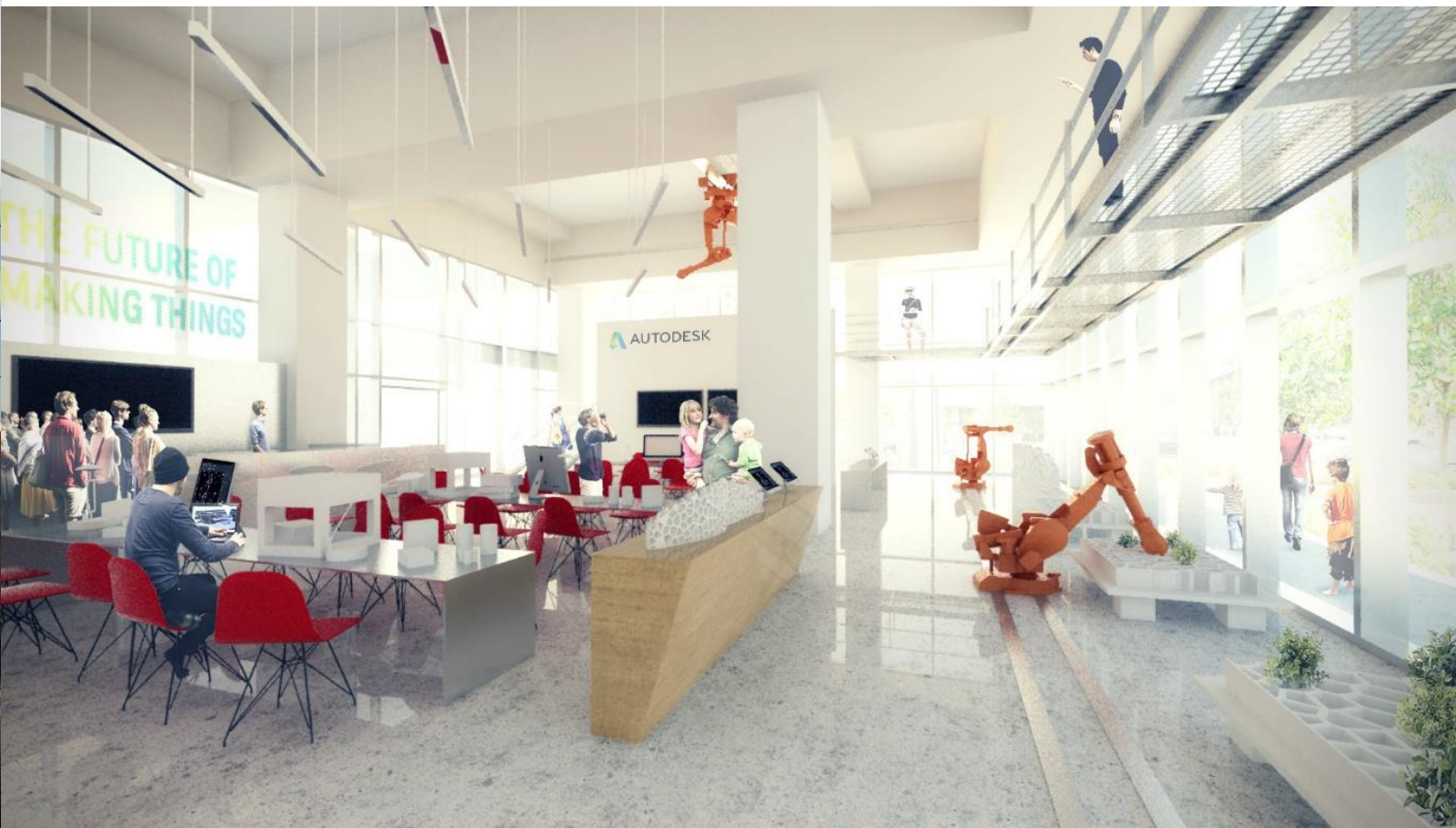
Automagically documents system



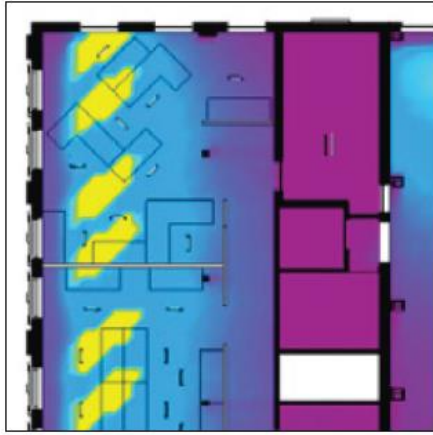
1. 주석 작업 (재료명 표기)
2. 도면 치수 작업
3. 슬라브 레벨 체크
4. 도면 자동 배치
5. 도면 크기 맞추기
6. 반복 문자 작업
7. 도면 레이아웃
8. 보 일람표 작성
9. 창호 일람표 작성

# 7 Days to 2 Days

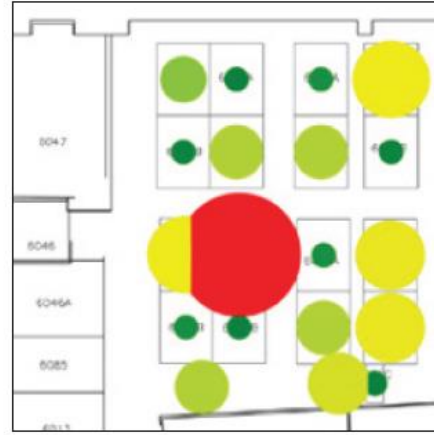








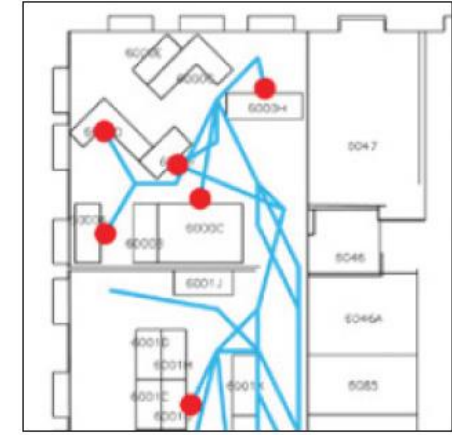
1. Daylight



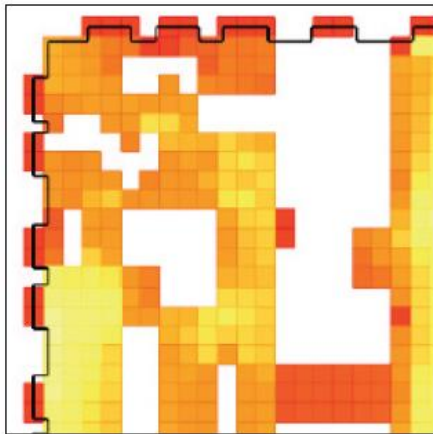
2. Low Visual Distraction



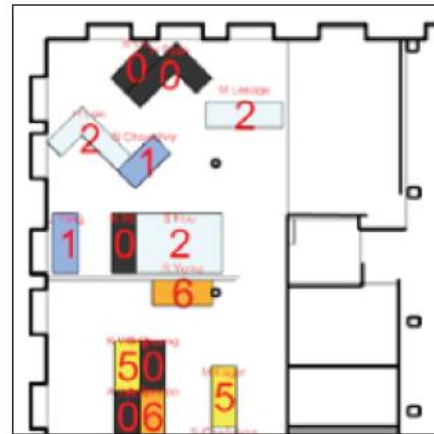
3. Views to Outside



4. Adjacency Preference



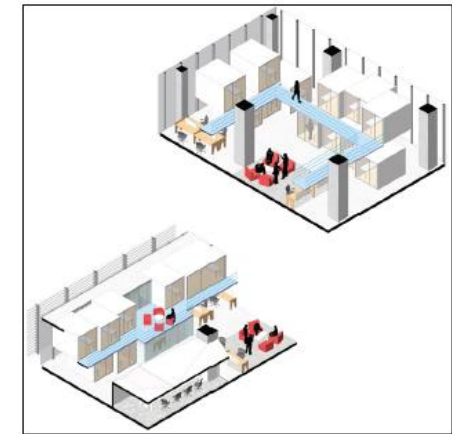
5. Circulation



6. Work Styles

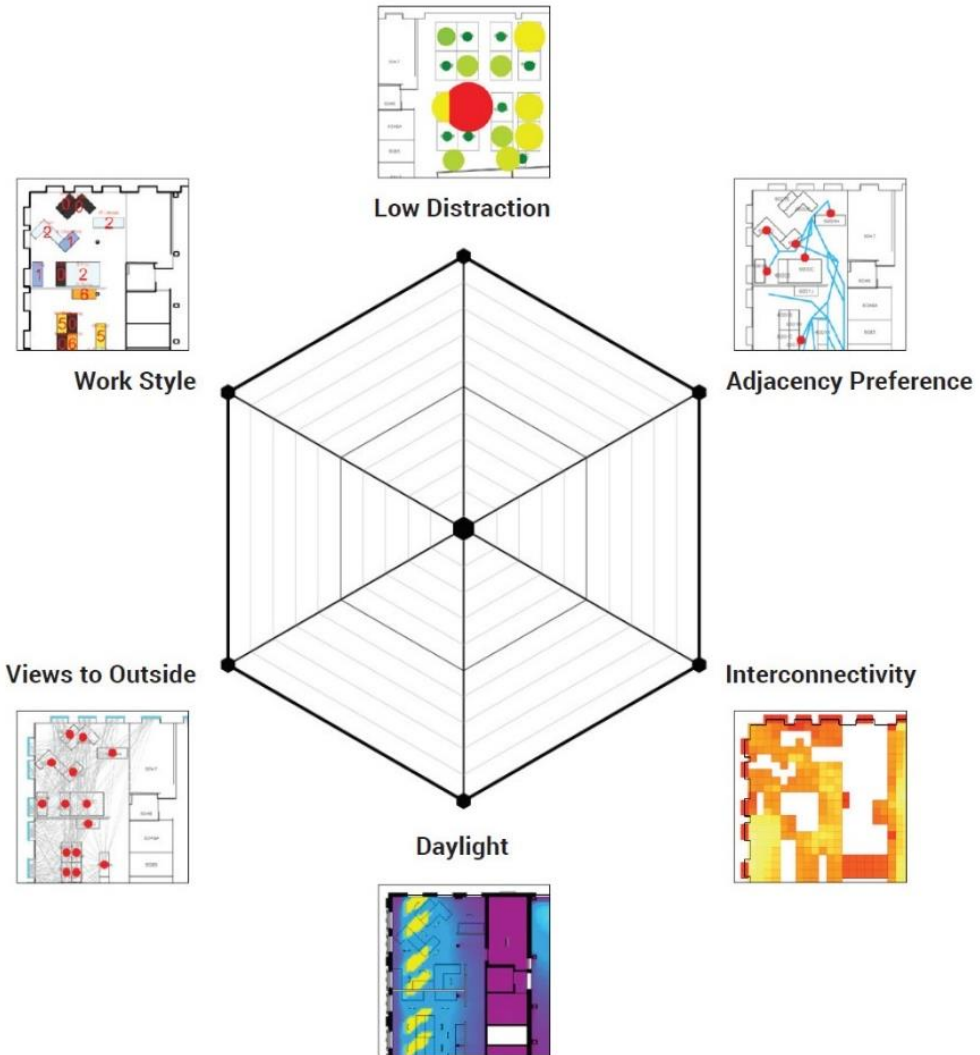


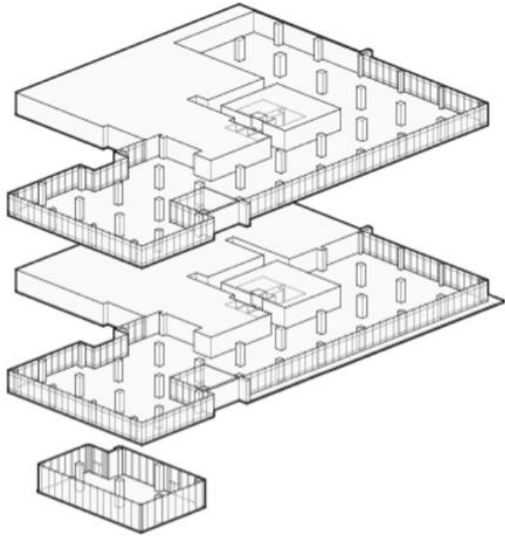
7. Low Acoustic Distraction



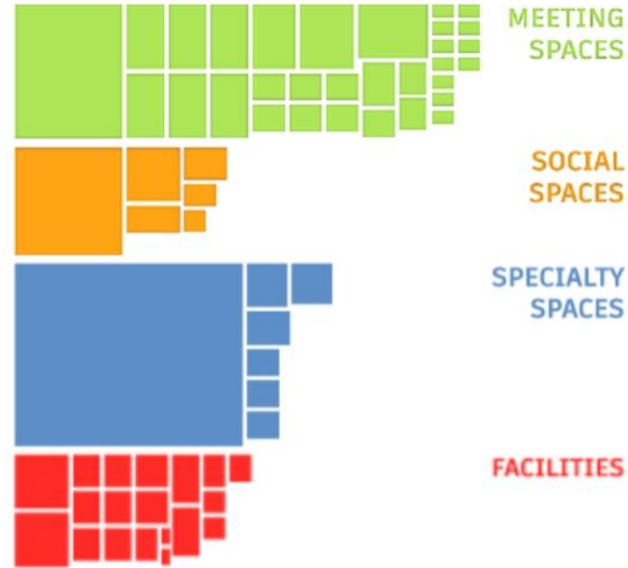
8. Low Density



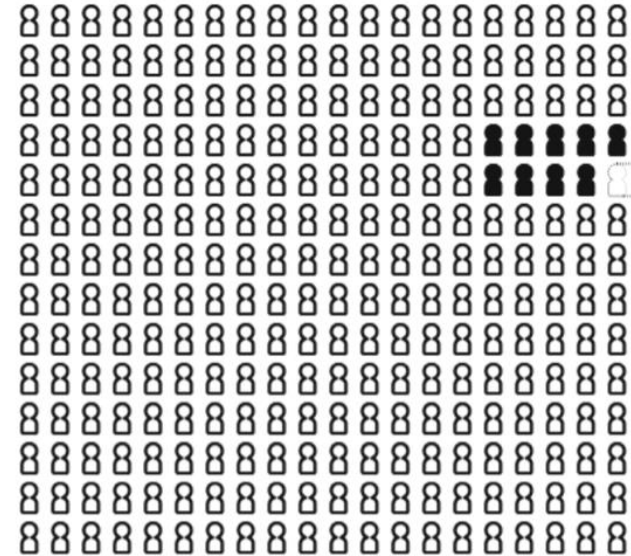




3 floors  
48,000 square feet



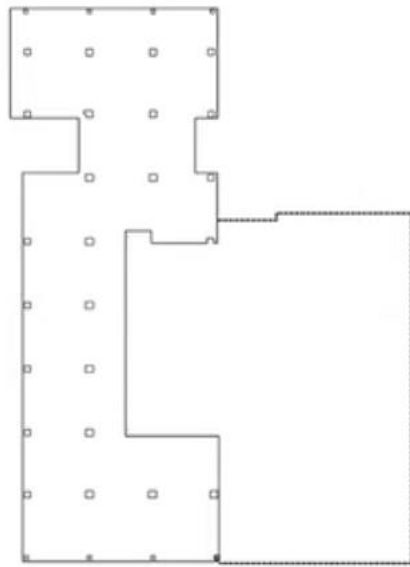
11 meeting rooms  
6 multi-purpose rooms  
11 phone booths



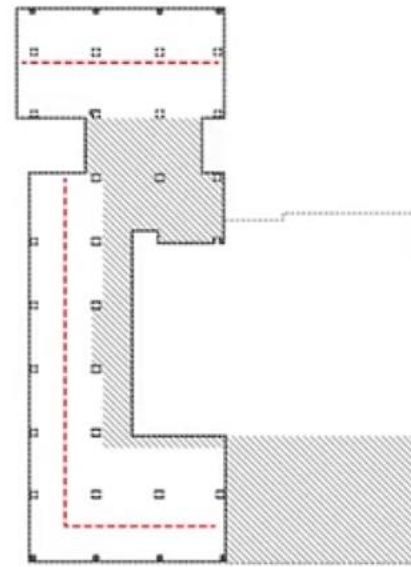
250+ people  
25+ teams

Name:	John Villaggi
TEAM	
Division:	CTO
Manager:	David Lau
Size:	8
Interns:	2
PREFERENCES	
Daylight:	8.0
Acoustic:	4.0
ADJACENCIES	
Teams:	Ray Nagy Dale Locke
Amenity:	Telepresence SCRUM Fabrication Lab AR/VR Lab

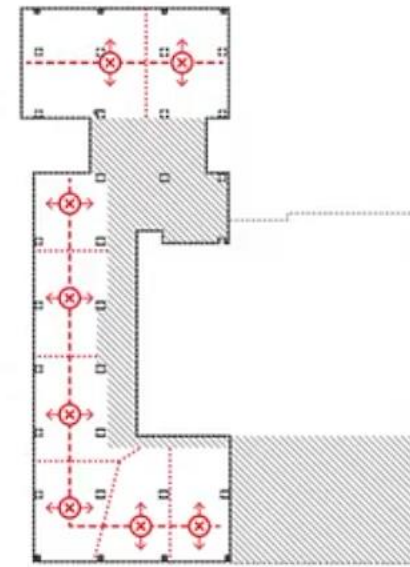




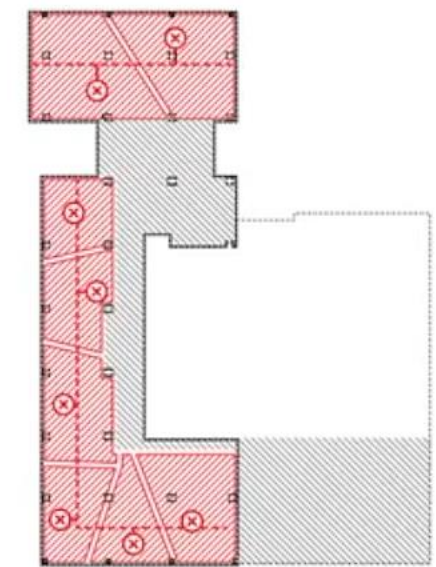
① Initial conditions.



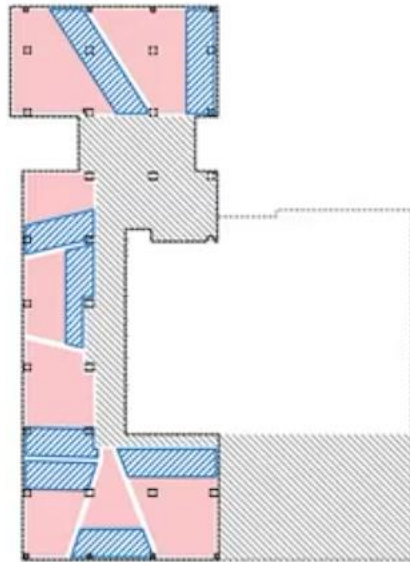
② Definition of fixed / non-generative zones and central spine for organizing neighborhoods.



③ A variable number of neighborhoods are seeded along spine, and given a parameterized range of motion.



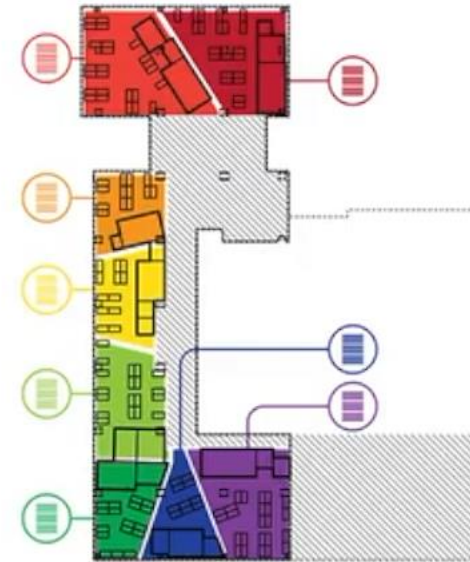
④ Optimization algorithms shift seeds along the spine creating angular divisions.



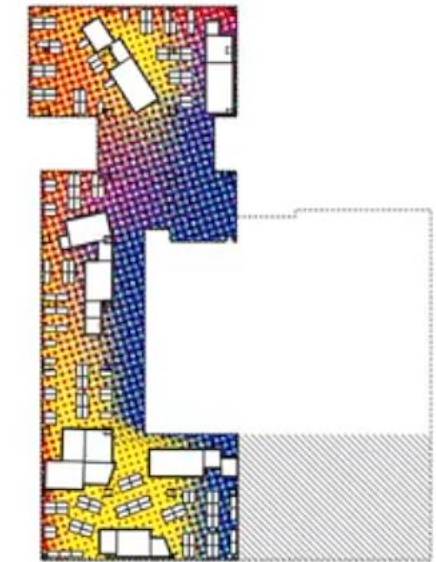
⑤ One edge from each neighborhood is selected to generate zone for amenity clusters.



⑥ Automated "test fit" generates amenity rooms from space matrix and desk layout.



⑦ Teams are assigned by best-fit algorithm. Neighborhood amenities are assigned by team preferences.



⑧ Evaluation engine simulates and scores each design, and returns results to genetic algorithm.





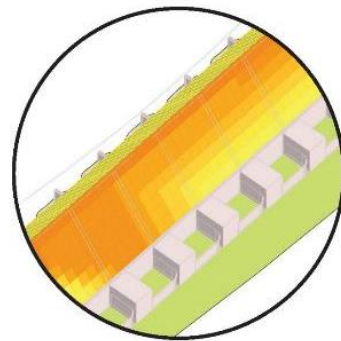




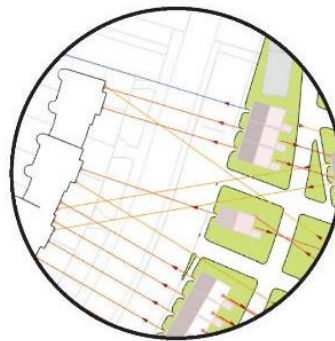


# GENERATIVE DESIGN

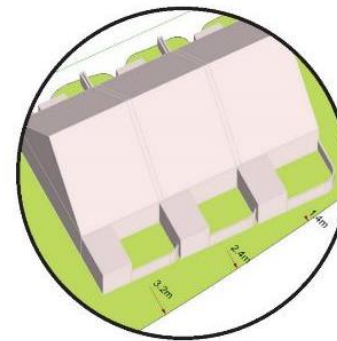
[ DESIGN GOALS ]



solar energy



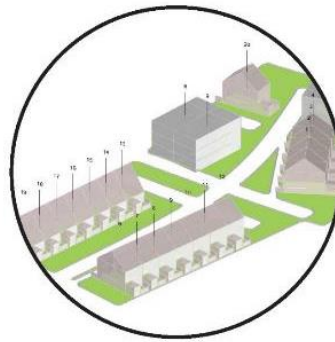
views



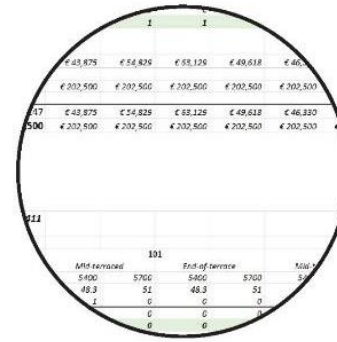
backyard size



variety



program

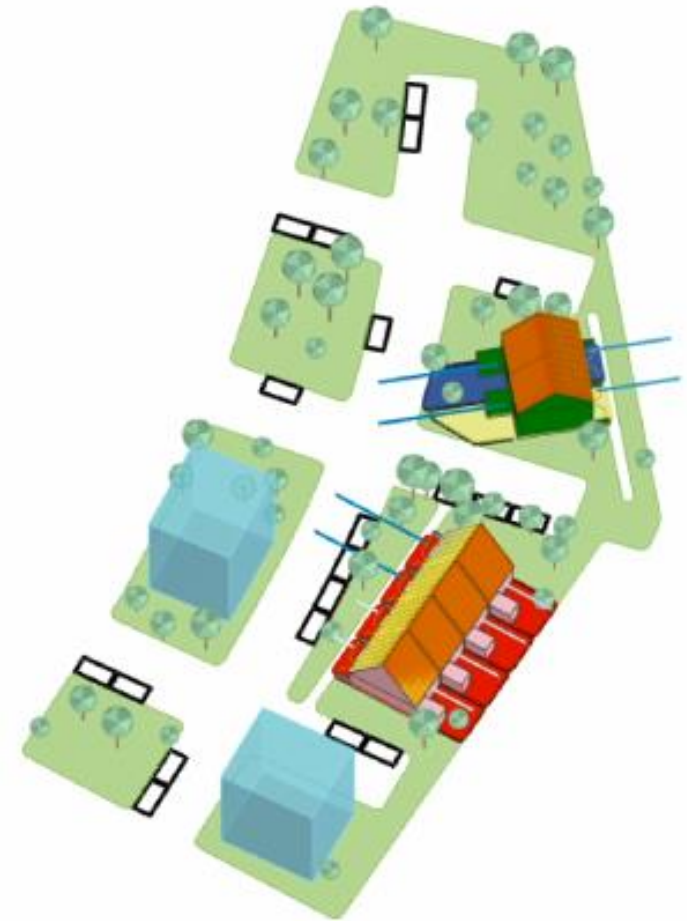
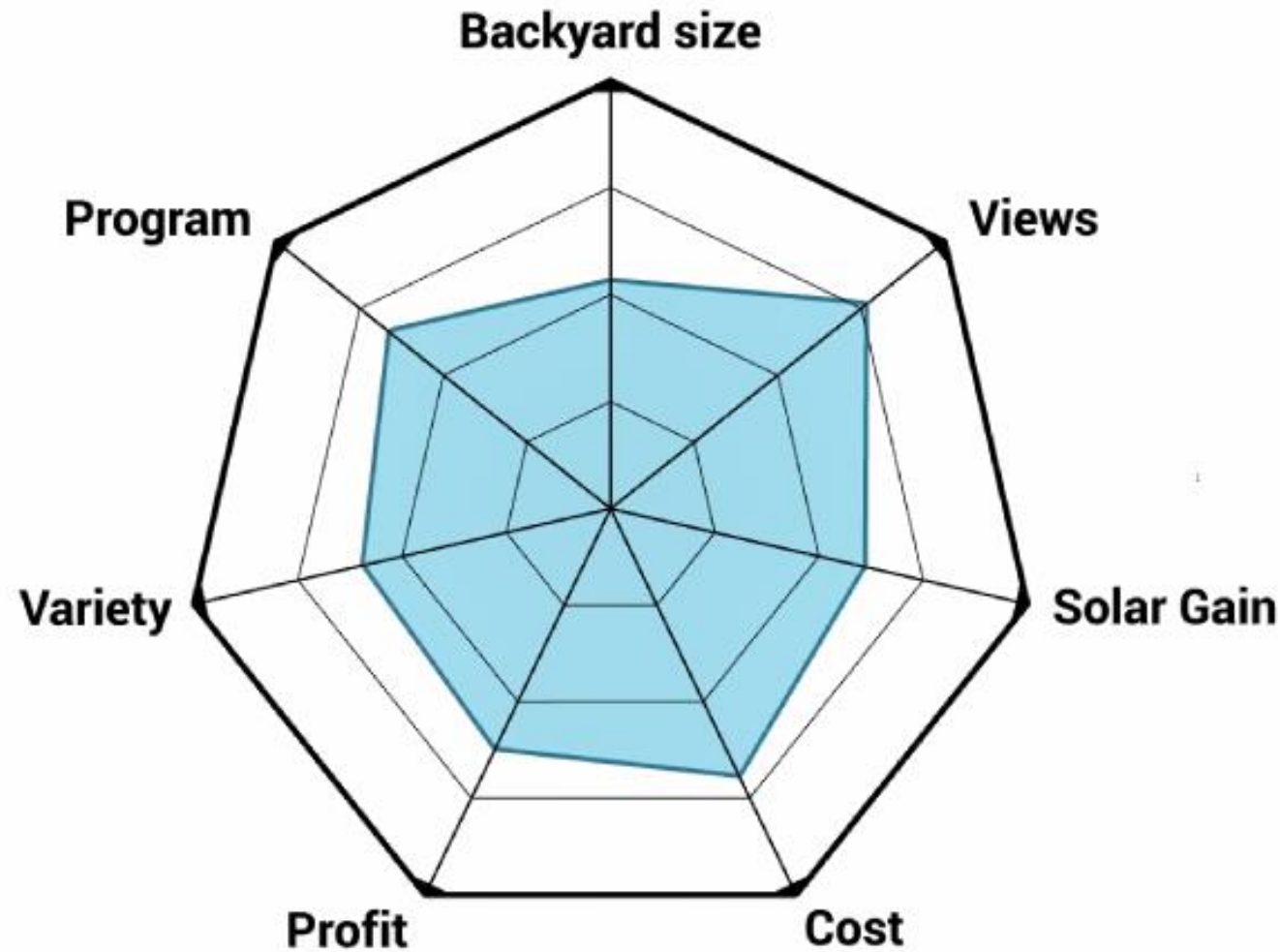
A circular diagram showing a table with financial data. The table has columns for various financial metrics and rows for different scenarios. The data is presented in a structured format, representing profit.

profit





# 설계 목표에 최적화된 대안 설계 자동화

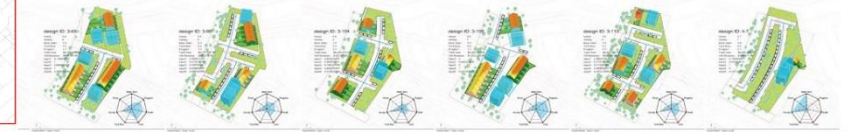
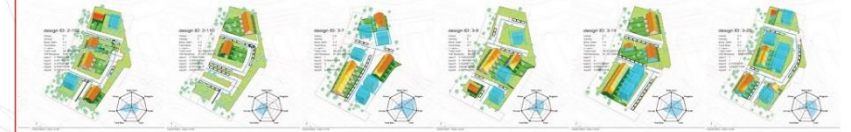
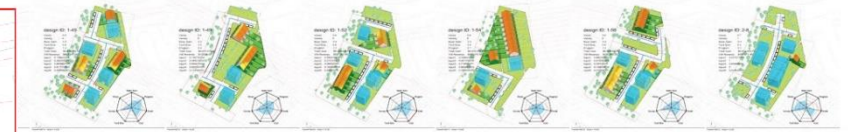
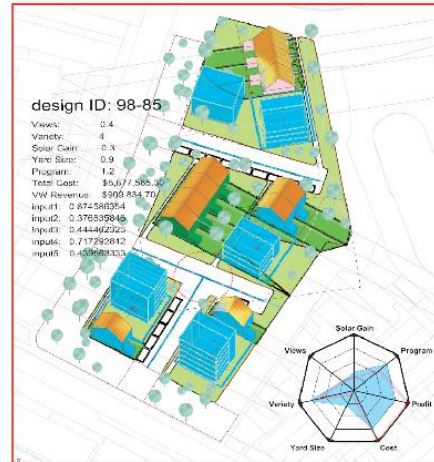
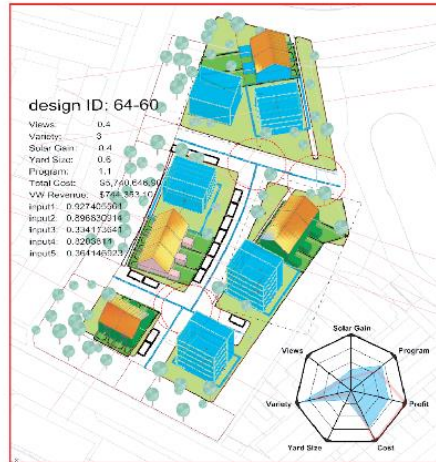
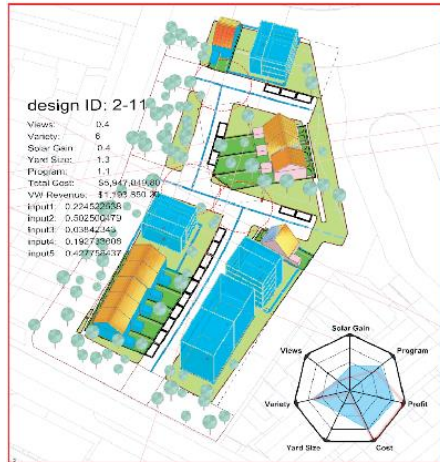
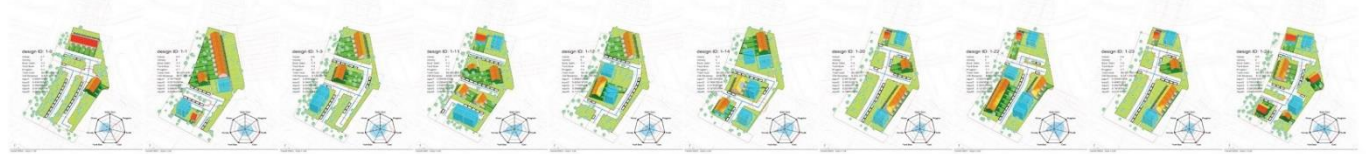




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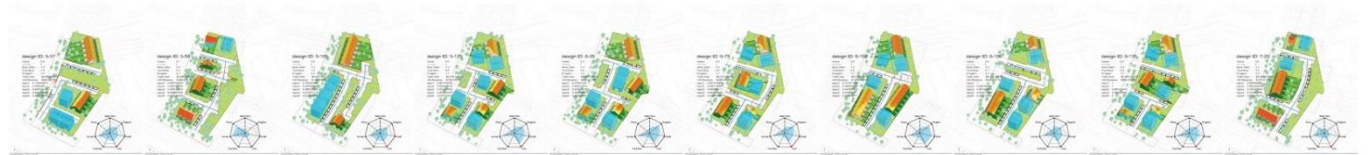
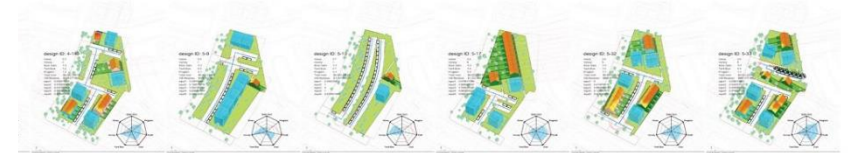
## NEIGHBOURHOOD DESIGN & BUILDING CONFIGURATION

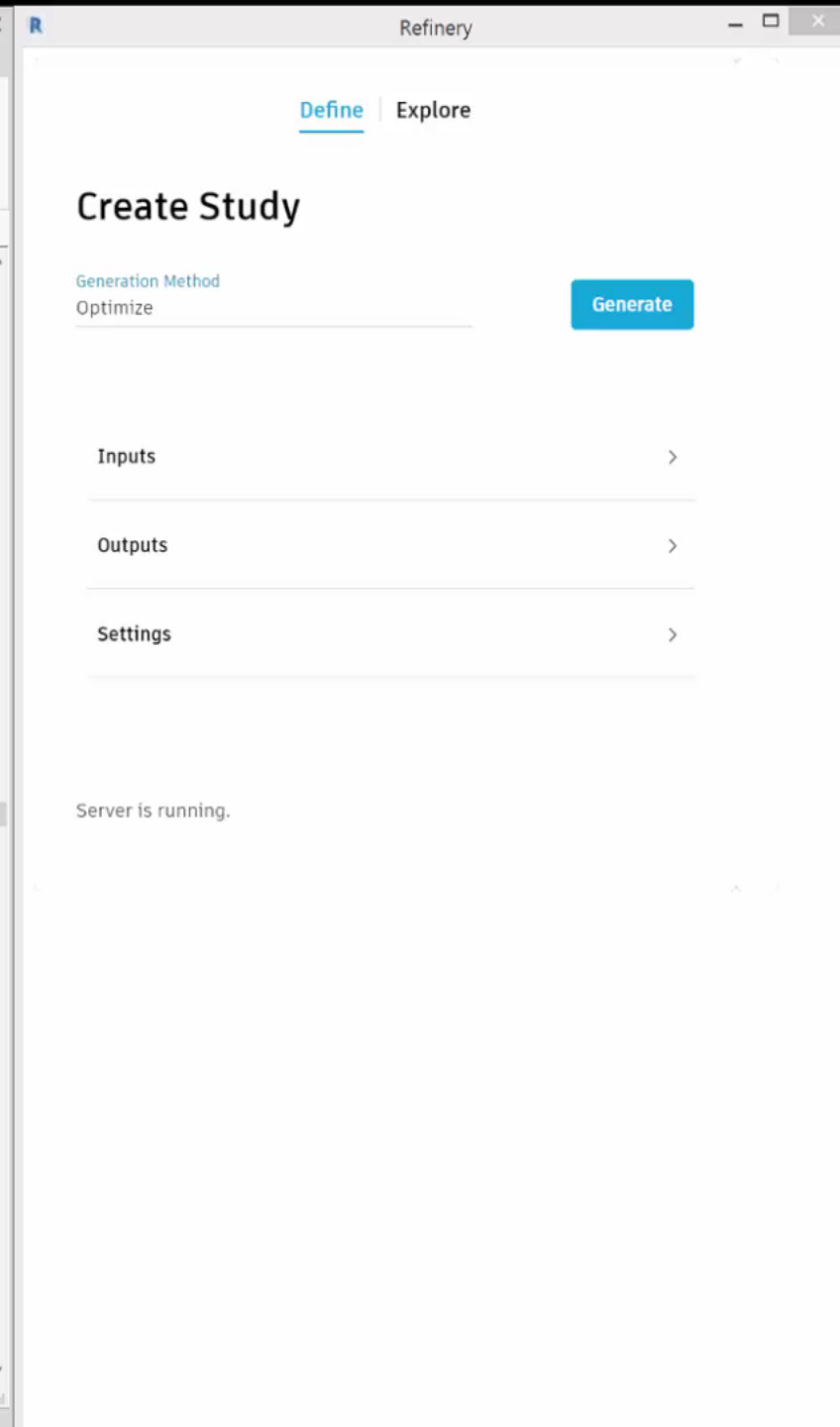
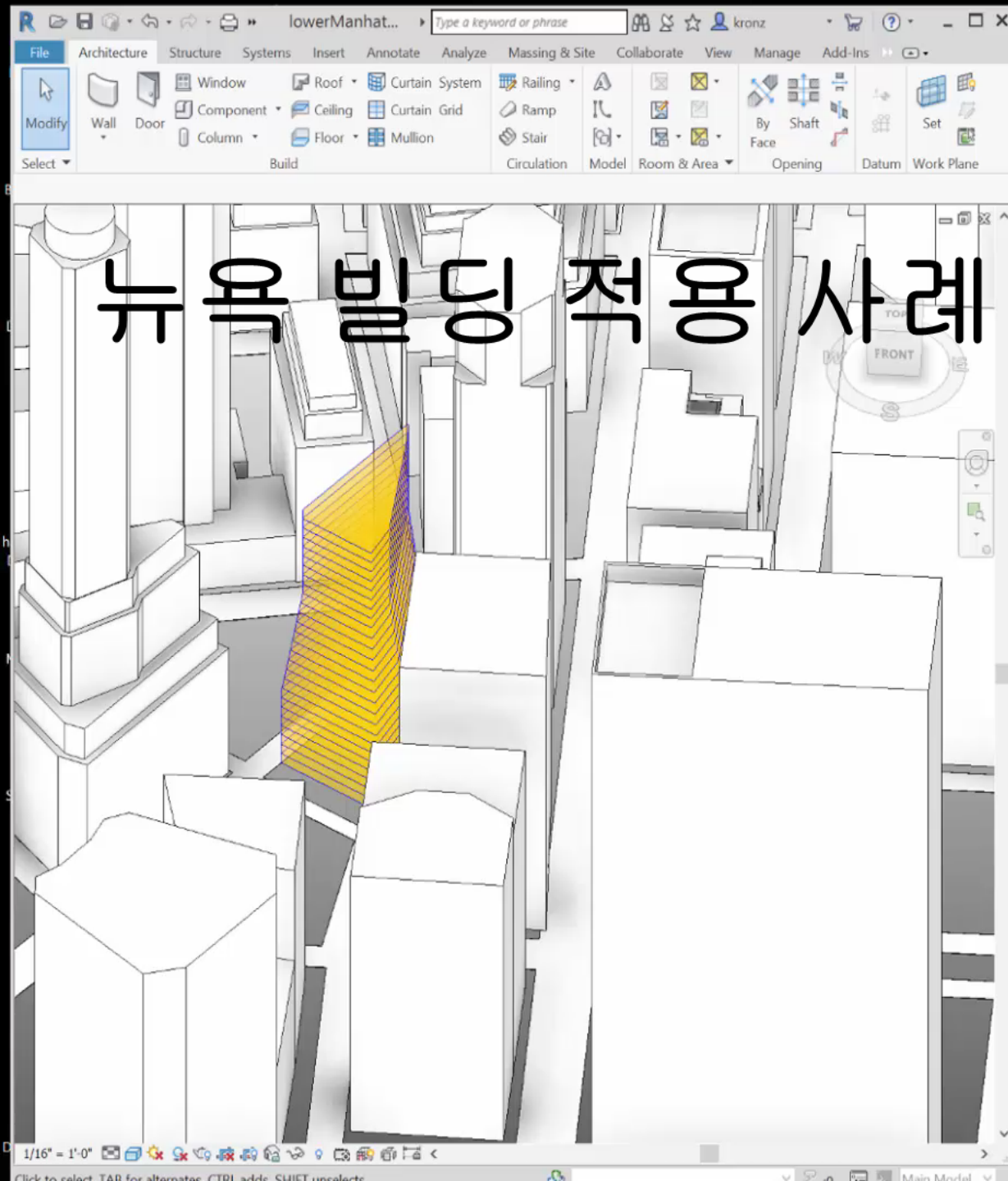


- +++ Communal green space
- ++ Circulation continuity
- + Mix unit types
- + Variety

- +++ Circulation continuity
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- ++ Mix unit types
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STADIUM DESIGN



# 기타 적용 사례

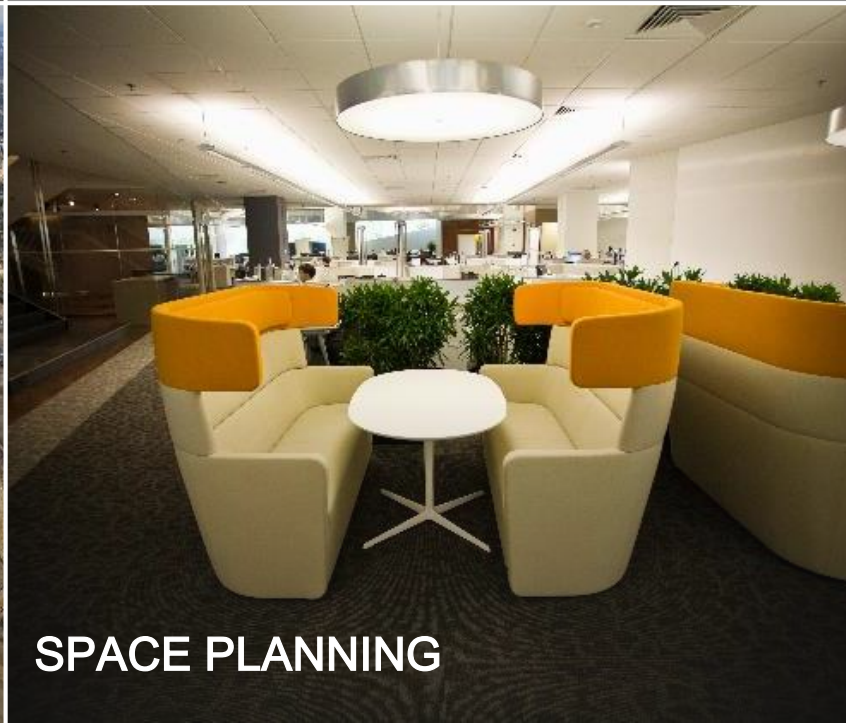
CONSTRUCTION PLANNING



SITE DRAINAGE



NEIGHBORHOOD PLANNING



SPACE PLANNING



FAÇADE DESIGN





Make anything™

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