

AI AT BIG

✦ IMPACT & OPPORTUNITIES ✦

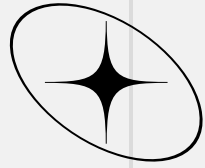
ie

UNIVERSITY
SCHOOL OF
ARCHITECTURE &
DESIGN

BIG

BUNNIPRO GROUP

MARILYN
VILLANUEVA



RESERACH

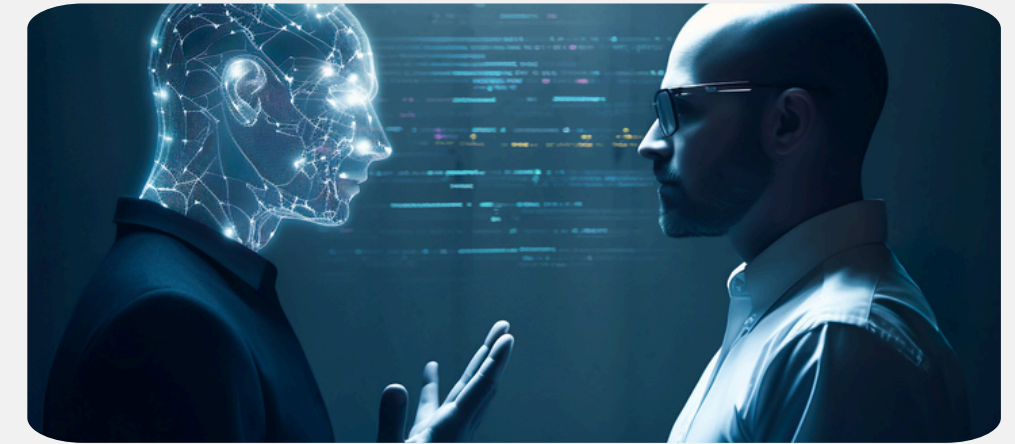
AI's integration into architecture offers opportunities for more efficient workflows, improved design communication, and enhanced creative possibilities. By understanding these trends, BIG can strategize AI adoption to remain at the forefront of architectural innovation.



BIG ARCHITECTS



- Founded in 2005 by Bjarke Ingels, BIG (Bjarke Ingels Group) has expanded into a global architecture firm with over 700 employees.
- The firm is recognized for its innovative, sustainable, and experimental design approach, blending creativity with functionality.
- Global Presence: Offices in Copenhagen, New York, London, Barcelona, and Shenzhen, with projects spanning urbanism, infrastructure, and emerging technologies.
- Design Methodology: BIG follows a pragmatic utopian approach, merging sustainability, aesthetics, and efficiency.
- Business & Clients: Works with public and private sectors, including cultural institutions, tech companies, and governments.



AI TODAY



- **Generative AI for Design:** AI-powered tools (e.g., MidJourney, Stable Diffusion, and Autodesk Forma) generate architectural concepts, enhancing creativity and speeding up ideation.
- **AI for Visualization & Rendering:** Tools like NVIDIA Omniverse enable faster, photorealistic renders and interactive design iterations, optimizing presentation quality.
- **Automation & Efficiency:** AI streamlines project management, BIM coordination, and cost estimation, reducing time and human error.
- **AI for Inclusivity & Collaboration:** ChatGPT and real-time translation tools allow multilingual communication, breaking language barriers in global teams.
- **AI in Immersive Technologies:**
 - AI-enhanced VR/AR/XR (e.g., Unreal Engine, Enscape) creates real-scale environments for full-scale virtual walkthroughs.
 - Holographic and Spatial Computing (e.g., Apple Vision Pro, Microsoft HoloLens) may replace traditional screens, allowing architects to interact with designs without VR headsets in the future.

1. AUTOMATION OF REPETITIVE TASKS

- ✓ AI Used: Machine Learning models, Autodesk Forma, Revit AI, Midjourney, Rhino Compute.
- Current Impact: Reduces time spent on drafting, 3D modeling, and documentation with AI-generated workflows.
- Projection (5 years): Increased integration of AI in BIM software will make generative documentation standard, minimizing errors and manual workload.
- Business Relevance for BIG: Faster iteration cycles enable more ambitious and complex projects, improving efficiency without sacrificing quality.

2. GENERATIVE AI IN DESIGN

- ✓ AI Used: Midjourney, Stable Diffusion, DALL·E, LookX, Finch3D, DreamStudio, Adobe Firefly.
- Current Impact: AI generates design concepts from sketches and parameters, expediting early-stage visualization.
- Projection (5 years): AI will offer more advanced generative models, allowing architects to develop fully editable parametric models from AI-generated forms.
- Business Relevance for BIG: BIG can leverage AI to explore avant-garde architectural forms while maintaining control over final design refinement.

3. PROCESS OPTIMIZATION & SUSTAINABILITY

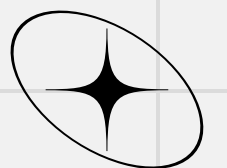
- ✓ AI Used: Cove.Tool, ClimateStudio, Autodesk Insight, Ladybug Tools, UrbanFootprint.
- Current Impact: AI optimizes material use, energy efficiency, and environmental impact analysis.
- Projection (5 years): AI will integrate real-time data to refine sustainable strategies dynamically during design and construction.
- Business Relevance for BIG: Enhancing BIG's sustainability-driven design approach, positioning the firm as a leader in sustainable architecture.

4. DIVERSITY & GLOBAL TALENT INCLUSION

- ✓ AI Used: ChatGPT, DeepL, Google Translate AI, OpenAI's Whisper.
- Current Impact: AI-powered translation tools enable seamless communication in multilingual teams.
- Projection (5 years): More advanced AI will facilitate real-time voice translation, reducing language barriers in global projects.
- Business Relevance for BIG: Expanding talent acquisition without language limitations, ensuring a more diverse and inclusive workforce.

OVERVIEW

OPPORTUNITIES



5. VIRTUAL REALITY, AUGMENTED REALITY & HOLOGRAMS

✓ AI Used: Nvidia Omniverse, Unreal Engine 5, Enscape, Twinmotion, Microsoft Mesh, Varjo XR-3.

Current Impact: AI-enhanced VR/AR tools allow clients to experience projects before construction.

Projection (5 years): AI-driven real-time material and lighting simulations will allow predictive user experience testing.

Business Relevance for BIG: Enriching client presentations and decision-making, reducing redesign costs and increasing engagement.

6. AUTOMATION IN CONSTRUCTION

✓ AI Used: Boston Dynamics, Doxel AI, AI Build (3D printing).

Current Impact: AI-powered robotics streamline construction processes and minimize errors.

Projection (5 years): AI-driven predictive analytics will enable proactive site management, optimizing workforce allocation and safety.

Business Relevance for BIG: Cost reduction in construction phases, ensuring faster and more precise execution of designs.

7. SMART CITIES & URBAN PLANNING

✓ AI Used: Sidewalk Labs, Spacemaker AI, UrbanFootprint, CityEngine, Delve by Google.

Current Impact: AI enhances urban planning with data-driven insights.

Projection (5 years): AI will predict urban evolution based on socio-economic trends and real-time population behaviors.

Business Relevance for BIG: Enhancing large-scale urban projects with data-backed planning, reinforcing BIG's position in city-scale innovation.

8. INTEGRATION WITH THE METAVERSE & VIRTUAL SPACES

✓ AI Used: Unity AI, Unreal Engine AI, Nvidia Omniverse.

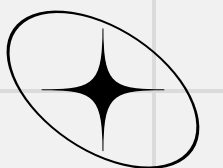
Current Impact: AI-generated digital environments allow firms to explore metaverse real estate.

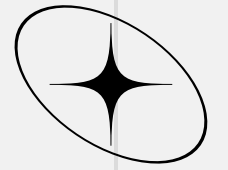
Projection (5 years): AI will create hyper-realistic digital twins of real-world spaces, increasing their commercial and functional value.

Business Relevance for BIG: Early positioning in virtual real estate and NFT-backed architectural assets.

OVERVIEW

OPPORTUNITIES





OVERVIEW

THREATS

1. OVER-RELIANCE ON AI IN DESIGN

- 🚩 Risk: AI-generated concepts may limit human creativity.
- 💡 Solution: Position AI as an augmentation tool rather than a design replacement.

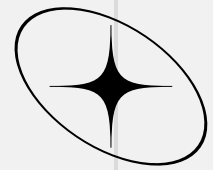
2. IMPLEMENTATION & TRAINING COSTS

- 🚩 Risk: High costs of AI adoption in software and training.
- 💡 Solution: Implement gradual AI integration with high-ROI solutions first.

3. ETHICAL CONCERNS & AI BIAS

- 🚩 Risk: AI biases can lead to exclusionary design outcomes.
- 💡 Solution: Use diverse datasets and incorporate human oversight in decision-making.







OVERVIEW

THREATS


4. IMPACT ON EMPLOYMENT & ARCHITECTURAL ROLES

 Risk: AI automation may replace some architectural roles.


 Solution: Re-skill employees to collaborate with AI rather than compete against it.


5. SECURITY & INTELLECTUAL PROPERTY RISKS

 Risk: Data breaches when using AI for confidential projects.

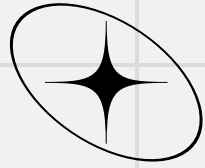
 Solution: Ensure compliance with data security best practices and use internal AI tools.

6. RAPID OBSOLESCENCE OF AI TOOLS

 Risk: AI tools may become outdated quickly.

 Solution: Choose adaptable and modular AI systems to reduce dependency risks.





IN - DEPTH GENERATIVE AI

BIG in 2030: AI as a Competitive Advantage

- ◆ From Sketch to Construction in Record Time – AI will optimize the process from early concepts to BIM-ready models.
- ◆ Industry Leadership in AI-Driven Architecture – Early AI adoption will position BIG as a pioneer in generative AI for design.
- ◆ More Innovative & Sustainable Designs – AI will help create low-impact, adaptable, and energy-efficient spaces.
- ◆ Enhanced Client Experience – AI-generated design options will allow for more data-driven and personalized decision-making.
- ◆ BIG in 2030: Merging human creativity with computational intelligence to redefine architectural innovation.



HOW WILL THIS WORK?

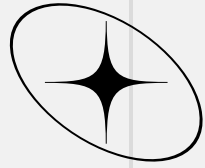
- ◆ AI-Driven Sketch-to-Model Pipeline – Hand-drawn or digital sketches will be interpreted by AI to generate editable parametric geometries, streamlining early-stage design exploration.
- ◆ Multi-Input Generative Design – A combination of sketches, text prompts, and reference images will feed AI models like Midjourney, DALL-E, and Stable Diffusion to create diverse conceptual iterations.
- ◆ Parametric Refinement via AI – Tools like Finch3D and LookX will integrate AI-driven design iterations based on structural, climatic, and material constraints, converting them into Rhino and Revit models.
- ◆ AI-Integrated BIM Workflow – AI will automate the translation of conceptual designs into BIM-ready parametric models, ensuring geometric consistency and construction feasibility.

OPPORTUNITIES

- ✓ Creative Expansion: AI will enable the exploration of unconventional forms and innovative materials by combining sketches, visual references, and parametric data.
- ✓ Dynamic Personalization: AI-generated architecture will adapt to site conditions, client needs, and local regulations.
- ✓ Structural & Energy Optimization: AI-driven real-time topological analysis will enhance structural integrity, energy efficiency, and material usage.

THREATS & CHALLENGES

- ⚠ Conditioned Creativity – AI-generated styles might become repetitive, limiting architectural innovation.
- ⚠ Technical Limitations – AI-generated images may appear compelling but could lack structural and functional feasibility without proper validation.
- ⚠ Sketch-to-Model Accuracy – The precision of AI in transforming sketches into models will depend on training data and input clarity.



AI STRATEGY

FOR BIG KEY ACTIONS



A. IMPLEMENT AN AI-ENHANCED SKETCH-TO-MODEL PIPELINE

- ◆ Why? To accelerate the design process and maintain BIG's creative edge by integrating AI into early-stage conceptualization.
- ◆ How?
 - Develop an in-house AI system trained on BIG's design principles, allowing architects to input sketches, text prompts, and reference images to generate parametric models.
 - Use Stable Diffusion, Midjourney, and DALL·E for visual exploration while connecting outputs to Rhino + Grasshopper + Finch3D for parametric refinement.
 - Ensure seamless BIM integration (Revit, ArchiCAD) to streamline the workflow from concept to construction.

B. AI-DRIVEN ITERATIVE VALIDATION & SIMULATION

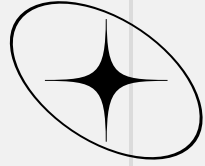
- ◆ Why? To minimize technical risks by ensuring AI-generated concepts meet structural and sustainability standards.
- ◆ How?
 - Automate structural analysis using AI-powered simulations for material efficiency, wind loads, and environmental impact.
 - Collaborate with engineering AI tools (LookX, Autodesk AI, Karamba3D) to validate feasibility in real-time.
 - Implement a feedback loop where AI-generated outputs are continuously refined based on real-world constraints.

C. DEVELOPMENT OF BIG'S AI DESIGN TOOLKIT

- ◆ Why? To standardize AI usage and maintain a competitive edge.
- ◆ How?
 - Develop a custom AI plugin integrating sketch-to-BIM automation into BIG's existing design software.
 - Train AI models on BIG's past projects to generate context-aware, brand-aligned architectural solutions.
 - Foster collaborations with leading AI researchers and software developers to keep the toolkit cutting-edge.

D. ETHICAL AI & DESIGN SAFEGUARDS

- ◆ Why? To protect originality and prevent over-reliance on AI-generated aesthetics.
- ◆ How?
 - Establish a human-in-the-loop policy, where architects always have the final decision in AI-assisted designs.
 - Develop a bias detection system to prevent AI from reinforcing repetitive or culturally insensitive design patterns.
 - Set internal guidelines for AI transparency, ensuring all AI-generated elements are properly reviewed.



AI STRATEGY FOR BIG



AI CULTURE AT BIG: KEEPING THE TEAM MOTIVATED & AT THE FOREFRONT

A. Position AI as a Creative Partner, Not a Replacement

- ◆ Conduct AI Design Challenges where teams explore experimental workflows, blending human creativity with AI.
- ◆ Showcase AI-driven projects in internal exhibitions to inspire confidence and spark innovation.

B. AI Training & Upskilling for BIG Architects

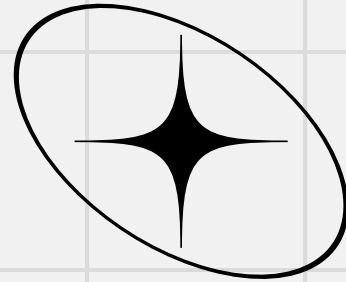
- ◆ Host monthly AI workshops on parametric modeling, machine learning, and generative design.
- ◆ Offer certification programs in AI-assisted architecture to keep BIG at the forefront of the industry.

C. Foster a Prototyping Culture for AI-Driven Workflows

- ◆ Establish a dedicated AI innovation lab where designers experiment with AI-generated solutions.
- ◆ Encourage cross-team collaboration between computational designers, sustainability experts, and AI engineers.

D. Partner with Leading AI Research Institutions

- ◆ Collaborate with MIT, Harvard GSD, and AI labs to develop cutting-edge architectural AI applications.
- ◆ Participate in AI-focused design competitions and research grants to keep BIG in global AI conversations.



THANK YOU

AI is Not Just a Tool—It's an
Architectural Partner

