MHA

Midlands Highway Alliance Plus

Skills and Digital

Tuesday 17 September 2024

Midlands Highway Alliance Plus

Evolving Skills and Pathways for digital in Civil Engineering

Or Embracing Automation, Low-code Tools, and Programming.

David Owens

Head of Digital Engineering & Building Information Modelling | WSP UK Roads

Who are WSP ?

WHAT WE DO

WSP is a leading engineering and environmental professional services consulting firm which supports significant multidisciplinary projects in both the built and natural environments. We provide engineering and design services to public and private sector clients in the transportation and infrastructure, property and buildings, earth and environment, power and energy, resources and industry sectors, as well as a strategic advisory offering.

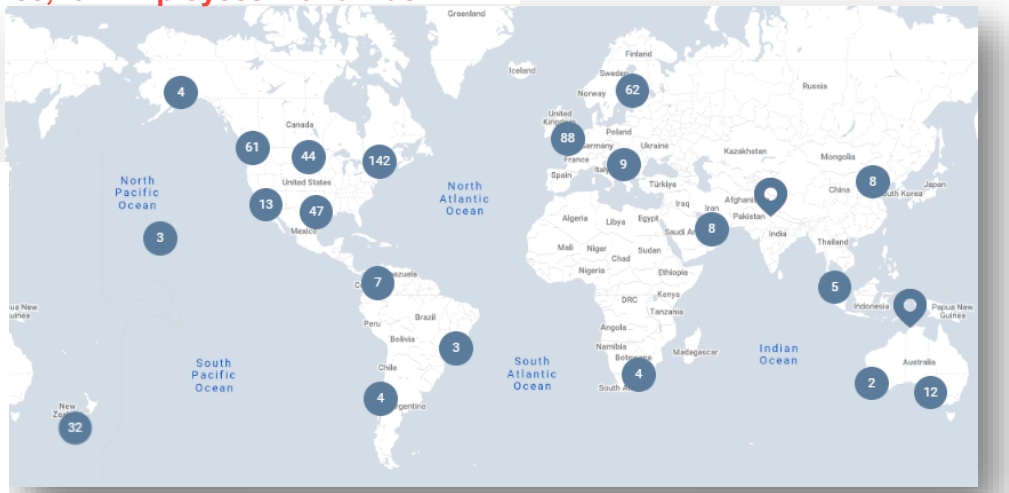
Leading Engineering and Environmental Consultant

Information Management and Digital Project Delivery Subject Matter Experts

Digital Advisory Offer

Public and Private Sector Major Project Experience

68,751 Employees worldwide



Introduction

David Owens | Head of Digital Engineering & Building Information Modelling

Experience

I am a Civil Engineer ~20+ years

Designer > Contractor > Consultant > Design

- Residential/Commercial Estates
- M25 Widening
- A556 Knutsford to Bowden
- HE BIM Programme
- Digital Consultancy
- Costain Engineering / Automated Design

Expertise

I am a Design Manager

Process Driven + Data Centric

- BIM Level 2 / UK BIM Framework
- BSI B/555 Committee ISO19650+
- buildingSMART UK&I – OpenBIM

Technology Agnostic

- NOT Autodesk or Bentley
- Low Code > FME
- Open Source / Open Data

Previous Employers

Bay Assoc, Stuart Michael Assoc, Tully De'Ath > Balfour Beatty, Skanska, Costain > National Highways > WSP

Evolving Skills and Pathways for Digital in Civil Engineering

Or Embracing Automation, Low-code Tools, and Programming

Civil engineering has long relied on traditional methods of design, analysis, and construction management. Engineers use well-established processes to plan and execute projects that shape our world's infrastructure.

The industry is rapidly evolving with the rise of Artificial Intelligence, automation, programming, and low-code tools. Engineers face the challenge of adapting to these technologies to remain efficient and competitive. Many civil engineers still rely on manual, repetitive tasks. This is limiting our ability to improve or focus on innovation and complex problem-solving.

Can civil engineers embrace new digital skills and tools, such as programming and low-code platforms, to automate workflows, enhance productivity, and unlock new levels of design efficiency?

By learning programming languages like Python and utilising low-code tools such as Rhino3D with Grasshopper, civil engineers can automate tedious tasks, optimise complex designs, and stay ahead in an increasingly technology-driven field.

The Digital Skills for Civil Engineers

As an industry what are considered the skill imperatives? How highly do we value computer literacy? What type of training do we provide?

Core Digital Skills

- Basic Computer literacy: Excel (Pivot & Macro)
- CAD (Computer-Aided Design) and BIM (Building Information Modelling) software.
- Geographic Information Systems (GIS) tools.
- Analysis tools (Finite Element Analysis, Computational Fluid Dynamics).

Visual Programming Tools

- Grasshopper for Rhino3D: A parametric design tool that allows engineers to automate design tasks and optimize solutions.
- Dynamo for Revit and Civil 3D:
- FME by Safe Software is a data integration platform that allows civil engineers to efficiently process, transform, and automate the flow of geospatial and non-spatial data between different systems and formats.

Advanced Digital Skills

- Various Programming Languages such and #C and Python
- Python: Popular for automation in engineering workflows, data analysis, and simulations.
- MATLAB: Ideal for mathematical modelling and control system simulations.

Automation and Low-Code Tools in Civil Engineering

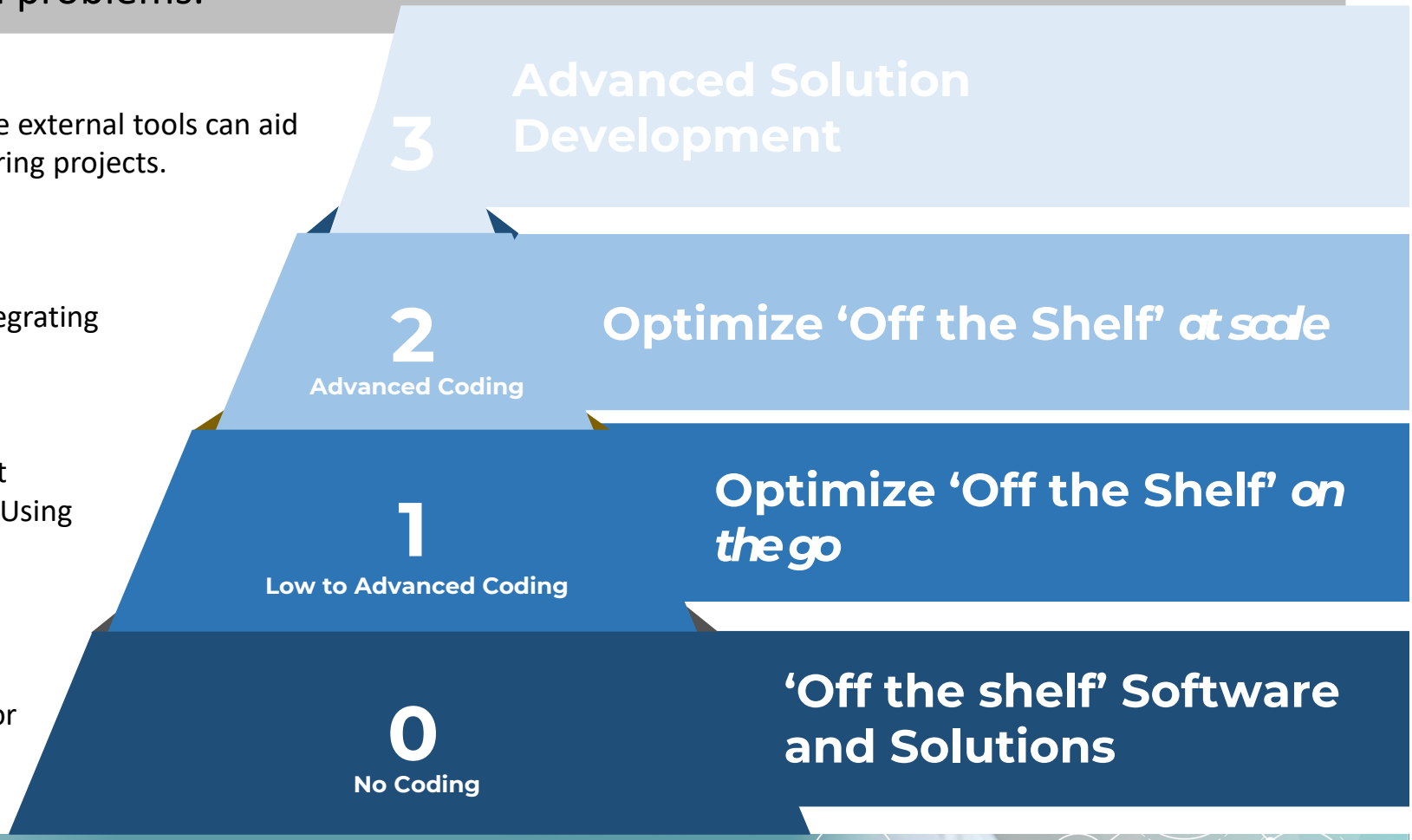
To introduce automation into Civil Engineering, use digital tools to automate repetitive tasks like calculations, design iterations, and analysis. Automation enhances productivity, reduces errors, and allows engineers to focus on complex design problems.

APIs and Machine Learning: How learning to integrate external tools can aid decision-making and predictive modelling in engineering projects.

Python or C#: Automating repetitive calculations, integrating various software systems.

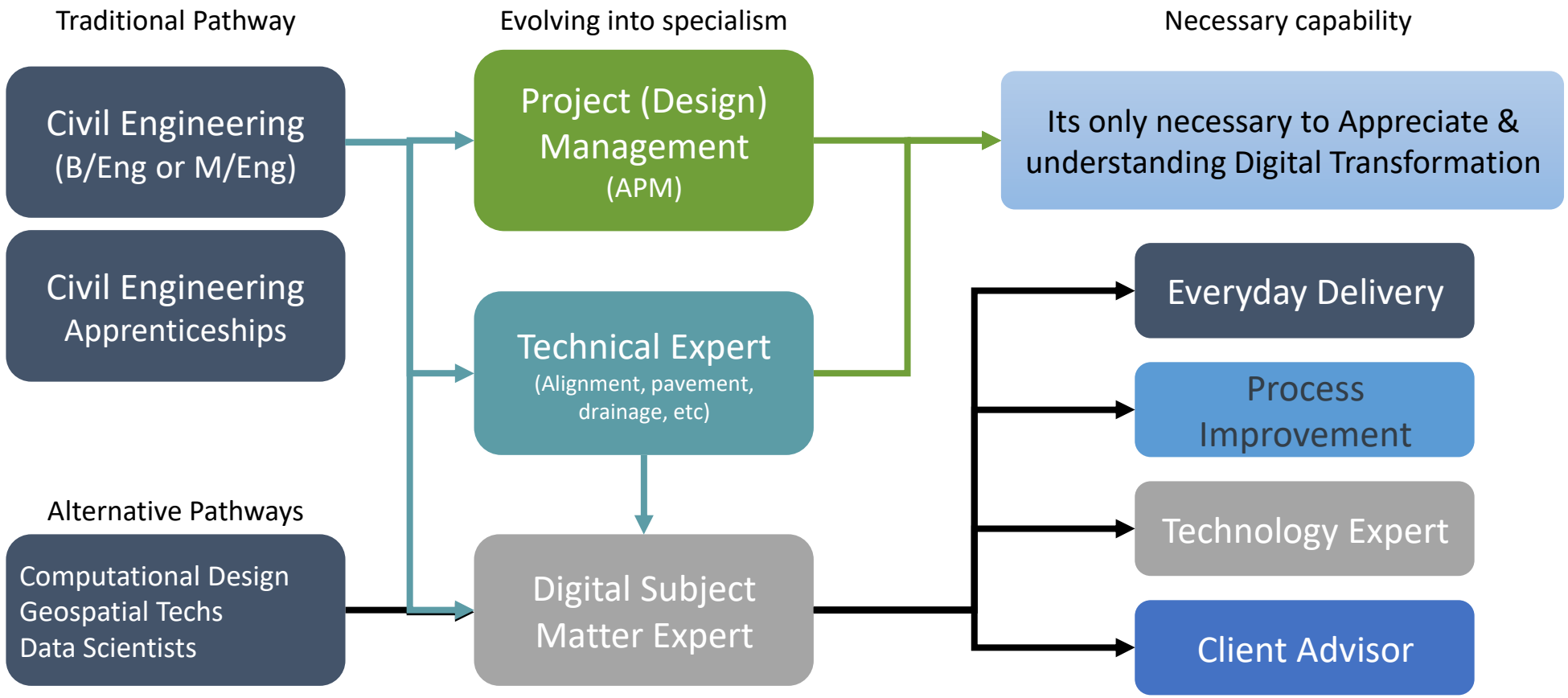
Low-Code/No-Code Tools: Tools like FME or Microsoft PowerApps that require minimal programming skills. Using low-code tools to streamline data collection for infrastructure inspection.

Rhino3D + Grasshopper (visual scripting) a powerful combination for parametric designs is already used for structural optimisation, bridge design, façade engineering, and urban planning.



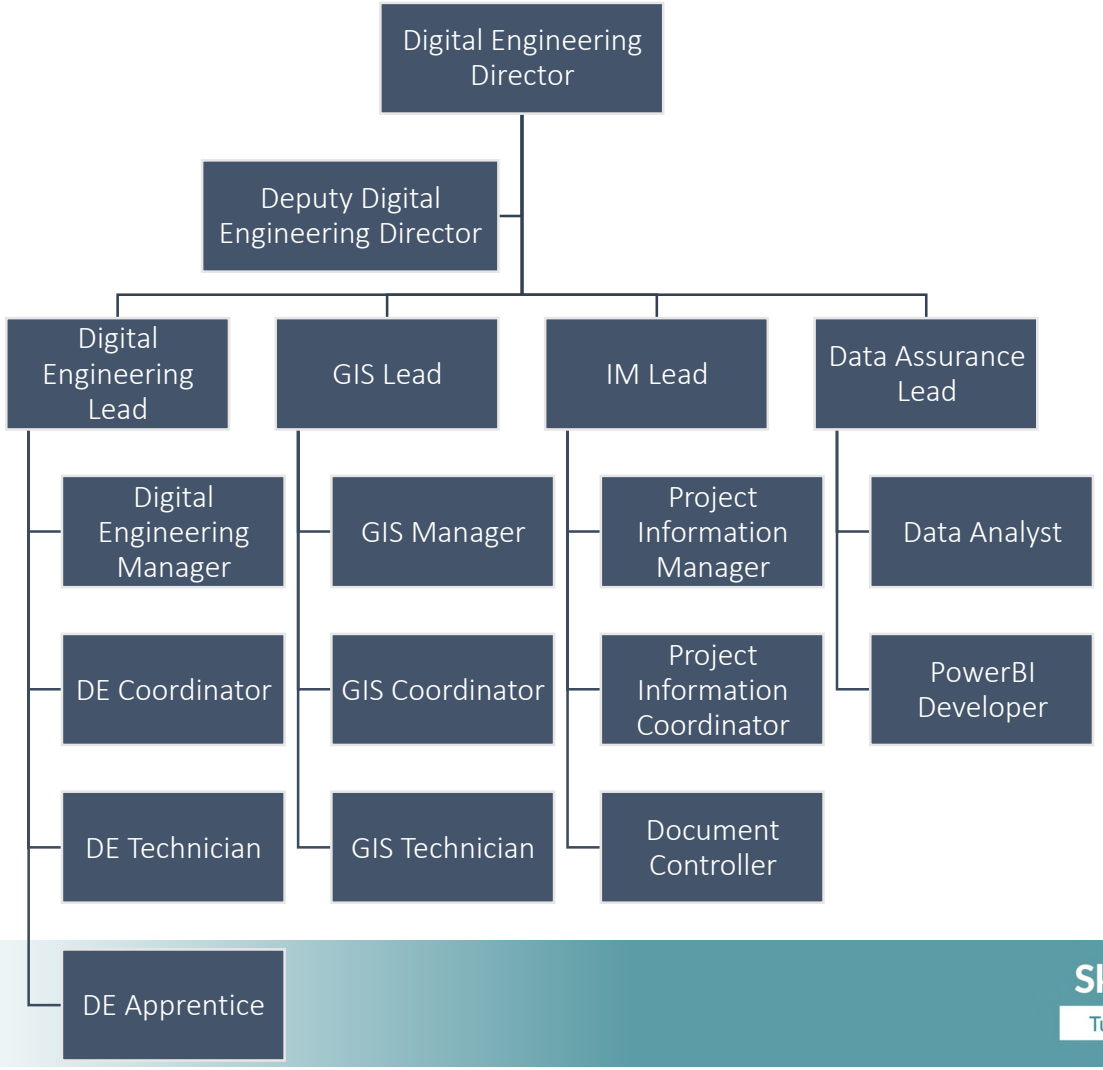
Consider the traditional pathways and roles of a Civil Engineer.

Global challenges and emerging trends and increasing role of technology and automation in civil engineering. Shall we explore how civil engineers can leverage digital skills, programming, and low-code tools to supercharge their roles?



Evolving Project Organisations Structures

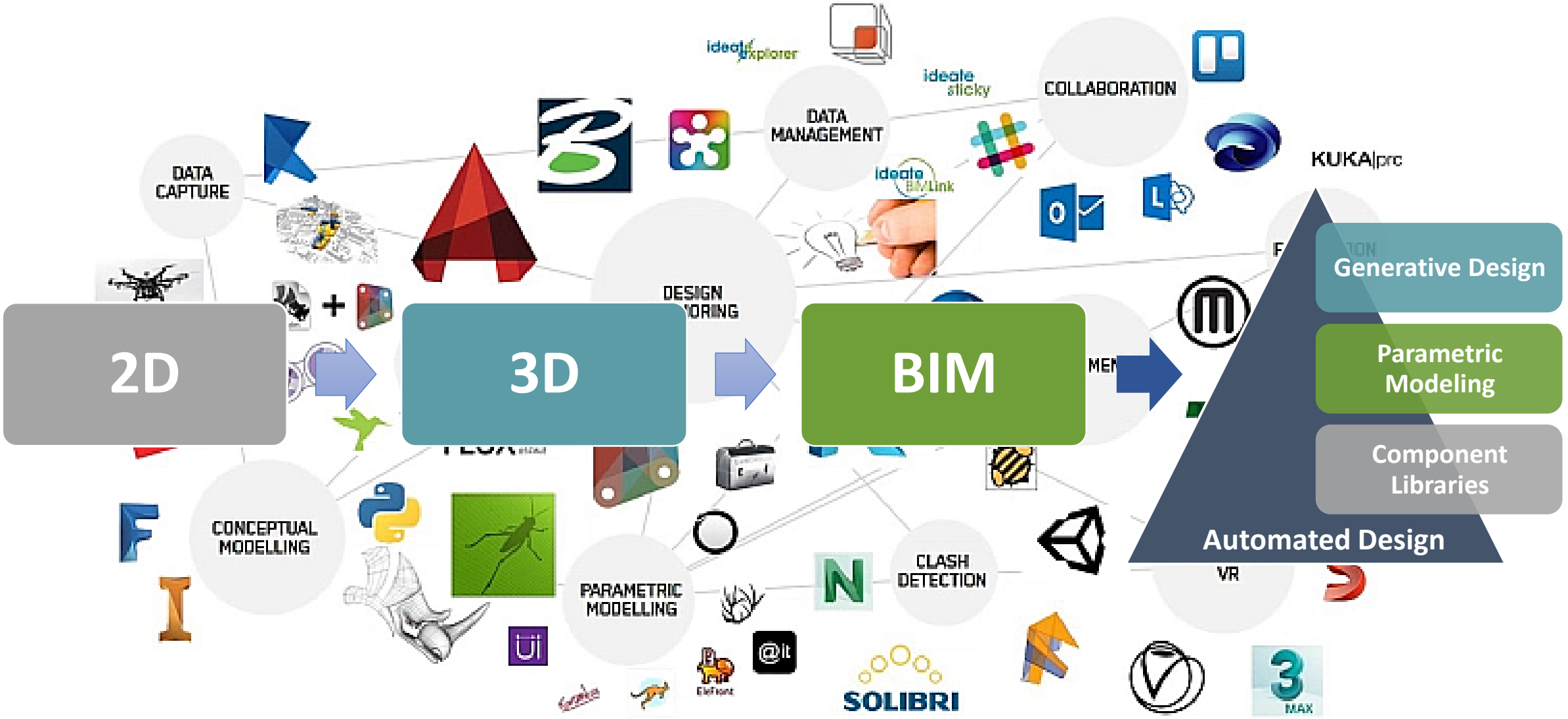
Making room in major projects or across frameworks for highly capable people to lead an evolution. They will bring productivity and value.



Roles & Responsibilities

- **Digital Director** – Sets & delivers the strategy, owns the Information Execution Plan.
- **Digital Eng**– Modelling set up, coordination & system set-up. Content Library, Rapid Prototyping, Digital Rehearsals, VR, AR, Asset Data
- **IM** – Doc Control, Deliverables Mgt, PCF Coordination
- **Data Assurance** – Data governance, quality control and reporting. (Cost, Carbon, hazards, deliverables etc).
- **All**
- Providing training for the engineering team, support and assistance in deploying the digital project requirements within the teams.

We can lead and evolution of design and engineering



Final thoughts…

Positive Outlook

An increasing role for Automation in Civil Engineering:

- AI-driven design tools, smart infrastructure, and automated project management systems.

The role of Civil Engineers in an Automated Future:

- Shifting focus to high-level design, strategy, and sustainability.
- Collaboration with data scientists, programmers, and urban planners to create more efficient systems.

Conclusion

- Civil engineering is evolving with the integration of digital tools and automation.
- Learning programming (Python, Grasshopper) and using low-code platforms can significantly enhance an engineer's capabilities.
- Engineers need to embrace continuous learning to stay relevant in a technology-driven future.
- Adopt Continuous Learning: The importance of adapting to new technologies and learning programming skills to stay competitive in the field.

After all, people remain our greatest assets.

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Thank you

Any Questions