

Identifying the barriers and opportunities to the adoption of advanced materials in construction

Composites in Construction 2018

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STRUCTeam Introduction



- Independent Composites Solution Provider
- We help our clients to:
 - ✧ Make better decisions
 - ✧ Reduce costs
 - ✧ Improve efficiency
 - ✧ Select and develop appropriate technologies for their composite business
- Over 200 successful projects since 2018 across all markets



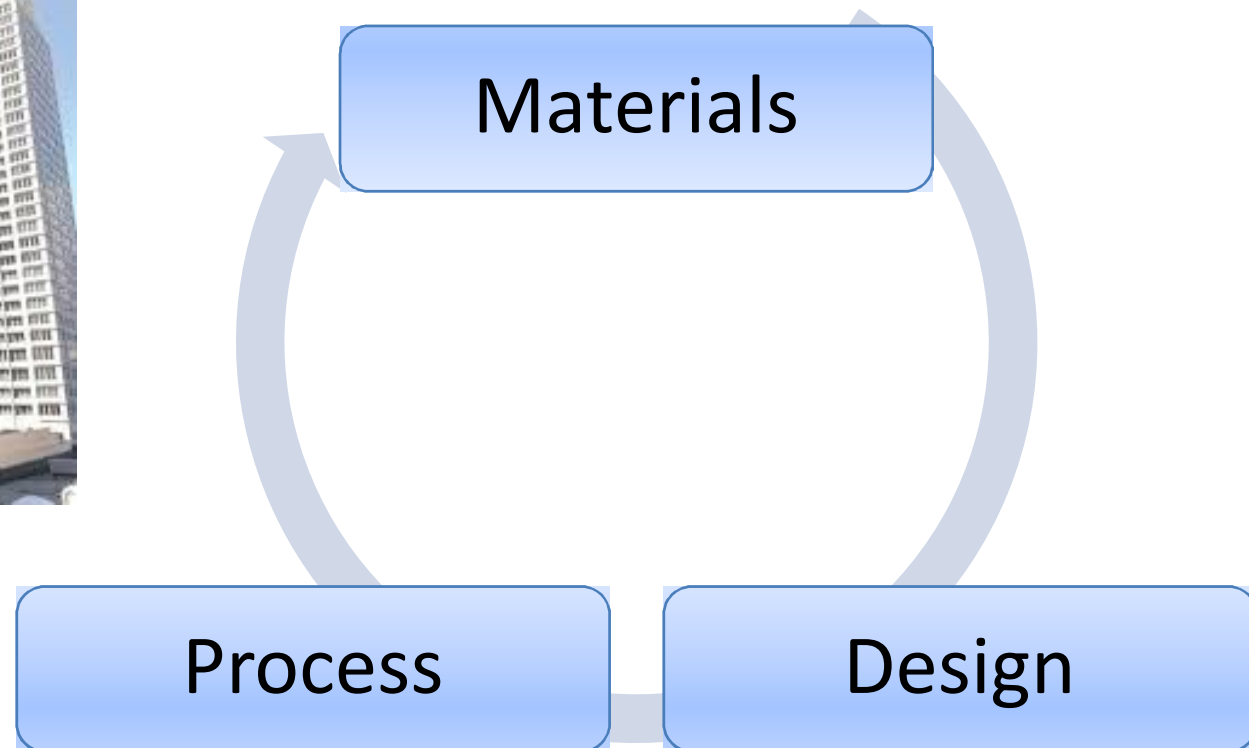
Agenda

- What are Advanced Materials
- Composites in Construction – a Sector Analysis
- Barriers to Adoption
- Conclusions and Questions

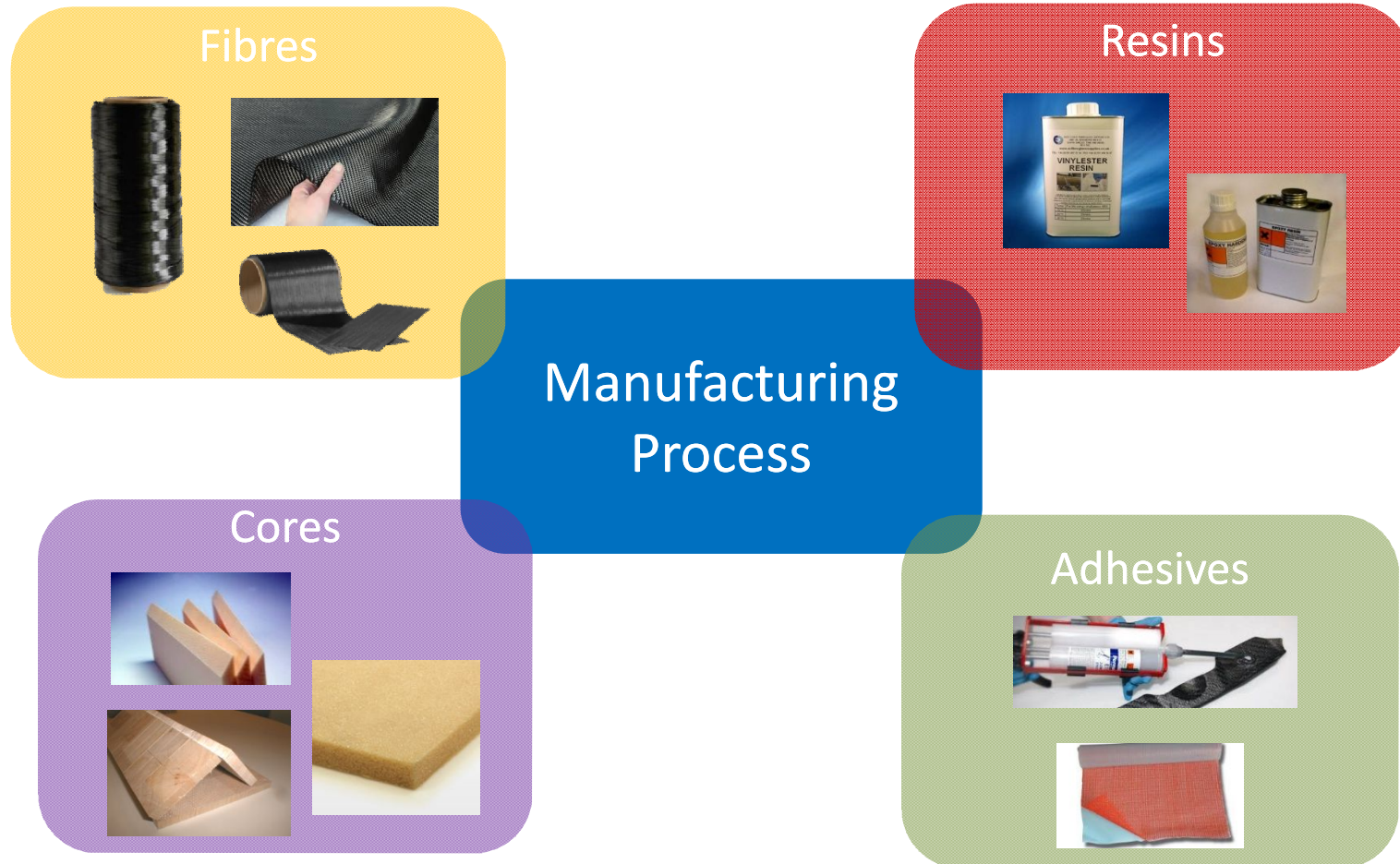


What are Advanced Materials?

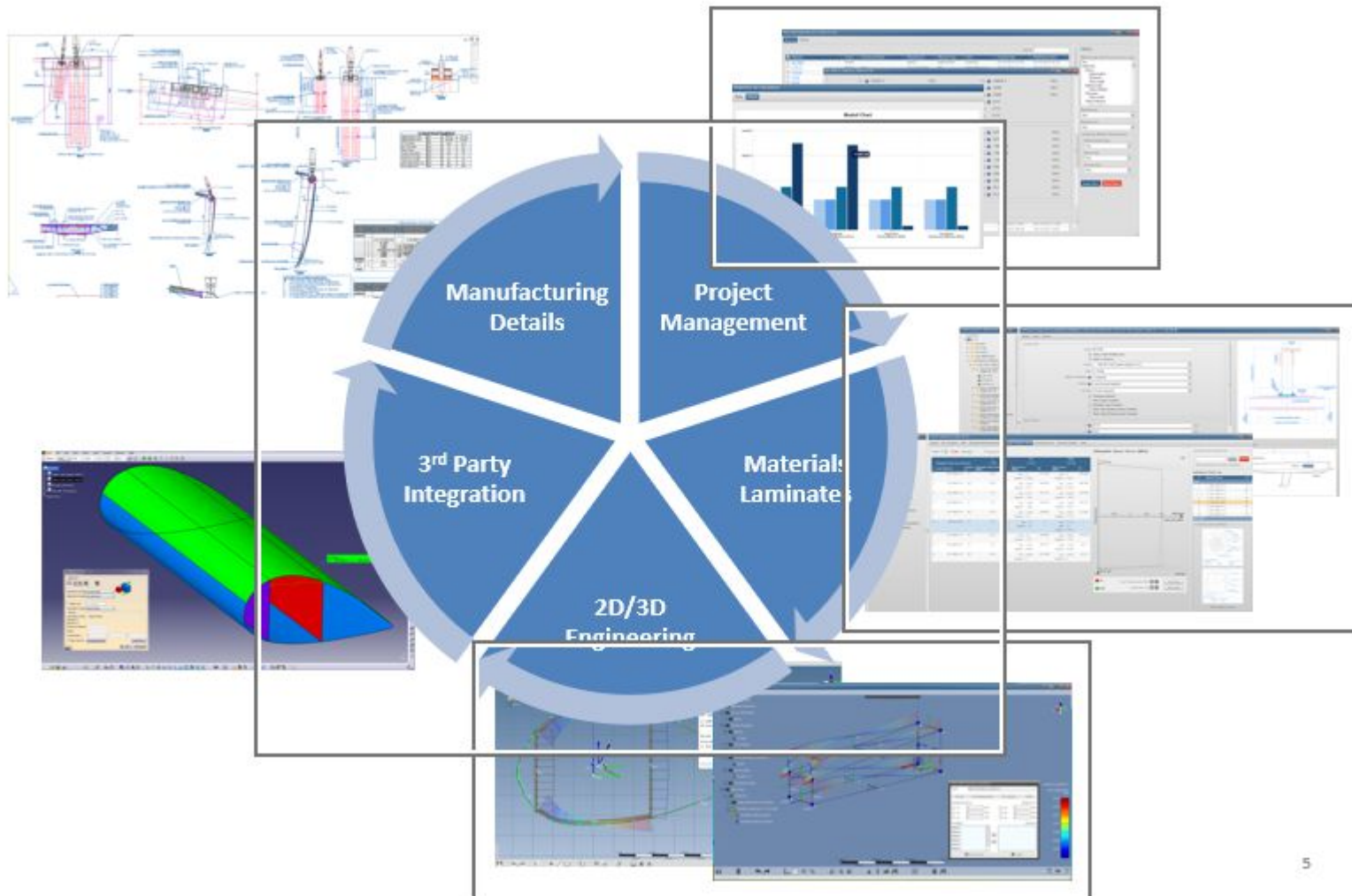
Composites



The Engineers Material Palette



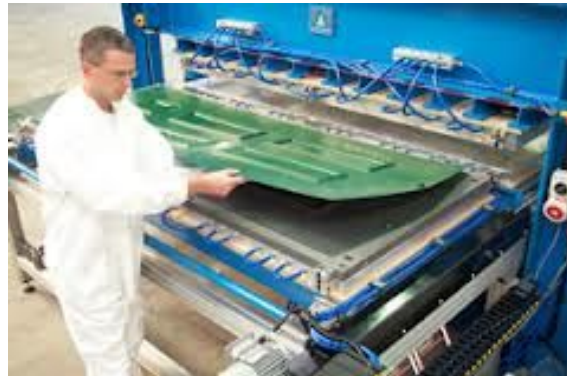
Design Elements



Manufacturing Technologies



Wet lamination



Press



Infusion



Pultrusion



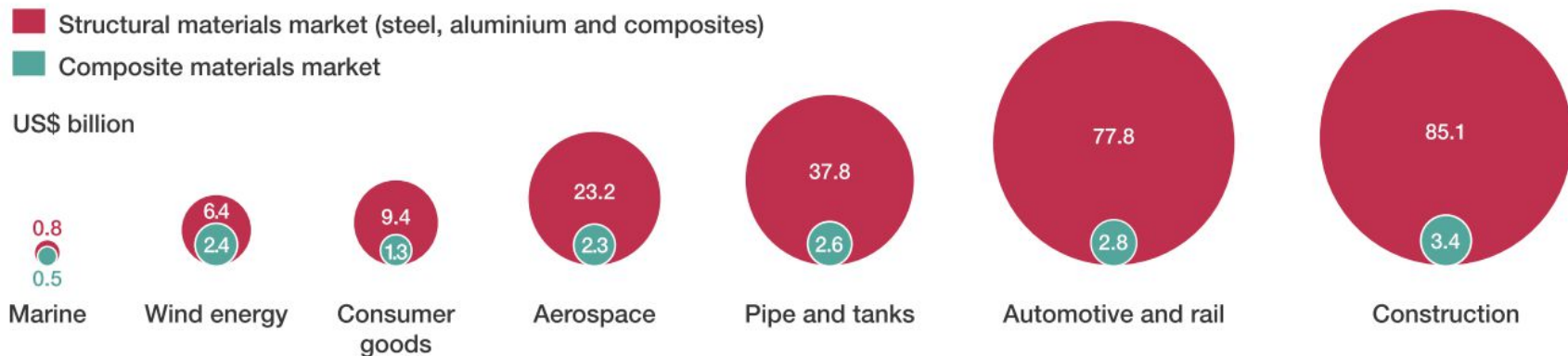
Prepreg



Automation


Composite Market Value

- Composites penetration in end markets compared to competing materials



(Source: Lucintel)

Comparison of requirements for composites applications



	Marine	Automotive	Heavy Truck	Aerospace	Wind Energy	Industrial	Architecture
Durability	●		●			●	●
Impact resistance	●						
Corrosion resistance	●	●	●		●	●	○
Design freedom	●	●		●			●
Low weight		●	●	●	●		●
Part consolidation		●					●
High heat			●				
High strength				●	●		●
Sound damping				●			○
Insulation Properties						●	●

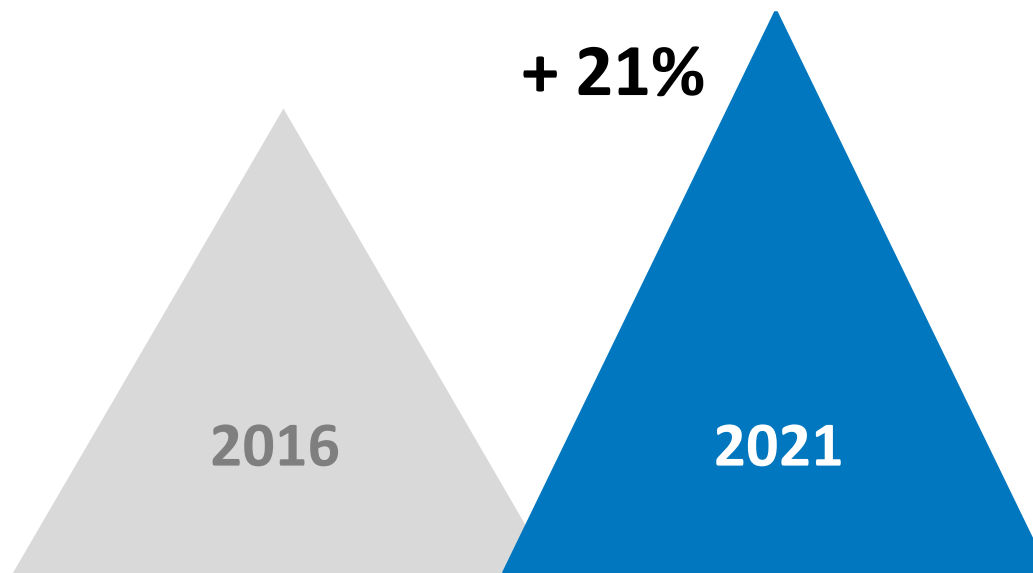
Courtesy of COBRA International 'Embracing Composites'

Composites in Construction

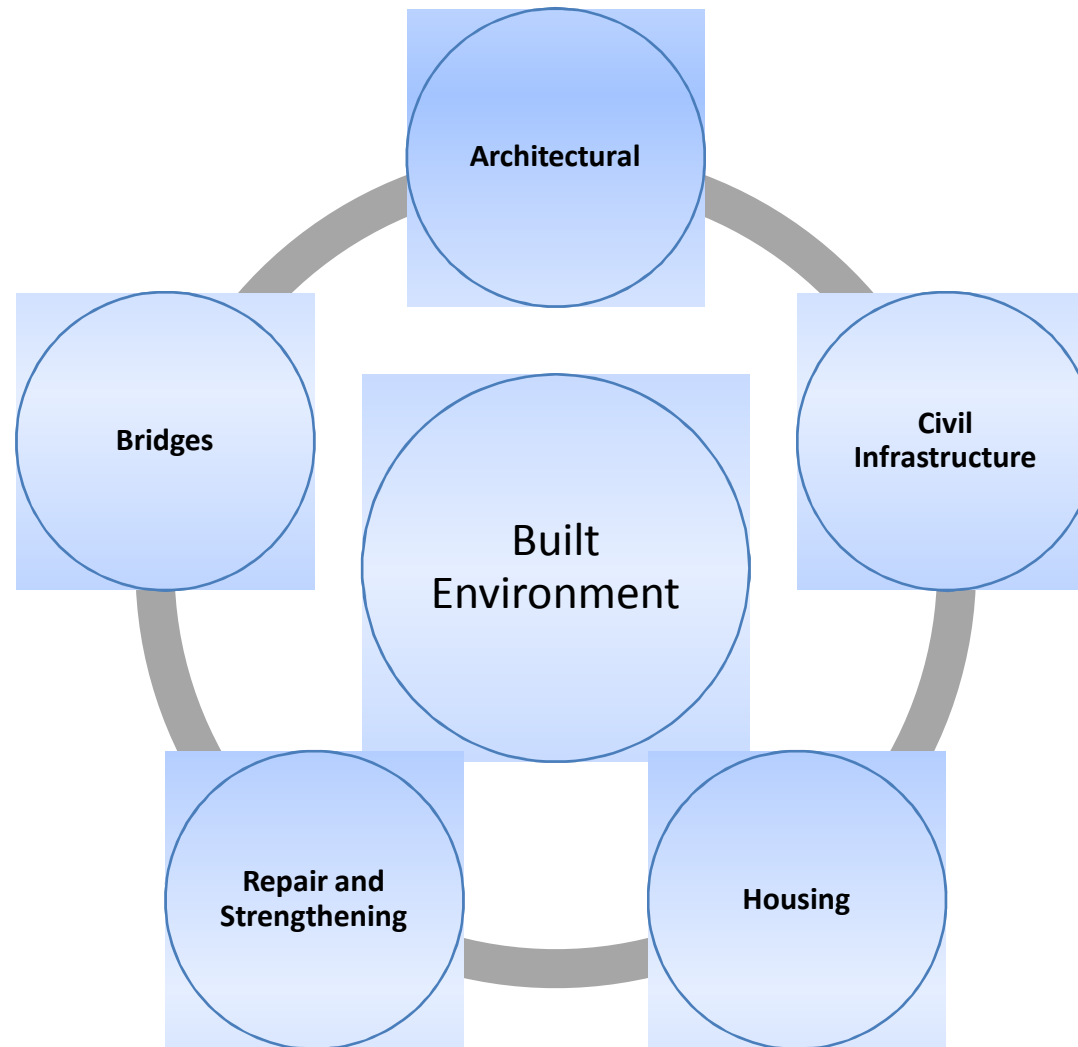
Construction Industry Size



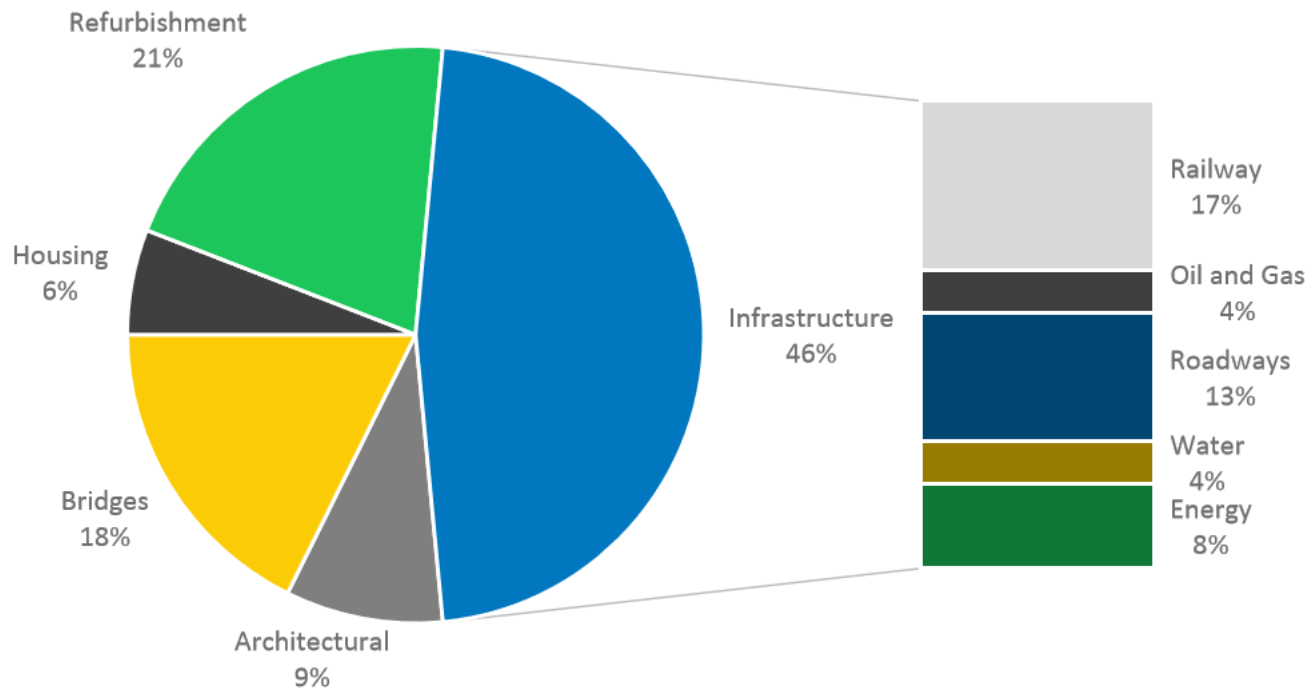
- Construction industry **regaining growth** momentum
- Construction market currently worth **€6.8 trillion** and has an expected **CAGR of 3.9%** per year until 2030



Sector Analysis



Sector Analysis



Composite construction sector market share

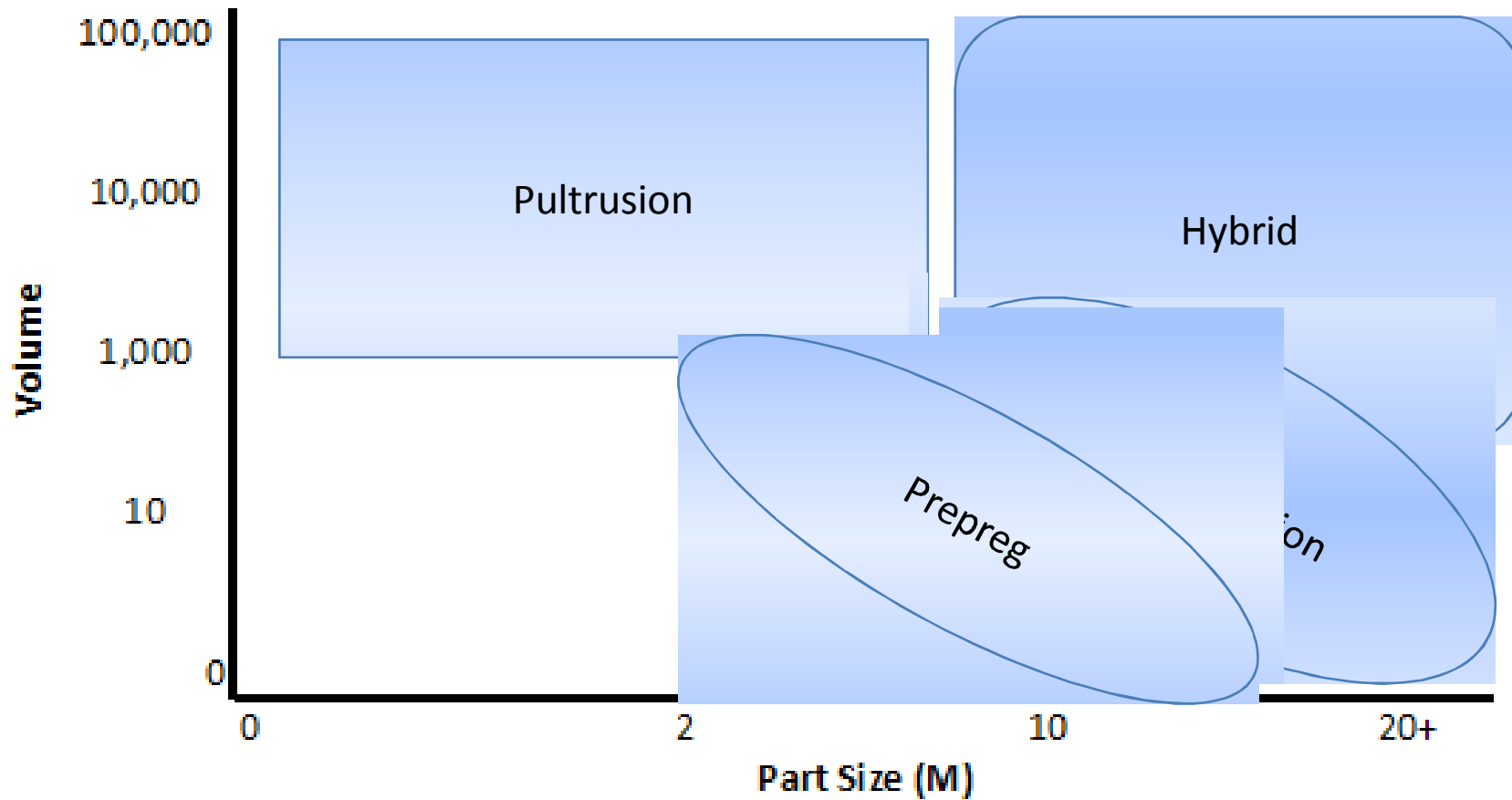
Source: STRUCTeam Ltd

Typical Value Chain

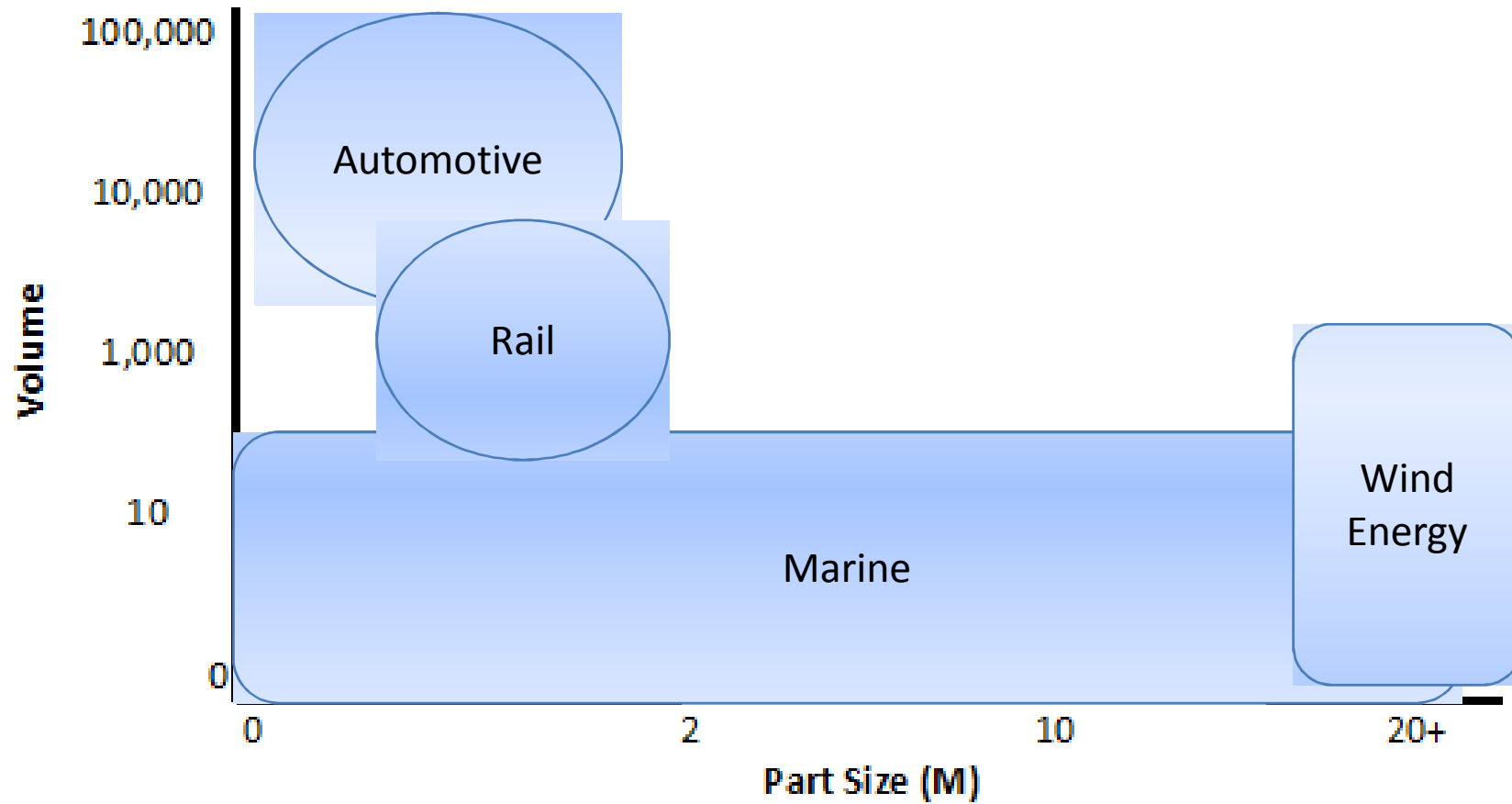


End Client	Consultants			Contractors		
	Architect	Cost Consultant	Structural Engineer	Main Contractor	Sub Contractor	Suppliers
Public or Private Body	Responsible for developing and delivering overall project design brief	Responsible for Value Engineering, Cost management and Quantification – Quantity Surveyors, Accountants, Financial institutions	Responsible for Civil Engineering Design and calculations	Responsible for Build of project and sub contractor management	Supply specialist skills or additional resource to main contractor	Companies supplying materials or service to project.

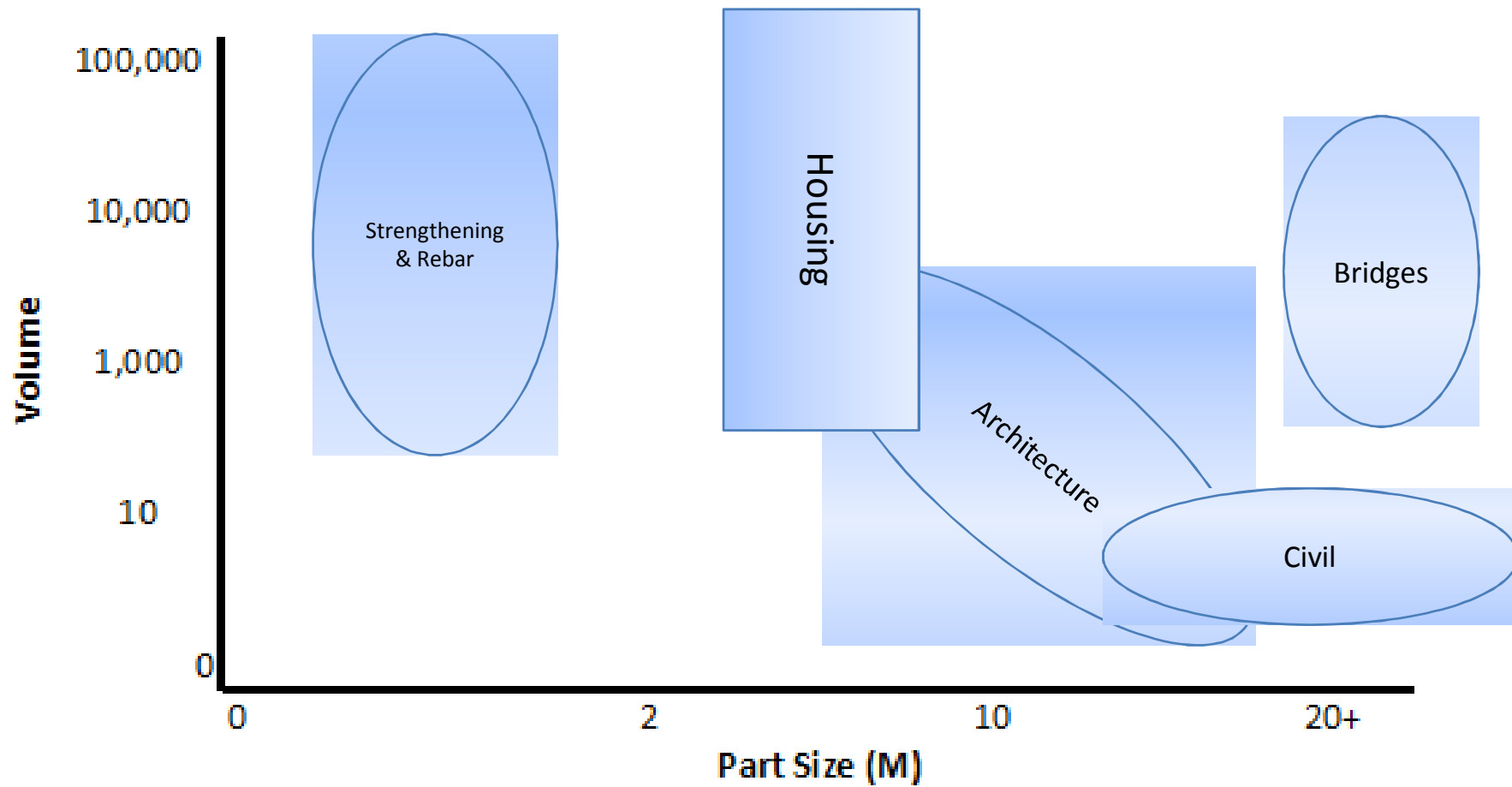
Technology Sectors



Established Market Sectors



Civil Sectors



Civil Opportunity Categories

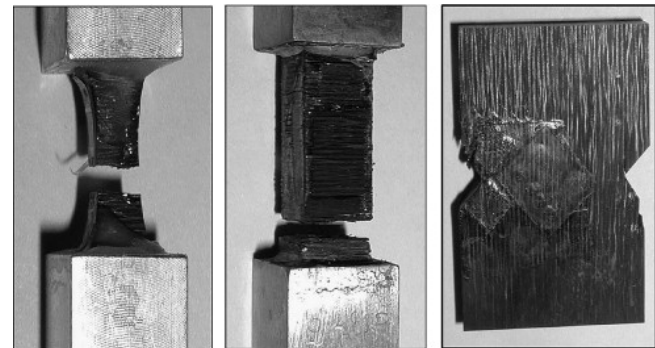


Opportunity	Sub Segment	Technology	Volume	Part Size	Enabler	Structural
Rebar	infrastructure	Pultrusion	High	Small	Regulation	Yes
Refurbishment	Strengthening	Pultrusion	Medium	Small	Contractor	Yes
Footbridges	Bridges	Pultrusion/ RTM	Medium	Large	Operator	Yes
Facades/Roofs	Architecture	Pultrusion/ RTM/PP	Low	Large	Architects	Yes

Barriers to Adoption

Material Challenges

- Expensive, organic materials
- Flammable
- Impact performance
- Brittle failure
- Repairs (supply chain based issue)
- Costs per kg



Design Challenges

Standards and Mechanical Properties

- Slow development of new standards
- Lack of repeatable design and best practises
- Composite design approach does not align with civil engineering
- Costs per kilo
- Orthotropic properties
- Low stiffness and toughness
- Difficult to modify once manufactured



Manufacturing and Supply Chain challenges



- Insufficient training
- Limited research with composite construction sector
- Material and fabrication cost higher than convectional materials
- Conservatism within the industry
- Maintenance and Repairs



Conclusions

- The construction sector is fragmented and barriers exist
- However, it is likely 'someone has done it somewhere'
- JEC 'Future of Buildings' and COBRA International 'Embracing Composites'
- World of experts will drive technology and improve accessibility



Questions?

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