

# Gathering21

Construction Innovations  
for Future Generations

CitA

## An Exploration of Lean and BIM synergies with a focus on SMEs in Construction

Marina Andreou , Barry McAuley , Alan Hore and Avril Behan



**5th CitA BIM Gathering Virtual Conference**

21 - 23 September 2021

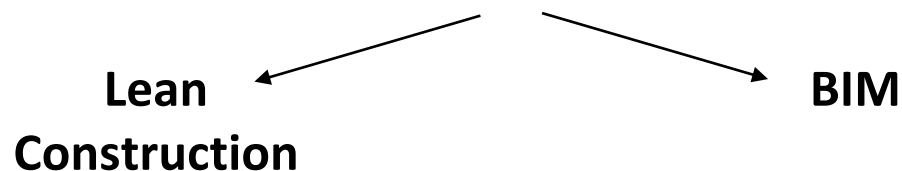


SMEs account for **99.7%** of the Irish Construction Industry and contribute to **68%** of all employment in the sector.



COVID-19

These enterprises need to modernise their workflows and adopt new ways of working, such as adopting Lean Construction and Building Information Modelling.

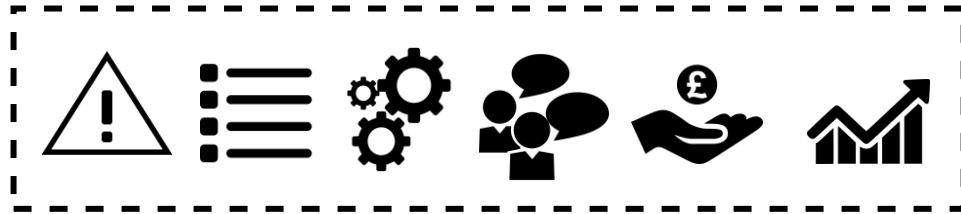


It is more difficult for SMEs to change their ways of working due to **limited finances**, **limited internal resources** and, **the cultural shift**.

The main issues that Irish construction SMEs face:

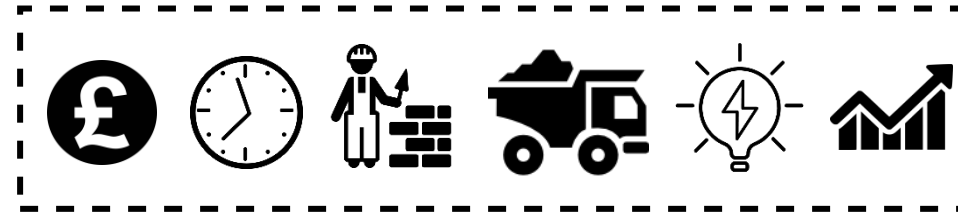
- ❖ **Low productivity**
- ❖ **Construction waste**





## Reasons that lead to low productivity

- Defects in construction
- Not Identifying the reasons that cause delays
- Weak commitment to new opportunities
- Bad communication
- Non-strategic cost reduction
- Not using progressed collaboration tools



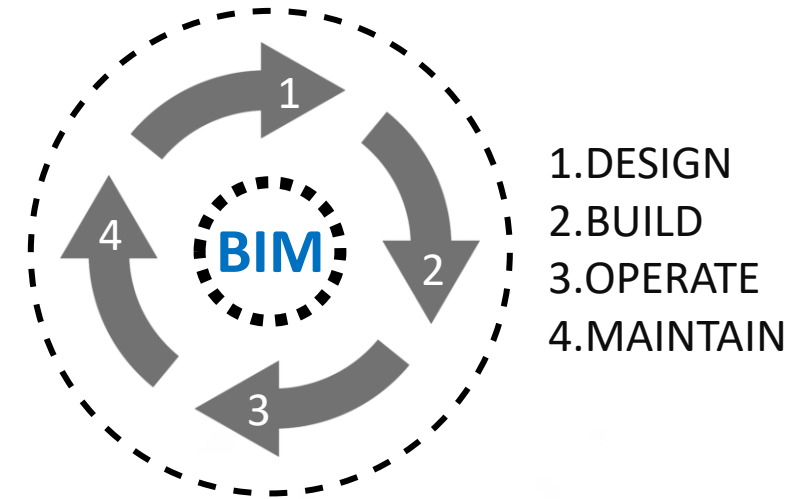
## Different forms of waste

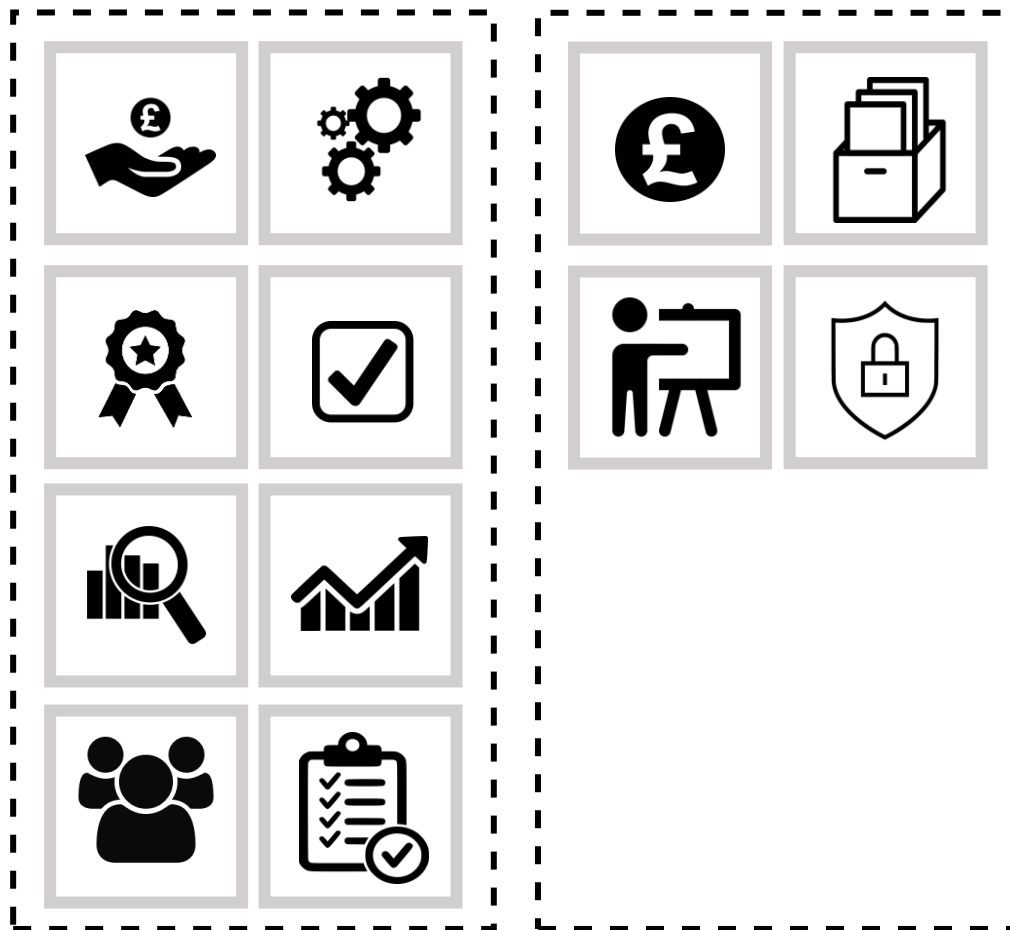
- Waste of money
- Waste of time
- Waste of effort
- Waste of materials
- Waste of energy
- Waste of opportunities





- BIM is a collaborative process in which all parties are involved in a project and can be applied through the complete lifecycle of a project.
- BIM can enable the industry to leverage more value from new software tools and technologies.
- The effective implementation of BIM requires changes to be made to almost every aspect of an enterprise.
- For an enterprise to implement BIM, it will require developing BIM strategies and using BIM standards.  
\*Otherwise, it may lead to further waste.
- An innovation such as BIM to succeed within SMEs, they will need to address several barriers.





### Advantages

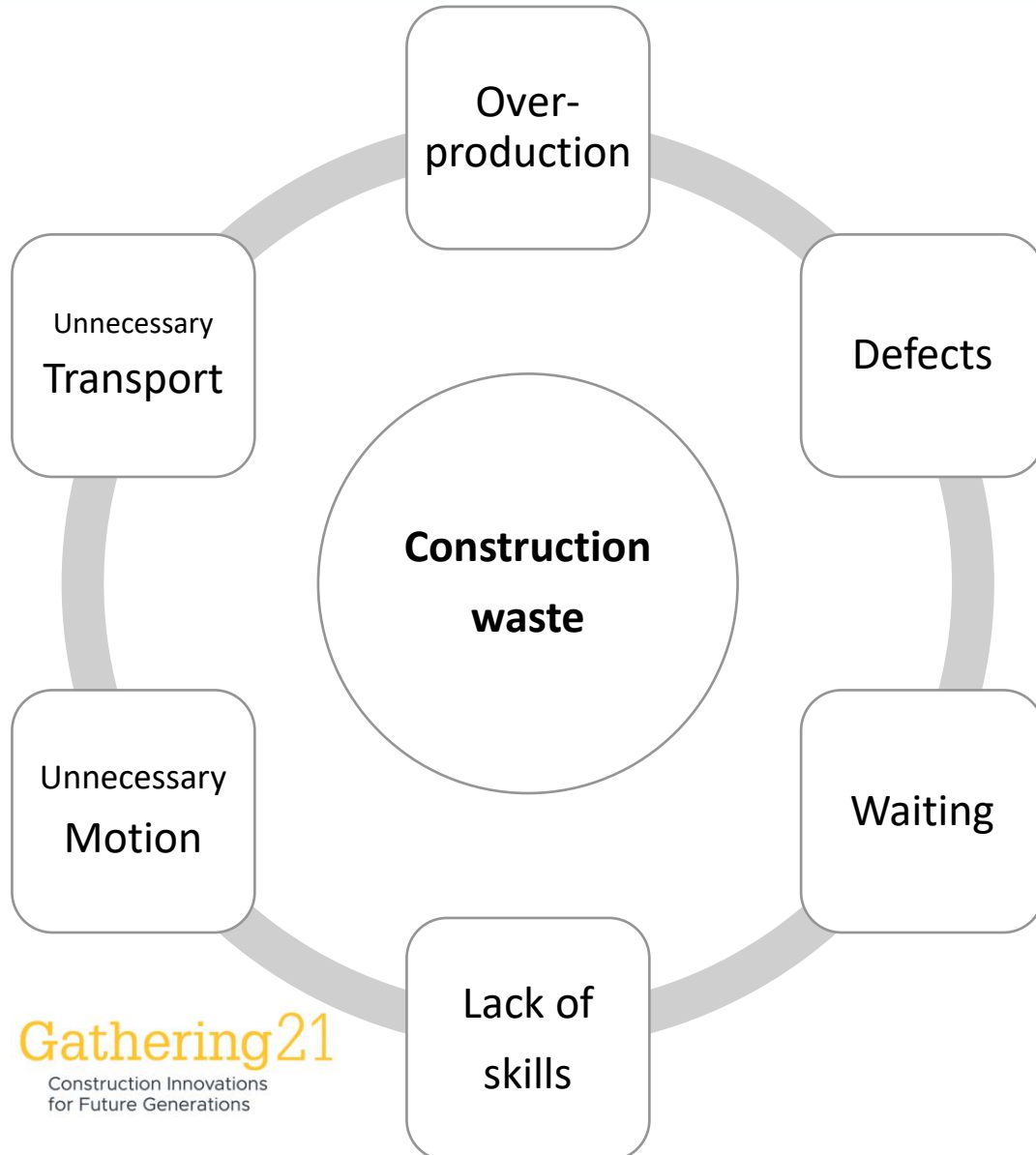
- Reduced projects' costs
- Reduced breakdowns, and minimise rework
- Better reputation
- Enable professionals deliver projects on time
- Improved management of information
- New roles, training and development
- Better collaboration
- Ability to phase works

### Disadvantages

- Cost to implement
- Upfront time to collect information
- Training and expectations
- Security and ownership

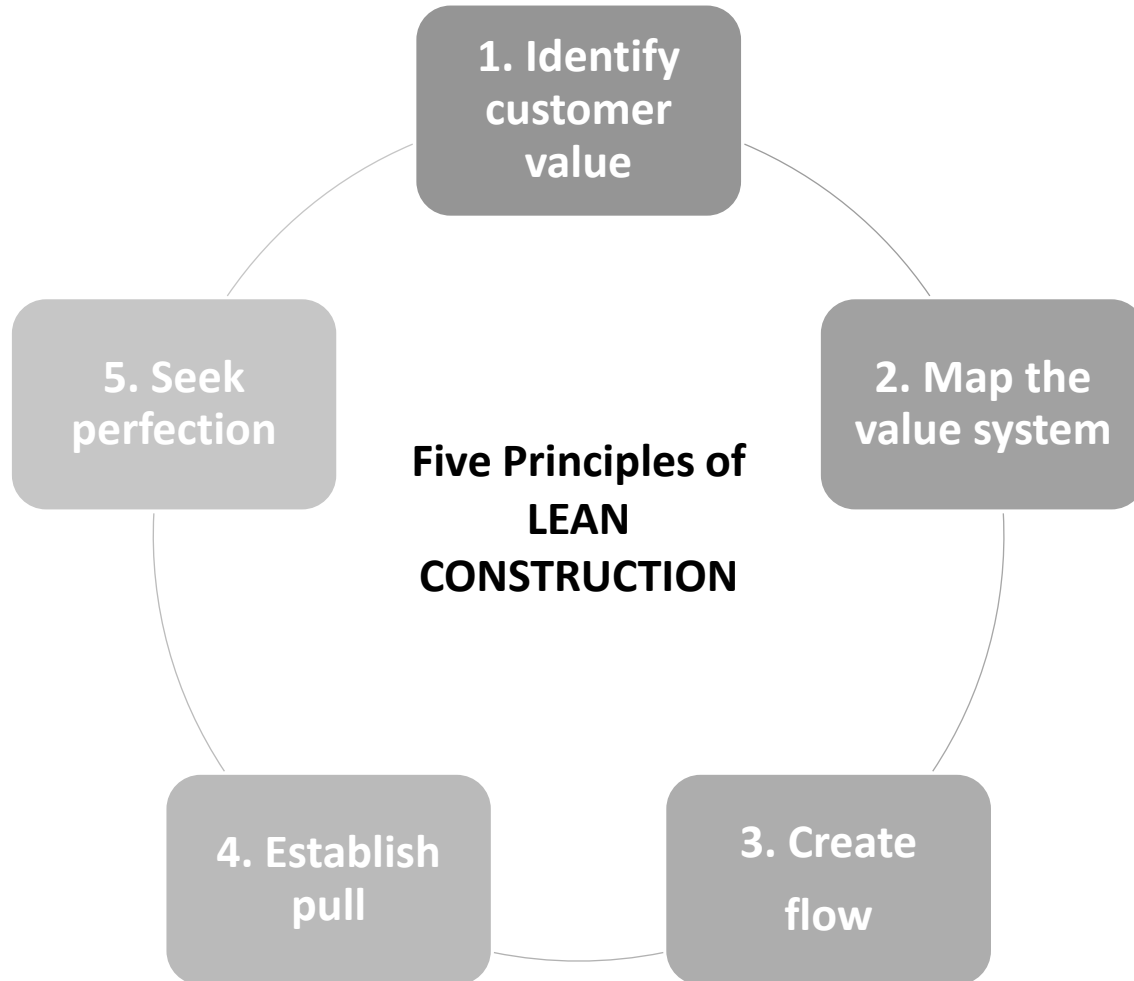
BIM





- The main objectives of lean are to maximise value and at the same time minimise waste.
- Therefore, the application of lean construction in SMEs can:
  - ✓ Increase productivity
  - ✓ Guarantee better compliance with deadlines
  - ✓ Reduce costs associated with waste
  - ✓ Improve the quality of processes





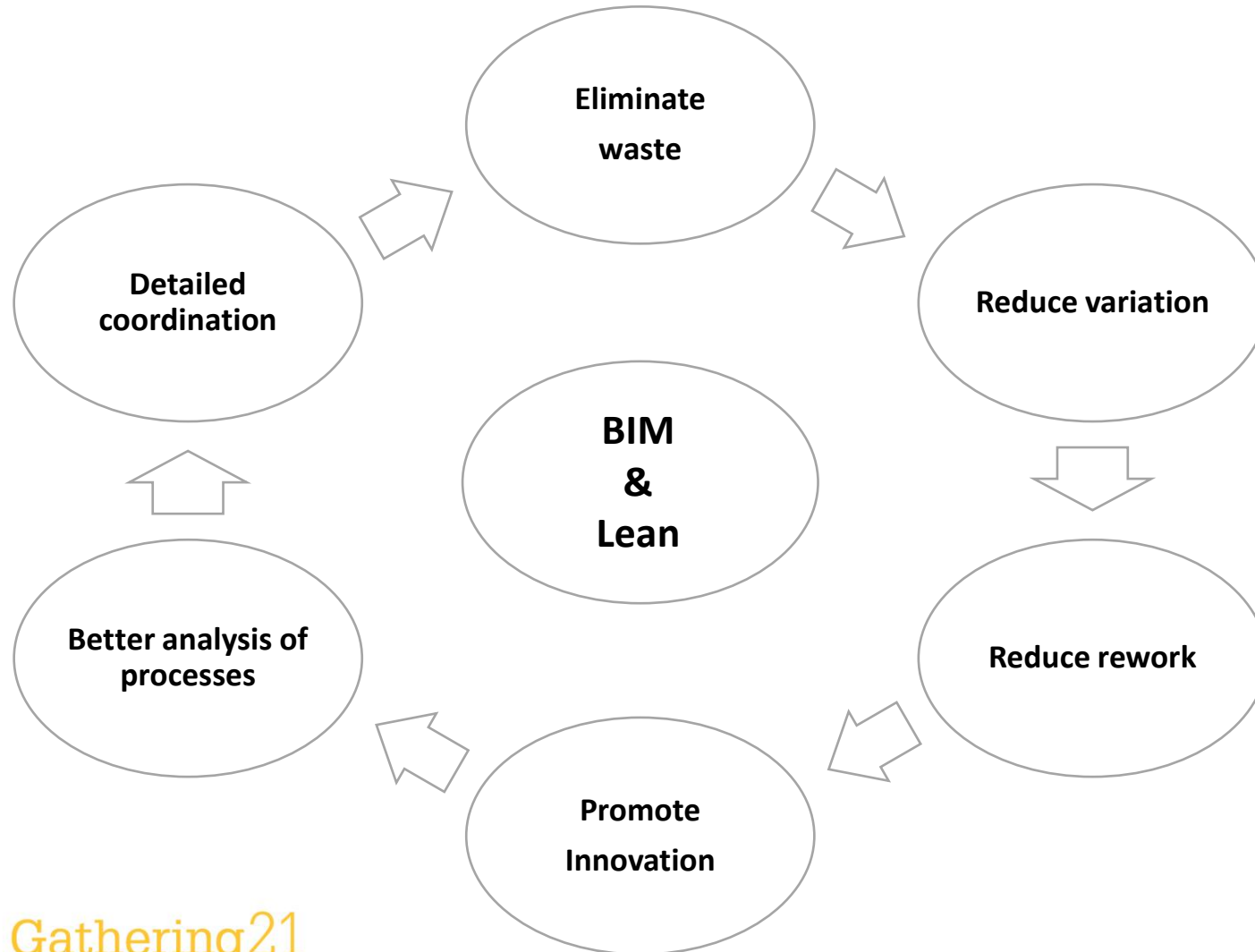
## Advantages

- Maximize value
- Minimize waste
- Increase productivity

## Disadvantages

- Lack of resources
- Lack of employees
- Lack of finances





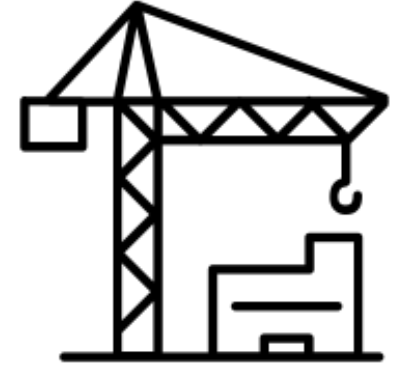
- **BIM** can be seen as a **lean tool** that helps eliminate waste and, at the same time, increases opportunities and promotes sustainability.





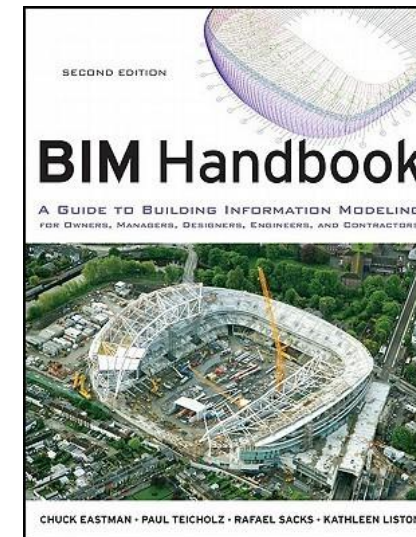


- Lean construction techniques require careful coordination between the general contractor and subcontractors to ensure that work can be performed when the appropriate resources are available on-site.
- BIM can assist with this as the model provides an accurate model of the design and the material resources required for each segment of the work.





- According to Sacks, there are 56 synergies between BIM and lean construction.
- An experimental and practical literature survey found that 48 of the 56 interactions improved the flow of information and materials.
- Sacks also developed a prototype BIM-based management information system to support a lean workflow called KanBIM.
- This system enabled visualisation of the processes and provides a reduction of wasted time spent looking for work.





## Some of the main barriers include:

- Financial concerns
- Legal concerns
- Lack of implementation strategies
- Lack of knowledge
- Software and hardware restrictions
- Lack of employees





## Facts about SMEs

- Lack of capital for innovation and new processes
- Less stuff
- In some cases, the owner is the manager of the enterprise
- SMEs might have a simple hierarchy
- An integrated set of enterprise functions





## Opportunities for SMEs

- SMEs are better positioned to innovate than larger firms.
- SMEs ' flexibility, simple organisational structure, and speed in decision-making are the essential factors that allow them to innovate.
- SMEs can generate, develop and deliver significant technical innovations due to the level of control that a manager has over decision making.





- A Systematic Literature Review, Canadian Journal of Civil Engineering: Lean Construction and BIM in Small and Medium Sized Enterprises (SMEs) in Construction.
- The aim of this research is to establish a lean digital construction innovation framework that SMEs can use to address the critical actions to transition from traditional to digital practices.
- This paper represents the initial stage of this framework. It will explore the barriers that SME's encounter and how BIM and Lean synergies can potentially address some of these concerns.





- The Economic analysis of productivity in the Irish construction sector Report has called for public contracts to support, value, and reward innovation through BIM, ISO 19650, Lean processes, and Modern Methods of Construction.
- The Build Digital Project is one of the leading actions of this strategy to raise construction productivity levels. This strategy will, in part, focus on both BIM and Lean in the context of raising its profile within SMEs.
- Increasing BIM and Lean Construction adoption among SMEs is key for achieving the construction industry's transformation.





- The synergies gained from partnering both of these processes together can lead to increased productivity and opportunities for SMEs, which is one of the key targets of the Build Digital Project.
- The research will establish an essential supporting structure to introduce digital construction and lean processes into SMEs.
- The proposed innovation framework will address the key pillars of innovation required for SMEs by partnering with BIM and lean methodologies concerning the Irish Construction Sector.





Thank you