

# Exploring the Perspectives of Small and Medium Enterprises (SMEs) in Adopting Digital Technologies and offsite manufacturing for Housing Construction

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ENHR 2023  
Lodz, Poland

28-30 Jun

# Context

- According to the Lincoln Institute of Land Policy (LILP) in a 2019 survey, 90% of the 200 cities around the globe were considered to be unaffordable to live in, based on average house price in relation to median income
- The construction and housing industries face multiple challenges, including:
  - Projects delivered over budget
  - Missed deadlines
  - Poor quality
  - Unsafe environments
- Digital technologies and modern methods of construction (MMC) have been promoted by governments as solutions in many advanced countries, including the UK.

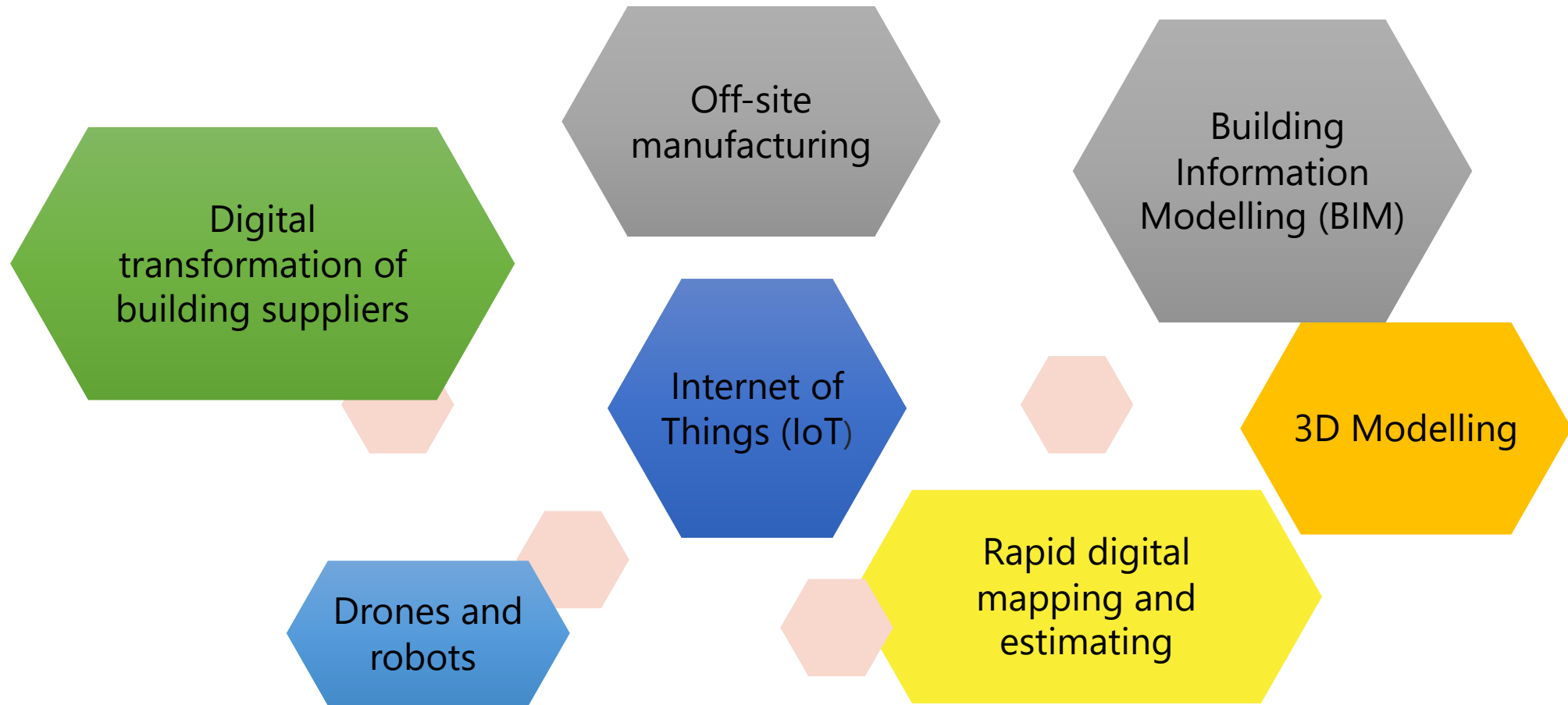


## Gaps in the literature and policy documents

SMEs play a vital role in the housing construction industry: 87.81% of a total of 325,736 general contracting firms in the UK can be considered as SMEs, accounting for almost 72% of total employment in the sector (ONS, 2019). Dickens (2017) also stated that 97% of the construction industry comprises companies with fewer than 14 employees. However:

- they are often neglected in policy discussions and reform initiatives, which primarily focus on large-scale enterprises.
- limited studies have specifically examined the perspectives of SMEs in adopting digital technologies and OSM.

# Tackling The Housing Crisis Through Digital Technologies and Offsite Manufacturing



# Building Information Modelling (BIM)

Building information modelling (BIM) is one of the technologies that is rapidly gaining attention in the construction industry. It is computer aided technology and perceived as the backbone of all digital solutions in the construction industry. This is because various kinds of software, drones and building sensors can eventually be connected to it.

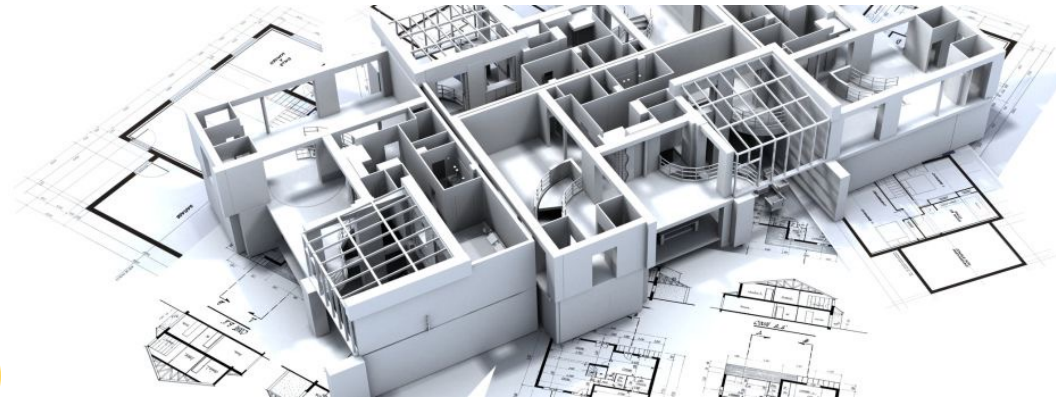
# Building Information Modelling (BIM)

Detects and eliminates errors

Generates a virtual model of a building and quality information

Maintenance routines

Reduces time and cost



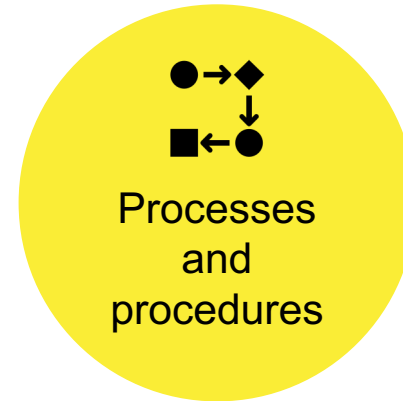
Reduces the likelihood of conflicts and delays

# Off-site Manufacturing

OSM is a manufacturing-based approach involving the production of components of buildings (e.g. foundations, roof cassettes, walls, floors, kitchen and bathroom units), or whole (modular) units of a dwelling, in a factory for installation in their final positions on a site. This high-precision, factory-based approach for construction is well-positioned to be used to provide increased numbers of new-build housing units that are of high quality and at a fast rate.



# Inhibitors to the take up of digital innovation





# Research Design and Methods

**Design:** Qualitative exploratory approach

**Sampling: Purposive**

- Stakeholders to be involved in a housing project using Digital technologies and OSM

- **Data Sources & Collection**

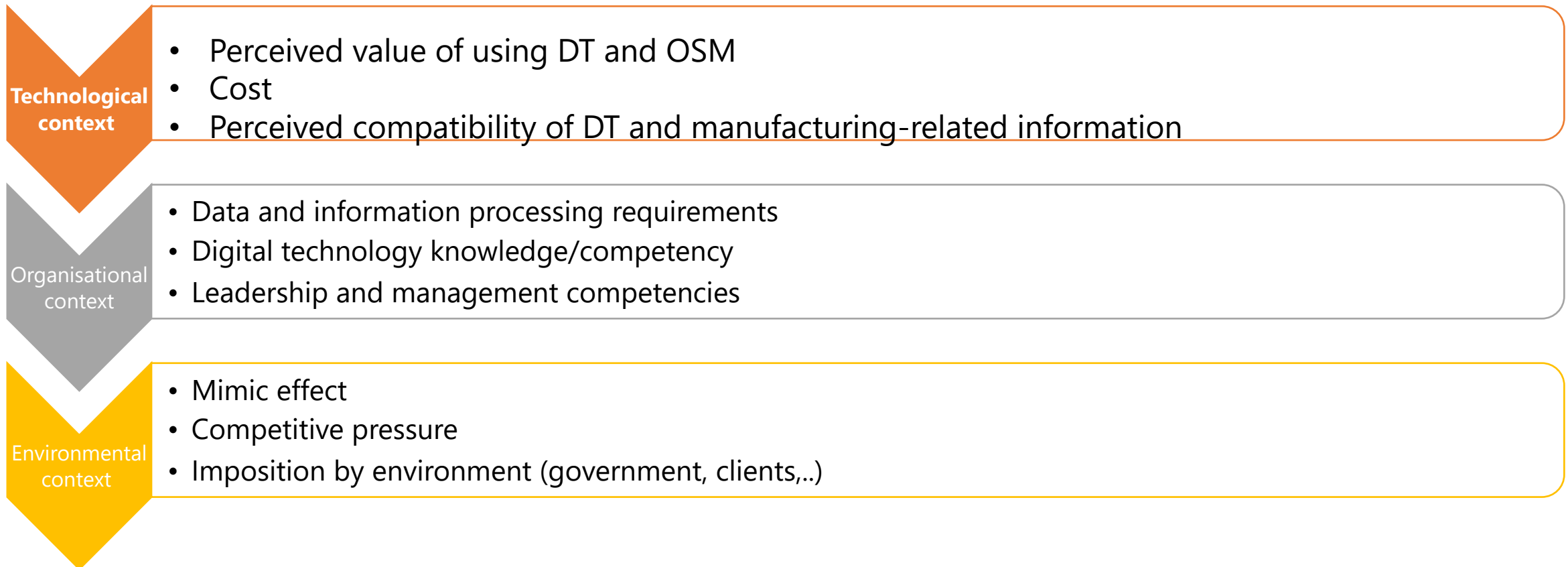
- Semi-structured interviews

- Two online workshops

- One in-person workshop

- ❖ Using Mentimeter during the online workshops to ask participants questions

# Technology-Organization-Environment (TOE) framework



# SMEs' perspective on embracing digital technologies and OSM; their challenges and needs (Cont'd)

SMEs are significantly limited regarding financial and human resources

Supply chain integration

Limited customization options

Practicality and cost-effectiveness in adopting digital technology

# SMEs' perspective on embracing digital technologies and OSM; their challenges and needs

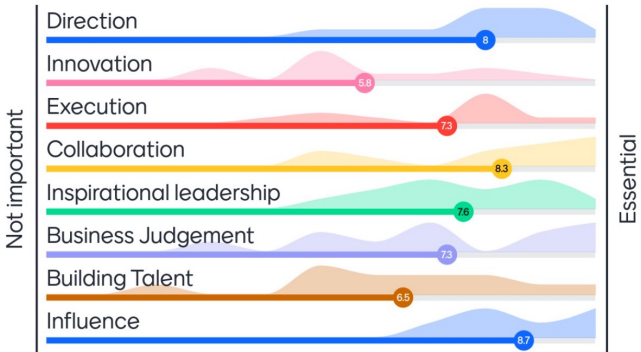
Disconnected information and lack of understanding regarding the relationship between models and schedules in the digital environment

Clarity, detail, and understanding of how different components and information within digital systems relate to each other

The lack of recognition and understanding of competence requirements for successful digital implementation at the senior management level

# Some Mentimeter results: What are the barriers to employ Digital technologies in the housing project?

Rank the characteristics of a Digital Leader



In one word, what is the biggest barrier to adopting digital technologies in your work?



What percentage of CEO's believe that digital investments fails because of business culture or team behaviours?



# Some Mentimeter results: What are the barriers to using OSM in the housing project?

Lack of credible supply chain.

Single point of failure.

Components don't fit

Evaluation of the Supply chain

Dependent on factory qa

Weak supply chain

Delivery issues, traffic delays.

Potential lack of understanding /  
knowledge by stakeholders

Offsite manufacturers seem to run  
out of money. Can't guarantee they  
will be able to deliver

# Some Mentimeter results: What are the barriers to using OSM in the housing project?

Skills shortages

Not able to adapt scope to work with issues on site

Vulnerable supply chain with peaks and troughs- down factory time bad news

Distance between the off-site plant and on-site. Managing the process and progress.

Design and prototype time

Wind can be an issue (when using cranes), so programme delays

# Recommendations and Strategies to Promote the Adoption of Digital Technologies by SMEs (Cont'd)

Development of industry-wide guidelines and standards to address these challenges

Comprehensive learning and implementation of digital tools, rather than partial adoption, to achieve effective results

Upskill the workforce and create a supportive environment for digital adoption

Enhance collaboration between industry stakeholders and the exchange of best practices to drive successful digital transformation



# Recommendations and Strategies to Promote the Adoption of Digital Technologies by SMEs

Provide support from external parties, such as clients, contractors, and government, to facilitate the transition and compliance with regulations

Set up local initiatives and partnerships with local authorities, construction companies, and clients to promote mutual benefits and support

Collaboration at the local level that fosters knowledge sharing, innovation, and the creation of digital ecosystems

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This research is part of the University of Cambridge's Social Science  
Impact Fund