Loughborough University

# Management of Construction Processes and Techniques

## 23CVP326

Semester 2 2024 In-Person Exam Paper

This examination is to take place in-person at a central University venue under exam conditions. The standard length of time for this paper is **3 hours**.

You will not be able to leave the exam hall for the first 30 or final 15 minutes of your exam. Your invigilator will collect your exam paper when you have finished.

Help during the exam

Invigilators are not able to answer queries about the content of your exam paper. Instead, please make a note of your query in your answer script to be considered during the marking process.

If you feel unwell, please raise your hand so that an invigilator can assist you.

You may use a calculator for this exam. It must comply with the University's Calculator Policy for In-Person exams, in particular that it must not be able to transmit or receive information (e.g. mobile devices and smart watches are **not** allowed).

Answer **THREE** questions. Answer **ONE** question from each of **Sections A, B and C.**

All questions carry equal marks.

Continues/…

## SECTION A

(Answer **ONE** question from this section)

1. a) Discuss (and sketch) how offsite and BIM have evolved over time in terms of the Gartner Hype cycle.

[12 marks]

b) Present a reasoned comparison between incremental and step change innovation, providing a recent example of each in the construction industry (but not BIM or offsite), explaining why they are innovative.

[8 marks]

c) Compare and contrast the drivers and barriers for innovation in construction and hypothesise how the main one of each may evolve in the future.

[13 marks]

2. a) With the aid of an appropriate example briefly explain the following terms that are associated with risk management in the construction sector:

i) Timeframe
ii) Chance
iii) Risk register.

[9 marks]

b) The typical process for managing risk in construction project employs a sequence of five (5) key stages:

i) Describe each of the five stages.
ii) Discuss any two demerits associated with the five-stage approach for managing risk in construction.

[9 marks]

c) A construction contractor has the following proposed income streams detailed in Table Q2, for a 12-period project that it has won as part of a major infrastructure development. The project manager has assigned the likelihood of recovering the income streams based on the difficulty of the work section in each period.

i) Calculate the risk associated with each income stream for each period.
ii) What is the expected periodic financial performance for the project?
iii) What minimum contingency should the contractor budget for, to take account of the overall financial performance risk of the project?

[15 marks]

Question 2 continues/…

**Table Q2**

| Period | Projected income (£) | Probability of recovering income |
|---|---|---|
| 1 | 112,000.00 | 0.8 |
| 2 | 123,000.00 | 0.8 |
| 3 | 135,100.00 | 0.8 |
| 4 | 148,410.00 | 0.8 |
| 5 | 163,051.00 | 0.8 |
| 6 | 171,103.60 | 0.85 |
| 7 | 179,558.70 | 0.85 |
| 8 | 188,436.70 | 0.85 |
| 9 | 197,758.50 | 0.85 |
| 10 | 207,546.40 | 0.85 |
| 11 | 212,685.10 | 0.875 |
| 12 | 252,809.00 | 0.88 |

Formulae

$$\mu = \frac{\sum x_i p_i}{n} \qquad \sigma = \sqrt{\frac{\sum p_i (x_i - \mu)}{n-1}} \qquad X = \sum_{i=1}^{n} X_i P(X_i)$$

Continues/…

## SECTION B

(Answer **ONE** question from this section)

3. a) Provide a critical evaluation of the differences between 'project management' and 'management of projects', and reflect on the appropriate skills for each.

[15 marks]

b) Using examples from mega projects (such as UK's Crossrail), identify and describe FOUR sources of project complexity.

[8 marks]

c) Cranes are important pieces of lifting equipment for building projects. Identify and discuss FIVE key considerations in the planning of craneage for a high-rise building project in a city centre.

[10 marks]

4. Complex projects present particular challenges for construction teams and innovative digital technologies have the potential to address such challenges.

a) Your team is working as the main contractor for a multi-billion pound megaproject. The project involves the creation of a 25km long, 7m diameter tunnel running along the path of the river Thames in London. Based on the characteristics of the project, evaluate applications of three different digital technologies that could be employed for improving the construction of the project, discuss their applications, expected benefits, and challenges.

[15 marks]

b) Construction 4.0 is defined as the interdisciplinary digital technologies (such as BIM, IoT, VR, AR, Cloud Computing etc) that enable the digitisation, automation, and integration of the construction process across the project lifecycle and throughout the supply chain.

i) Identify and describe THREE characteristics of the initial phases of the innovation process in the context of Construction 4.0.

[6 marks]

ii) Define 'innovation management'.

[2 marks]

iii) Using a diagram illustrating the innovation management model, discuss how innovation management can facilitate the adoption of Construction 4.0, particularly during the initial phases of the innovation process.

[10 marks]

Continues/…

## SECTION C

(Answer **ONE** question from this section)

5. a) Compare and contrast the THREE main aspects of industrialisation and the overall context in which they should operate to maximise the benefits, providing a reasoned example for each from construction for each aspect.

[13 marks]

b) Explain how the different terms for construction industrialisation (prefabrication) in the UK have changed over recent decades.

[7 marks]

c) What are the main benefits and drawbacks of standardisation?

[7 marks]

d) Describe how the boom and bust cycle typical in the construction sector can affect the time/cost/quality, take up and continuity of offsite construction.

[6 marks]

6. a) The Sarah Slaughter paper (2000) identifies five categories of construction innovation. Describe these categories, providing examples from construction to illustrate your answer.

[25 marks]

b) It is often said that we should build our houses like we make cars – Discuss the main problems with this analogy.

[4 marks]

c) Both the car industry and construction use platforms. Explain the similarities and differences between the two sectors regards their platform approach.

[4 marks]

R Soetanto
C Goodier
M Wang