

Artificial Intelligence in the Construction Sector: How Can It Improve Talent Management

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Summary

The construction industry is continually challenged due to the skills deficit throughout the sector. This is currently impacting numerous projects throughout the UK including the housing programme, HS2 and significant infrastructure upgrades. There is a reluctance to change to new and improved methods within the sector, however, Industry 4.0 technologies are essential to the built environment and offers improvements in many areas of the workplace. This paper discusses the benefits of artificial intelligence in the sector and the requirements for investment by the UK Government and businesses throughout the construction industry.

Keywords: Talent management, Artificial Intelligence, skills shortages, Industry 5.0.

Track: Artificial Intelligence in Talent Management

Word Count: 1708

1. Introduction

The Construction Industry Training Board (CITB) (2023) state that the UK will need an extra 251,500 workers by 2028. This has been a long-term issue for the sector, which has been heightened due to high profile projects and the UK falling into recession due to the COVID-19 pandemic. The Royal Institute of Chartered Surveyors (RICS) (2024) explains that the construction industry must improve talent management using digitalisation within the sector to help improve quality, sustainability, productivity and profitability. Li *et al.*, (2020) explained that COVID-19 has added a new dimension for both employers and employees, changing how many organisations are run and how employees now work. However, Van der Heijden (2023) explains that the industry is slow at adopting technological innovations which will hold the

sector back from the fifth industrial revolution, whereas other industries are further advanced. Unfortunately, The UK Parliament Post (2021) explains that around a fifth of the UK population do not have essential digital skills for life and 44% of organisations suffer from a digital skills gap; therefore, businesses have a responsibility to upskill their labour to ensure that the sector can technologically advance to integrate the Internet of Things (IoT), Artificial Intelligence (AI), Augmented Reality (AR), digital twinning, big data and robotics that will provide greater productivity and efficiency, whilst encouraging a new generation of skilled workers for the construction industry- resulting in increased competition and profit.

2. Literature Review

Ozkeser (2018), explains that Industry 4.0 is a big part in our lives by using mobile phones, touch screens, AI, IoT, and cloud computing whilst we are shopping however, by using Industry 4.0 in a lean form will help the sector move towards Industry 5.0. Paschek *et al.*, (2019) claims that Industry 5.0 will break down barriers between the real world and the virtual one whilst leading to increased collaboration between humans and smart systems like robots, especially in manufacturing. By taking this step, machines will take over all monotonous, repetitive tasks while humans enhance and enjoy their creative side taking on more responsibility and increased supervision of systems to elevate the quality of production across the board. Maddikunta *et al.*, (2022) emphasises this by explaining that the main difference between Industry 4.0 and 5.0 is mass production of emerging technologies to mass personalisation as human experts must work collaboratively with efficient, intelligent and accurate machines. COVID-19 has had a huge impact on businesses forcing organisations to enhance and invest in basic technologies to enable companies to continue operating whilst allowing employees to work remotely. However, there are still many businesses who are reluctant to invest in new technologies and businesses could invest more to enable organisations to become more efficient.

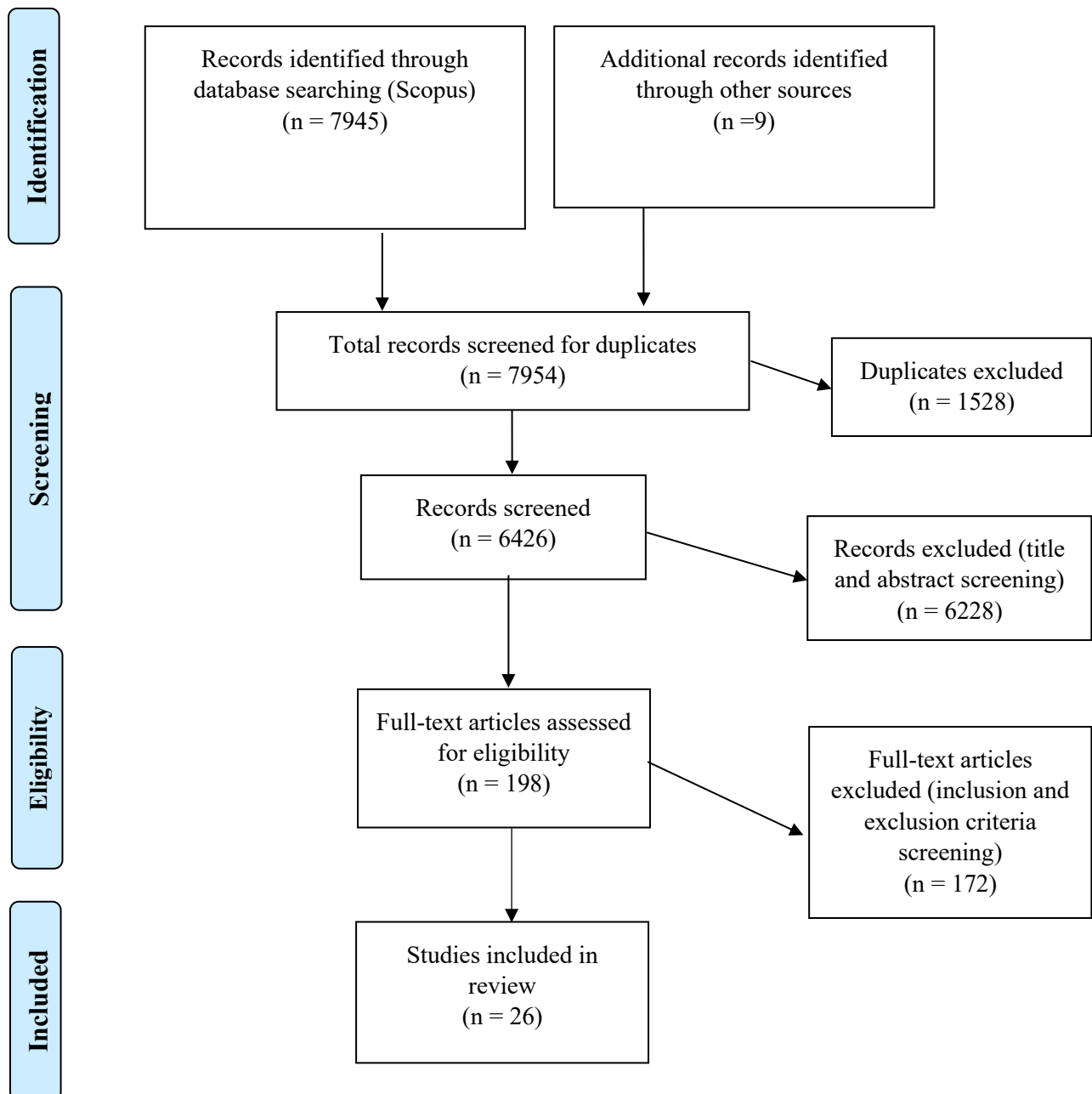
It is understood that Industry 5.0 will promote skilled jobs enhancing the skills encouraged by Industry 4.0 however, Maddikunta *et al.*, (2022) explains that Industry 5.0 focuses on mass customisation where humans will be guiding robots. Abioye *et al.*, (2021) states that AI has several sub-fields including improved machine learning, natural language processing, robotics, computer vision, optimisation, automated planning and scheduling, that have been applied to tackle complex problems and support decision-making for real-world problems. This will help improve processes, cost-efficiency, reduced production times, improved safety and helped to achieve sustainability goals. Therefore, it is imperative that the construction industry progresses digitally to ensure the future of the sector is sustainable. Morze *et al.*, (2021) argues that if the construction industry works towards Industry 5.0 it will benefit skills shortages within the construction industry as the use of robotics and atomisation will replace the labour that was previously needed to fulfil these roles. Garcia de Soto *et al.*, (2019) further clarifies that whilst the industry is improving technologies, this will encourage new tech-savvy workers to join the construction industry whilst helping remove the dangerous, dirty and difficult stigma that has been attached to the industry for many decades. This will benefit the sector by advancing digitally, improving health and safety, efficiencies, productivity and profits to help meet key construction programmes and targets with a diverse workforce.

3. Methodology

The primary objective of this study is to explore the benefits of AI in construction and how resolving this issue could help decrease skills shortages throughout the construction sector. The first stage covers the collection of secondary data using a systematic literature review approach using the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA). The systematic review approach was developed to collect the available data, filter it according

to the credibility of the sources, to analyse the filtered data to determine its overall effect and finally, to disseminate the data based on its effectiveness (Higgins and Green, 2011). Moher *et al.*, (2015) explains that detailed, well-described protocols can facilitate the understanding and appraisal of the review methods, as well as the detection of modifications to methods and selective reporting in completed reviews. This study uses a mixture of literature by using peer reviewed journal papers and government strategies to understand the current outlook digitalisations within the construction sector.

Figure 1: PRISMA diagram



The steps followed for the systematic literature review proposed by Tranfield *et al* (2003) and are as the following:

- Formulation of the review question.

- Identification of keywords and search terms based on scoping study, the available literature and researchers' suggestions.
- Identification of the most appropriate search strings.
- Compilation of a full list of information search outputs of all articles and papers reviewed.
- Incorporation of studies that meet the inclusion criteria as specified into the research.

Search Process and search term generation

A search of databases including Scopus and Google Scholar were used and further to these reports from industry bodies and professionals were reviewed to ensure a full review of industry literature was used to enhance the research. Titles including one or more of the search terms: AI in construction, talent management, construction skills shortages, Industry 5.0, construction skills deficit and drivers or benefits. The searches took place in February 2025, covering all years of publications from 2010. Figure 1 displays the PRISMA diagram displaying that 7945 were initially screened by Scopus and an additional 9 documents were sourced. 7954 were screened for duplication which removed 1528. Once all screening was complete 26 studies were used for this study.

Literature Review Question

A well identified and constructed research question guarantees a focus on the research scope and avoid unrelated searching and limit the risk of turning the literature review process into one that is significantly large and non-systematic. Petticrew and Roberts (2006) argued that breaking the review question into sub-questions ensures a better framing and formulation of the question. The Population, Intervention, Control, and Outcomes (PICO) model is a tool that can be applied in this case.

Table 1: Systematic literature review process

Acronym	Definition	Description
P	Population	Construction business, bodies and the UK Government
I	Intervention	Government and construction body strategies
C	Comparison	Strategies vs reality of the construction industry
O	Outcome	What is the outlook of the sector?

The developed literature research question is as follow: How can AI improve the construction industry?

Identification of inclusion/exclusion criteria

The selection process relied on a thoroughly specified benchmark to select relevant primary studies (Ali and Petersen, 2014). Hence, the inclusion of: Papers that we believe contribute to the body of knowledge on women in construction; Papers that are from peer-reviewed journals, conference proceedings, government publications or construction bodies; and the paper is written in a language other than English were excluded.

4. Results and Conclusion

It is widely recognised that the construction industry is inefficient, unproductive, use technology poorly and a there is a reluctance to change, however, new technologies and

specifically AI can have a significant impact on the industry. Literature shows that there are new digital technologies that could be either implemented within the sector or improved; however, whilst this progresses, current labour must be upskilled. It is essential for talent management strategies to retain and develop current skilled workers and integrate new technologies. Improving digital strategies is a method to retain and attract new talent that will allow the new digital era to progress as the impact of Industry 4.0 and 5.0 and will add a new dynamic to the sector by improving processes, cost-efficiency, reduced production times, improved safety and meet sustainability goals. However, whilst the UK Government are investing in new technologies, businesses must also invest capital to continue innovation and meet the demands of Industry 5.0 and reduce digital poverty whilst creating safer working environments.

5. Strengths and Limitations

This study reviewed how digital technologies can improve the construction sector and how improvements within the industry can be improved to reduce the skills shortage and improve productivity. This work is critical to the industry as well as many other researchers' work. However, relying on a systematic review as a search strategy involves the risk that valuable published sources and articles are excluded due to being deemed as out of the scope strategy, therefore due to a lack of published evidence, articles and statistics have been used to support the published evidence. Only publicly available databases and full text available articles were searched and reviewed. Additionally, conference materials were also excluded from this review but there has been some good material that are published in conferences. This potentially omitted valuable published materials which may have been vital to this study. However, most conference papers are further developed and published in peer reviewed journal papers.

6. Future Research Development

Further studies should concentrate on how the UK Government and the construction industry can invest more into new technologies for the construction industry. This will help reduce the skills shortage throughout the sector, and help attract and retain current labour.

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