Initial Literature review

Over the past 30 years, IT has become the dominant form of designing urban environments. There have been numerous studies that investigate the urban evolution under the effects of IT (Saed Rezaei, 2016), and with the arrival of HS2, the impact of large-scale planning on environments in the United Kingdom has been brought to the fore.  
 The number of important archaeological sites that have been discovered in the process of creating the new rail link has been impressive, and many of the finds have increased the knowledge and understanding of the complexity of people interacting with the landscape over thousands of years. Unfortunately, many of these sites will be destroyed, and that is a great loss to the country.

Despite this, valuable data has been collected that could potentially allow these sites to be reconstructed virtually, enabling people to see a world long vanished to our eyes.

Creating simulations of the past is certainly nothing new; museums have been creating replicas for centuries now, with the cast rooms at the Victoria and Albert Museum in London being a notable example. During the 1980’s, the Jorvik Viking exhibition recreated the sights, sounds and smells of 9th Century York, with multi-sensory experiences since appearing in museums and theme parks across the world.  
More recently, online virtual environments have been used to engage people as active participants Where they can experience products and environments from the comfort of their homes. 2017 was considered a significant year for virtual reality destination marketing campaigns from brands such as Thomas Cook, New York Times, and Disney. (mbryonic, 2017) This has been made possible through significant breakthroughs in mobile digital technology and high-resolution screens. Ideally, a virtual environment provides a substitution to the real-world environment by enabling users to remove physical word stimuli and fully immerse themselves in a virtual world. (B.G Witmer, 1998)

However, there are much wider applications of the use of visualisation technology: in this particular case, the use of digital technology to aid visualisation of archaeological findings and environments.

Archaeology has always been a visual science. Visual observations of shape, style, size, helping form preliminary classifications allowing archaeologist to organise, interpret and reconstruct complex narratives out of the past and communicate to the present day.

“…Simply put, this act of visual translation, moving from the things that archaeologists find to reconstructing a narrative of past human behaviour, is as much a creative act as a scientific one. Archaeology’s very foundations are built upon visual elements.”  
(Opgenhaffen, 2021)

However, it is important to note that the term ‘visualisation’ is different from ‘representation’. Representation is often static and implies a certain level of objectivity as the visual output should represent the object as it was it specific moment in time.   
Visualisation is far more active because it functions as both the product and the practice. For example, a 3D scan of original artifact is different from the original when it is translated and by the creative practice of the archaeologist becomes an original virtual artefact in and of itself.

Visualisation in archaeology is primarily a 2D medium, and even now it is considered normal practice to hand-draw excavations using a grid system; using conventional pencil and paper to record finds the archaeologist is uncovering. This does not mean that 3D visualisation is not being used; the move towards utilising geophysics who typically use Doppler Radar, Magnetometry, Resistivity and more recently Lidar, means that it is often impractical to rely on a 2D visual source. Morgan & Wright (2018) note that the use of conventional media is still highly prevalent in the United Kingdom’s archaeological recordings despite the continued influx of digital recording methodology. They are surprisingly critical of what they consider to be a shift of methodology without consideration, taking exception to advocates of digital recording such as Bergen, Ellis et cetera, feeling that the personal aspects of physical recording still have a use and a place in the archaeological record.  
 It is ironic that despite archaeology's reliance on artistic skill and illustration not a single word is dedicated to the role of visualisation practice in archaeology. Along with Opgenhaffen, this journal provides an important contextual link to the technical and artistic skills still required in archaeology.

Opgenhaffen’s (2021) article, *Visualising Archaeologists: a Reflexive History of Visualisation Practice in Archaeology*, takes a snapshot through the history of archaeology, showing the artistic exploration and narrations of the past, emphasising the importance of artistic ability in the antiquarian to “restore” an object to its original form. This is particularly evident where Renaissance and Baroque statues are recorded, With Opgenhaffen giving some excellent examples.  
 He also emphasises how important it is for artefacts to be manipulated artistically rather than naturally in order to give a clear impression as to the shape of the object and how it may have been used. These drawings became the first means of assessing how groups of objects were connected, and comparisons and establishing the first classes of artefacts (Moser, 2009)

Throughout the 19th century it was not in common archaeologists to be accompanied by artists. One such artist was a pain search Sir Lawrence Alma Tadema (1836-1912) whose extensive experience of the ancient world through direct observations during his numerous travels to Italy, particularly Rome and Pompeii. This resulted in highly detailed and historically accurate paintings. Some critics sneered that the artist included so many items in his paintings that they resembled a catalogue: ironically demonstrating how well-informed Alma Tadema was. He included people interacting with objects as he sought to revive everyday life in the classical era. The objects and vessels were cleverly chosen were not mere aesthetic decoration, but intended to inform about their function and their use.

“The accuracy of Alma Tadema’s painting derived from his personal study of the archaeology and architecture, even though it was common at this time for artists to use a professional draughtsman to sketch the building first.” (Opgenhaffen, 2021)

Section 3 is of particular interest as it discusses the contemporary use of digital visualisation technology in archaeology, an area that this author is deeply interested in. It explains in detail the impact that digitally recorded data in conjunction with applications such as GIS AutoCAD and Adobe illustrator have had on visualisation practice. Due to the high precision of digital scanning is encouraged archaeologists to reconstruct in 3D what the structures would have looked like originally. Harrison Eiteljorg (Eiteljorg, 1996) was an early adopter of 3D technology, eventually recreating the entrance arch to the Acropolis in Athens. Ironically, there were many distractors who believed that the images were detached from the underlying archaeological data and some (Wheatley, 1993) believe them to be deceiving or misguiding. “These accusations have overshadowed the projects that indeed challenged these technically difficult issues by producing scientifically informed and research-based 3D reconstructions” (Opgenhaffen, 2021)

Opgenhaffen concludes by saying the both 2D and 3D:  
“…share the same legacy once the techniques that enabled the visualizations are removed, and focus is shifted to the creative practice of the visualizing archaeologist and the role that both the image and the maker plays in the archaeological process of knowledge production. “(Ibid, 2021)

He finally notes that the current 3D visualisations are striking, yet archaeologists using digital technology have only recently started to change the way that they create archaeological knowledge. He feels that ultimately a balanced combination of computational thinking, technology, and existing practises will result in a more creative visualisation practice that produces new and different knowledge about the past.