CHAPTER 3
BIM IMPLEMENTATION IN HERITAGE BUILDINGS

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3.1 INTRODUCTION

Half a century after the invention of printing, Benedictine abbot Johannes Trithemius published a book called *In Praise of Scribes* in which he fervently advocated the continued copying of books by hand. He pointed out that despite the availability of printed books in large numbers, there remained many unprinted books that were worth copying. However, the core of his argument was based squarely on the issue of preservation.

> "All of you know the difference between a manuscript and a printed book. The word written on parchment will last a thousand years. The written word is on paper. How long will it last? The most you can expect a book or paper to survive is two hundred years. Many think they can entrust their works to paper. Only time will tell."
>
> (Trithemius, 1494)

It has been a while since Trithemius wrote, and the era of electronic digital communication has been rapidly developing. Undeniably, electronic digital communication offers significant advantages over previous technologies, and it has taken hold and spread very quickly. As a new era

draws to a close, more and more records are being created, stored, and disseminated into digital form. A growing number of 'knowledge files' are being converted to digital form to be incorporated into computer-based systems. Recently, this recording pattern is also being practical for our historical and monumental buildings worldwide. Recently, various experimental applications have been performed to define conceptual models and procedures to integrate three-dimensional (3D) archaeological models with external related databases. One of the recent fashionable technologies is the building information modeling (BIM) platform.

3.2 BUILDING INFORMATION MODELLING

In simple terms, BIM can be described as a process of digitally illustrating all the elements that compose a building, while in technical terms it is defined as object-oriented parametric modelling. In other words, the BIM process involves the assembly of 'intelligent' objects (building components and spaces) into a virtual representation of a building or facility. These consist of geometry (two-dimensional (2D) and 3D) and associated (non-geometric) information. BIM objects are parametric, defined using rules and automatically adjusting to changes in their context.

In the new-build and infrastructure sectors, BIM has shown potential benefits of design and construction projects, with significant downstream gains in the operation stage. The key factors are effective multi-disciplinary collaboration, structured information sharing, and integration of facilities management requirements into early project stages.

Information is integrated into the model in a structured way, by adding the relevant pieces of information to corresponding BIM objects (heritage building). In this way, the BIM model constitutes a digital information resource for the built asset.

However, interestingly, the very first question that we must ask ourselves is "Are we aware that BIM can be used as a tool to preserve architectural components of any building?"

In the last few decades, information and communication technology (ICT) has been actively supporting significant heritage documentation

activities, providing even more advanced methods and technologies to record, manage, and process related data. In the archaeological domain, digital archives, image-based 3D modelling, virtual reality, and augmented reality, have allowed us to record a significant number of heterogeneous data and to describe via 3D models.

It was initially applied in the architecture, engineering and construction (AEC) field to urban contexts: Its purpose was describing new building structures and lifecycles inside a cooperative environment, but its application has recently been extended to historical architecture. The main aim is to provide 3D descriptive systems of objects from archaeological contexts and to make them suitable to the complexity of real-world settings. As these 3D reality-based models are integrated with the database, they can increase the informative potential of the archaeological resource, not only by 3D visualisation but also by 3D data recording.

Figure 3.1 Building information model of Balai Besar Kedah

3.3 HERITAGE BUILDING INFORMATION MODELLING

Unlike the new-build construction sector, where BIM has been widely applied for a number of years at an international level, BIM for heritage assets (historic buildings and sites) is a relatively new field of academic research and appears less popular in terms of adoption by heritage professionals.

The terms 'heritage BIM', 'historic building information modelling', heritage building information modelling (HBIM), 'BIM for heritage', and 'BIM for historic buildings' have been used almost interchangeably concerning BIM implementation in the heritage sector, including