

**DEVELOPMENT OF AN ANDROID MOBILE
APPLICATION VOICE TO TEXT EMBEDDED BY
IMPLEMENTING CONCEPT OF 7D-BIM
(FACILITIES MANAGEMENT)**

AHMAD ALQURTUBI BIN ALKHARIB SHAH

**FACULTY OF ENGINEERING
UNIVERSITI MALAYSIA SABAH
2022**



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(FACILITIES MANAGEMENT)**

AHMAD ALQURTUBI BIN ALKHARIB SHAH

**THESIS SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENT FOR THE DEGREE OF
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**FACULTY OF ENGINEERING
UNIVERSITI MALAYSIA SABAH
2022**



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IJAZAH : CIVIL ENGINEERING

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Ahmad AlQurtubi Bin Alkharib Shah
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ABSTRACT

Currently, there is a lack of mobile applications that have been developed to allow professionals, especially building managers and owners in the construction industry to help track important asset data such as its status and maintenance manuals. Due to this, professionals such as engineers sometimes find it hard to optimize assets and carry out operations and facility management. Hence, this 7D-BIM with facilities management mobile application will be developed to provide a unique approach where everything related to the facility management process is collated at a single place within the building information model with speech-to-text recognition system, therefore, the user also can store and edit information about their facilities information in this application which is gathered to produce document and form. This study aims to study how ready the Malaysian construction industry is for Speech-to-Text Recognition (STR) implementation, as well as the challenges, benefits, and possible strategies for using STR in the Malaysian construction industry. It also focuses on developing an android app that implement the concept of 7D-BIM (Facilities Management). A questionnaire survey of this study is conducted to 30 professional industrial players in Malaysia. Based on the survey, the rate of the readiness of STR implementation in Malaysian construction industry can be rated at 43.33%. The study also resulted to four main challenges of the adaptation; economic challenges, social challenges, technology challenges, and environmental challenges. Advantages suggested based on the survey is improve pronunciation utterance, adaptability to current technology, productivity improvement, reduce workload, and short time for documentation. The result and findings show how the mobile application were designed and developed by implementing the concept of 7D-BIM (Facilities Management) with voice-to-text embedded system using Android Studio (IDE) software.

Keywords: Building Information Modelling, Facilities Management, Android Mobile Application, Coding, Automatic Speech Recognition, Java Language



ABSTRAK

PEMBANGUNAN APLIKASI ANDROID MUDAH ALIH MENGUNAKAN PROGRAM SUARA KE TEKS YANG DISEMPURNAKAN DENGAN KONSEP 7D-BIM (PENGURUSAN FASILITI)

Pada masa ini, terdapat kekurangan dalam pembinaan aplikasi mudah alih bagi membolehkan golongan profesional, terutamanya pengurus bangunan dalam industri pembinaan untuk menjejaki data aset penting mengenai fasiliti seperti status dan manual penyelenggaraannya. Disebabkan ini, profesional seperti jurutera kadangkala merasa sukar untuk menjalankan operasi dan pengurusan kemudahan di tahap yang optimum. Justeru, aplikasi mudah alih konsep 7D-BIM (Pengurusan Fasiliti) ini akan dibina untuk membantu melalui pendekatan unik di mana semua maklumat yang berkaitan pengurusan fasiliti dikumpulkan dalam sesuatu tempat dengan mengaplikasikan sistem penukaran suara kepada teks, dan, pengguna juga boleh menyimpan dan mengedit maklumat mengenai fasiliti dan kemudahan mereka dalam aplikasi ini yang dikumpulkan untuk menghasilkan boring dan dokumen. Kajian ini bertujuan untuk mengkaji sejauh mana industri pembinaan Malaysia bersedia untuk pelaksanaan sistem penukaran suara kepada teks, serta halangan, kelebihan, dan strategi untuk menggunakan sistem penukaran suara kepada teks dalam industri pembinaan Malaysia. Tinjauan soal selidik kajian juga dijalankan kepada 30 ahli profesional dalam industry pembinaan bangunan di Malaysia. Berdasarkan tinjauan, kadar tahap kesediaan dalam mengaplikasikan sistem penukaran suara kepada teks dalam industri pembinaan Malaysia juga berjaya dinilai iaitu pada tahap 43.33%. Kajian itu juga memberi tinjauan dalam empat cabaran utama iaitu cabaran ekonomi, cabaran sosial, cabaran teknologi dan cabaran alam sekitar. Kelebihan yang telah didapati berdasarkan tinjauan adalah meningkatkan tahap kefasihan sebutan pengguna, kesesuaian dengan teknologi semasa, peningkatan produktiviti, mengurangkan beban kerja dan menghasilkan dokumentasi pada kadar yang cepat. Di dalam seksyen hasil dan penemuan, menunjukkan bagaimana aplikasi mudah alih direka bentuk dan dibangunkan dengan melaksanakan konsep 7D-BIM (Pengurusan Fasiliti) dengan sistem penukaran suara kepada teks dengan menggunakan perisian Android Studio (IDE).

Kata Kunci: BIM, Pengurusan Fasiliti, Aplikasi Mobil Android, Pengekodan, Pengecaman Pertuturan Automatik, Bahasa Java

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LIST OF ABBREVIATIONS

AEC	- Architecture, Engineering & Construction
ADT	- Building Information Modelling
AVD	- Android Device Manager
AHP	- Jabatan Kerja Raya
AOSP	- Public Works Department
API	- Statistical Package for Social Science
ASR	- Automatic Speech Recognition
BDS	- Building Description Systems
BIM	- Building Information Modelling
CAD	- Computer-Aided Design
COVID-19	- Coronavirus Disease
C&S	- Civil and Structure
DVM	- Dalvik Virtual Machine
FM	- Facilities Management
GAMP	- Government Asset Management Policy
GDP	- Gross Domestic Product
GIS	- Geographic Information Systems
GPS	- Global Positioning System
GSA	- General Services Administration
HAL	- Hardware Abstraction Layer
IDE	- Integrated Development Environment
IOS	- Iphone Operating System



IOT	- Internet of Things
IT	- Information Technology
JDK	- Java Development Kit
JKR	- Jabatan Kerja Raya
LOD	- Level of Detail
M&R	- Maintenance and Repair
M&E	- Mechanical and Electrical
NBIMS	- National Building States®
NCI	- National Cancer Institute
NIST	- National Institute of Science and Technology
PBS	- Public Buildings Service
PC	- Personal Computer
PMI	- Purchasing Managers' Index
PWD	- Public Works Department
QOL	- Quality of Life
RFID	- Radio Frequency Identification
SDK	- Software Development Kit
SDLC	- Software Development Life Cycle
SPSS	- Statistical Package for the Social Sciences
THIS	- Total Hospital System
7D-BIM	- Seventh Dimensional Building Information Modelling



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Google Questionnaire Form Survey

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CHAPTER 1

INTRODUCTION

1.1 Background of Study

Building Information Modelling (BIM) is a dynamic process that develops data-rich models for a building project's whole lifespan. The benefits of BIM technology include cost savings, reduced material consumption, and indirect efficiency gains across the three primary phases of the building lifecycle: design, construction, and management (Sarman et al., 2021) as specific factors are added to the present information in BIM based on the project stages and complexity. BIM adoption might help the construction sector become more efficient, effective, flexible, and innovative (Takim et al., 2013).

BIM is deemed more effective in terms of both time and money consumption when compared to the traditional 3D CAD technique as semantic information such as the component type, materials, costs and its relationships with other components are embedded into the model's building components (Figure 1.01). BIM offers dependable facility records and information as well as comprehensive views among all facility systems, enabling facility managers to obtain and analyse data from many systems and giving a new method of looking at how buildings have behaved through time, which could aid facility maintenance and restoration planning (Akcamete et al., 2019). The purpose of BIM itself to improve product distribution, which knowledge management, consistency, and timelessness of the procedure (Ani et al., 2015).

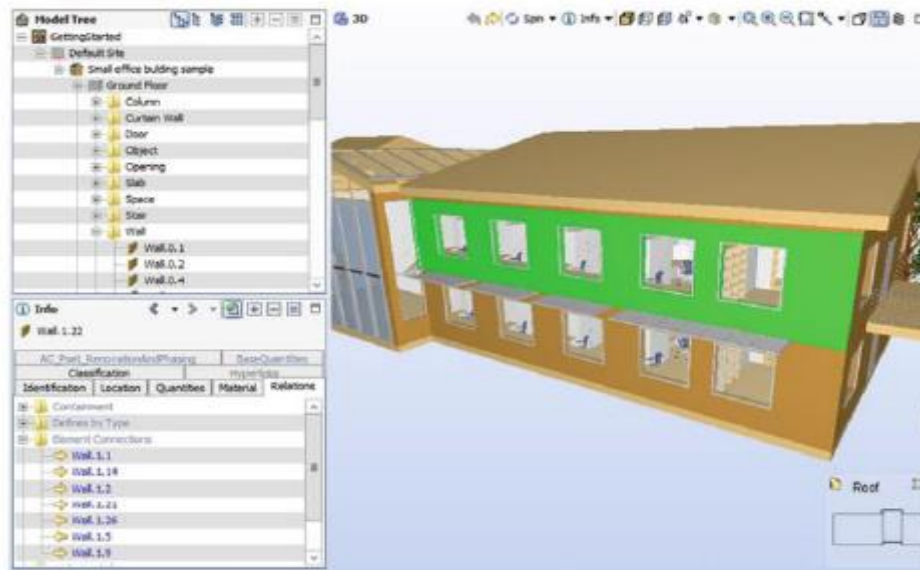


Figure 1.01: A BIM model comprises its 3D geometry components

Source: Sinenko et al., 2020

While BIM is considered to revolutionise the way the built environment operates, most BIM research has focused on storing and distributing technical data (A M Sarman,2021). In reality, there are up to 10 dimensions in BIM: 3D (Shape), 4D (Scheduling), 5D (Estimating), 6D (Sustainability), 7D (Management), 8D (Safety),9D (Lean Construction) and 10D (Industrialized Construction). BIM is deemed more effective in terms of both time and money consumption when compared to the traditional 3D CAD technique.

A set of success criteria relating to the project's output, such as time, cost, and quality targets, may be used to determine the benefits of BIM adoption (Bryde et al., 2014). Related to the context of this study, basically the concept of 7D-BIM facilities management in an android mobile application will be made based on the literature review, and all the problems that had been identified. With this project, the implementation of 7D-BIM through mobile application development hopefully will help to facilitate work for construction and provide awareness in the Malaysian construction industry to the potential of 7D-BIM (seventh-dimensional building information modelling).

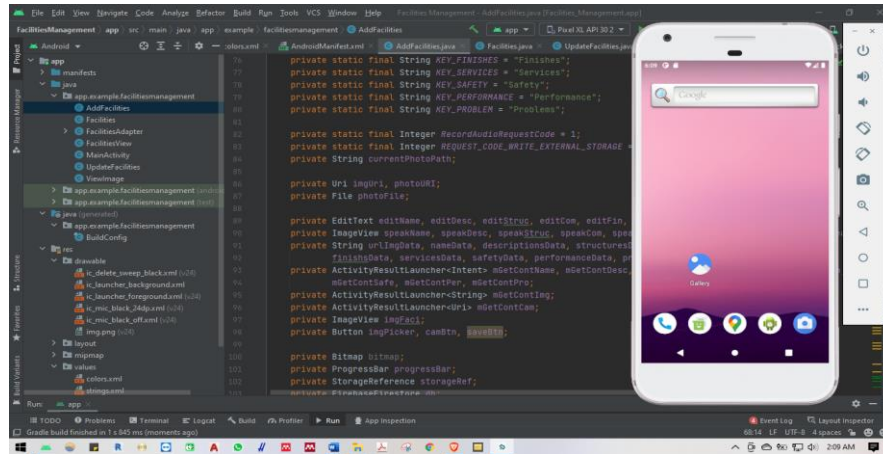


Figure 1.02: Interface of Android Studio (IDE)

During the lifespan of a facility, BIM represents the creation, use, and exchange of digital models across digital stakeholders, referring to the process of creating software for portable devices by the development using Integrated Development Environment (IDE) called Android Studio such as smartphones and personal digital assistants.

Application development requires a specialised integrated design environment, such as Android Studio (Figure 1.02) as the app is initially put through its paces on emulators, which are software simulations of the actual hardware device, before being put through its paces in the field. Another important aspect of application development is mobile user interface (UI) design, which is used to implement a unique feature of the 7D-BIM (seventh-dimensional building information modelling) facilities management concept. Based on the building information modelling (BIM) technology, this study proposed a 7D-BIM (seventh-dimensional building information modelling) concept to assist in exposing and raising awareness of 7D-BIM potential in the Malaysian building sector. and to increase potential of implementation of 7D-BIM through mobile application development in facilitating work for construction.

Last but not least, by implementing Internet of Things (IoT) into the 7D-BIM concept through the use of an android mobile application, it will make significant contributions to the project's information collection and communication, which should be the promising direction of BIM implementation.